

GLOBAL
EDITION



INTRODUCTION TO
**MANAGEMENT
ACCOUNTING**

SEVENTEENTH EDITION

CHARLES T. HORNGREN
GARY L. SUNDEM
DAVID BURGSTAHLER
JEFF SCHATZBERG



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Introduction to

MANAGEMENT ACCOUNTING

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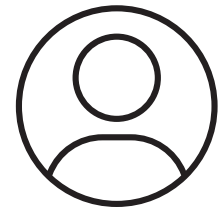
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Preface

Now more than ever, managers have to understand how their decisions affect costs.

Management accounting is an essential tool that enhances a manager's ability to make effective economic decisions. Because understanding concepts is more important than memorizing techniques, *Introduction to Management Accounting*, 17th edition, describes both theory and practice so students understand how to produce and apply information that's useful in day-to-day decision making. From the first chapter, we encourage students to think about the advantages and disadvantages of various techniques, not to simply memorize and apply the techniques.

Introduction to Management Accounting, 17th edition, deals with all business sectors—nonprofit, retail, wholesale, service, selling, and administrative situations—as well as manufacturing. The focus is on planning and control decisions, not on product costing for inventory valuation and income determination.

Our Philosophy

Introduce concepts and principles early, then revisit them at more complex levels as students gain understanding. Provide appropriate real-world examples at every stage.

In management accounting courses students learn how managers use accounting information to help make better business decisions. They begin their understanding of managerial decisions by asking, “How will my decisions affect the costs and revenues of the organization?” Students then progress to more complex questions: “What is the most appropriate cost-management system for the company?”, “What products or services should we emphasize?”, and “What do our budget variances mean?”. *Introduction to Management Accounting* presents the most basic cost concepts in chapters 1–6 and adds more complex analyses that build on these concepts in the remaining chapters.

Our goals are to choose relevant subject matter and to present it clearly and accessibly, using many examples drawn from actual companies. Examples like Saudi Arabia's SABIC, Singapore's CerealTech Pte Ltd, Sweden's HL Display, the Indian Railways, and more, help students understand management accounting concepts in a real-world context.

New Edition Enhancements and Updates

The authors have made changes to both update the topic coverage and to add clarity to the discussion of various topics. Some noteworthy changes include the following:

- **Increased focus on merchandising and service sectors** keeps with the shifts in the world economy. This edition makes more use of merchandising and service sector examples and deemphasizes traditional manufacturing settings. For example, Chapter 3 illustrates cost behaviors in the context of managing finances associated with hotel services. Chapter 15 describes financial statements using Intel's technology services, big-data analytics, and its efforts in corporate social responsibility.
- **New and revised “Business First” boxes** provide insights into operations across a range of global organizations and startups, including Rent the Runway, Qatar Steel, Hopin, and Harvard University. Some boxes also cover how businesses have been affected by the COVID-19 pandemic.
- **New and revised chapter-opening vignettes** help students understand accounting's role in current business practice. We revisit the chapter-opening company throughout the chapter so that students can see how accounting influences managers in real companies. Students will recognize many of the companies, such as Airbus, Intel, Accor S.A., and Dell.

- **New examples** used throughout the text are of interesting young, high-growth firms from across the world that will resonate with young adults. For example, Amsterdam-based eyewear company Ace & Tate, the United Kingdom's leading African food online store Wosiwosi, and Brussels South Charleroi Airport that introduced the Environmental and Movement Monitoring for Airports (EMMA) operations management platform.
- **Updated problem** in each chapter based on Nike's SEC Form 10-K from 2021. These problems illustrate how publicly available information can lead to insights about a company, its costs, and its management decisions.
- **Increased coverage of ethics**, including an ethics problem in each chapter's assignment material.
- **End-of-chapter material** includes over 300 revised exercises and problems to provide fresh, new examples.

Solving Learning and Teaching Challenges

Studying management accounting is one of the best business investments a student can make. Success in any organization—from a local food stall to the largest multinational corporation—requires the use of managerial accounting concepts and practices. This book focuses on how accounting helps managers make better decisions, as managerial accountants are integral members of their company's decision-making teams; it also prepares students for the rewards and challenges they will face in the professional cost accounting world of today and tomorrow. To emphasize this prominence in decision making, the authors place managers in the forefront throughout this book. By focusing on basic concepts, analyses, uses, and procedures instead of procedures alone, the book recognizes cost accounting as a managerial tool for business strategy and implementation.

Opening Vignettes

Chapter opening vignettes help students understand accounting's role in current business practice. We revisit the chapter opening company later in chapter discussions so students can see how accounting decisions effect real company practices. The vignettes engage the reader in a business situation or dilemma, illustrating why and how the concepts in the chapter are relevant in business. For example, Chapter 2 looks at how European aerospace company Airbus reported a loss in 2019, despite earning over €70 billion of revenues; and how it can improve its future profitability by both controlling (reducing) its own costs as well as understanding how the operational costs of its aircraft will impact customers' profitability. Chapter 12 explains the purpose of cost allocation by using Sweden's H.L. Display and the merchandising installations it offers to other global brands.

► AIRBUS

Delivering a record-breaking 863 aircrafts in 2019, European aerospace consortium **Airbus** surpassed American rival **Boeing** to become the world's largest producer of aircrafts. Founded in 1970, the company has grown and evolved over the last 50 years, establishing itself as a pioneer in designing and manufacturing aerospace products and services spanning commercial **aircraft**, helicopters, defense aviation, and space.

Despite earning over €70 billion of revenues in 2019, the company reported a loss for the year. With commercial airlines largely grounded in 2020 and much of 2021 due to the global COVID-19 pandemic and most governments funneling resources into the healthcare sector to combat the spread of the virus, how will Airbus return to profitability?

Consider Airbus' decision to develop the pioneering, full-length double-deck A380 jumbo jet. Large enough to accommodate over 850 passengers, along with onboard amenities including lounge areas as well as private suites with beds and showers, the plane's size and configuration were unprecedented, surpassing Boeing's 747, when it was introduced on the market in 2007. It was estimated that the company spent between €25 and €30 billion to develop the aircraft. With post-pandemic travelers more aware of the health benefits of social distancing and the need to ensure good hygiene in shared spaces, it would seem that the A380 would be the aircraft most able to meet these expectations for space and cleanliness. However, in 2019, the company announced its decision to discontinue the model, with delivery of the last planes produced scheduled for 2022. Bob Lange, Head of market and product strategy, once described the plane as "the most passenger preferred aircraft in the world." Confident that passenger demand would translate into orders from airlines, sales of 1,200 planes were initially forecasted. Ultimately, only 251 A380s were eventually sold, of which 123 were sold to **Emirates**, by far the biggest buyer, followed

by **Singapore Airlines** with 24 in its fleet. No U.S. airline purchased the A380. "In the end, you have to face facts, and we could see that we were building A380s faster than people were ordering them," said Lange.

What lessons can be learned from the A380 and how can Airbus avoid making similar mistakes in the future? To answer these questions, Airbus must understand not only its own production costs but also the costs that will be incurred by customers and other key stakeholders, such as airports. In the case of the A380, research and development costs far exceeded Airbus' initial estimates, while high operational costs dampened enthusiasm from airlines and airports. In retrospect, the characteristics of the plane's biggest buyer, Emirates, illustrates the limited appeal of the aircraft to the broader market. According to an interview with Emirates' CEO Tim Clark, the company could profitably make use of the A380 because it bought a large fleet, reaping economies of scale in maintenance and crew costs, and because of its strategy as a hub-based, medium and long-haul operator providing high-occupancy flights to busy airports with limited landing slots.

With intense competition from Boeing, Airbus can improve its future profitability by both controlling (reducing) its own costs as well as understanding how the operational costs of its aircraft will impact customers' profitability and, consequently, their decision whether to buy from Airbus or Boeing.

This chapter begins your study of costs. One of the main goals of management accounting is to help managers understand **cost behavior**—how the activities of an organization affect its costs—as they make crucial decisions about their production and service activities. For example, how much would it cost Boeing to produce each 787? How much cost does **Ryanair** incur when it adds one more passenger at the last moment to an existing flight, or when it adds one more flight to the schedule? What does it cost **Tesla** to develop a new category of electric automobiles, such as **Lorries**? How much does it cost to produce one more Model S? How will an increase in Dublin's population affect the costs to run the government's department of transport? What does it cost **Nestlé Purina** to meet **Carrefour**'s specifications for shipments of pet-care products? What activities contribute most to Nestlé Purina's cost to serve Carrefour stores? These are all specific forms of the general question: What will be the incremental effects if an organization changes its activities? ■



Antony Nettell/Klapp Stock Photo

The design and production of an airplane is a complex process. This is an example of the Airbus A380 jumbo jet, which was assembled at the company's facility in Toulouse, France.

cost behavior
How the activities of an organization affect its costs.

Business First

Each Business First box provides insights into the operations across a range of global organizations and startups, and some boxes also cover current topics like how businesses have been affected by the COVID-19 pandemic and changing face of annual reports. New examples include:

- Starbucks: Looks at the use of Big Data and analytics at Starbucks (Chapter 1)
- Ethics: Looks at corporate codes of conduct across global organizations like Google and Pepsico
- COVID-19 and industries: Looks at how hotels and auto makers cut costs and lower their break-even point during the global pandemic (Chapter 2)
- Rent the Runway: Discusses how start-ups look to determining the best cost structure to ensure their growth (Chapter 2)
- Annual reports: Discusses how annual reports have changed over the years with examples of Alibaba Group, Korea Hydro & Nuclear Power, Adidas, and others (Chapter 16)

Business First

For Start-ups, Survival Depends on Determining the Best Cost Structure

When it was launched in 2009 by two Harvard Business School graduates, New York-based **Rent the Runway** disrupted the fashion industry, taking the decades-old, brick-and-mortar clothing rental business online, and making high-end designer fashion accessible to a broader public for the first time. The company started off by offering high-end designer dresses for short-term rental via its e-commerce site. Since then, it has extended its inventory to include leisure wear, work attire, and a range of accessories, and has introduced a monthly subscription option. As the company has evolved, so too has its cost structure.

Initially, the company outsourced the cleaning and repair of its clothing inventory to a third party (customers are not responsible for cleaning the garments they rent; this is done by Rent the Runway). However, the founders quickly realized that control of the cleaning and repair process was key to quality assurance and to guaranteeing that items ordered were delivered on time and in pristine condition, thereby ensuring high levels of customer satisfaction. An average dress on Rent the Runway goes home to 30 different customers. Seems impossible? 'It is possible when you own the dry cleaning process,' according to co-founder and CEO, Jennifer Hyman. According to an article in *The Economist*, the company's dry-cleaning facility is the largest in the world. In addition to cleaning, the facility is staffed

with seventy-five seamstresses, who immediately repair items that are returned damaged, as well as 'spotters', who remove difficult stains from the clothing. With a large and growing base of eager customers and fashion trends constantly changing, how does the company keep up? According to Chief Analytics Officer Vijay Subramanian, the key to success is being data-driven. From generating personalized style recommendations for customers to the efficient cleaning and distribution of the clothing, data is an integral part of the company's DNA.

Developing a highly sophisticated, customer-friendly e-commerce site is a challenge for any firm, as is developing a highly sophisticated and efficient order fulfillment and inventory management system. Part fashion industry disruptor, part data and logistics powerhouse, Rent the Runway has succeeded in combining both in its innovative business model.

Sources: "I'm Like a Drug Dealer: Drug Dealer of Fashion," CBS News, September 16, 2014, <https://www.cbsnews.com/news/high-fashion-at-a-low-price-with-rent-the-runway/>; "Rent the Runway Is Taking Clothes-sharing Mainstream," *The Economist*, June 9, 2018; Vijay Subramanian, Deciding by Data Web site, <http://decidingbydata.indicative.com/rent-the-runway-chief-analytics-officer-vijay-subramanian/>; S. Bertoni, "How Mixing Data And Fashion Can Make Rent The Runway Tech's Next Billion Dollar Star," *Forbes*, August 20, 2014; and R. Kestenbaum, "Rent The Runway's Outsize \$1 Billion Valuation Is Reportedly Coming Down to Earth," *Forbes*, May 27, 2020.

Making Managerial Decisions

Placed in different locations in all chapters, these boxes allow students to take what they've learned, apply this material to a real business situation, and then plot a course of action.

Making Managerial Decisions

What type of information—scorekeeping, attention-directing, or problem-solving—would managers use for each of the following decisions? Why?

1. Deciding whether to replace a traditional assembly line with a fully automated robotic process
2. Evaluating the performance of a division for the preceding year
3. Identifying which products exceeded their budgeted profitability and which ones fell short of their budgets

planning
Setting objectives for an organization and determining how to attain them.

control
Implementing plans and using feedback to evaluate the attainment of objectives.

Another essential element of the management process is planning and controlling the organization's operations. **Planning** provides the answers to two questions: What objectives does the organization want to achieve? When and how will the organization achieve these objectives? **Control** refers to implementing plans and using feedback to evaluate the attainment of objectives. Thus, feedback is crucial to the cycle of planning and control. Planning determines action, action generates feedback, and the control phase uses this feedback to influence further planning and actions. Timely, systematic reports provided by the accounting system are a primary source of useful feedback.

The left side of Exhibit 1-2 demonstrates the planning and control cycle of current operations that could be used by a particular Starbucks store. The planning section in Exhibit 1-2 shows an objective for the store (increase profitability) and how it will be attained (product growth and improved marketing). The control section shows the actions that are intended to increase profitability and how Starbucks will evaluate the actions. The Starbucks store will implement its plan to expand the number of drinks on its menu and increase advertising. Management will evaluate these actions based on three performance measures, the increase in drinks sold, increase in advertising expenditures, and the increase in revenue. Managers will then use the performance evaluation results for further planning and implementation.

Answers

1. Problem-solving. This is a one-time decision for which managers need information about the potential impacts of each of the alternatives under consideration.
2. Scorekeeping. This is a routine evaluation of an organizational unit for which managers want systematic data on a regular basis.
3. Attention-directing. To identify products that need attention, managers want information that highlights deviations of actual results from pre-specified expectations in the budget.

Summary Problem for Your Review

Every Summary Problem that presents students with the financial background of a company over a particular period in the context of certain challenges the company might face or decisions that its managers might have to make. This is followed by questions that encourage students to apply concepts that they have learned in the chapter.

Summary Problem for Your Review

PROBLEM

The manager at the **Airbus** assembly plant in Toulouse is looking at a monthly report of plant costs. He notices that the receiving activity costs vary substantially from month to month and is interested in knowing more about why the total cost and unit cost of the receiving activity change. The number of parts received has ranged from 10,000 to 30,000 parts per month over the last several months.

1. Prepare a table that shows the cost of equipment, the cost of fuel, the total of equipment and fuel costs, and the cost per-part-received for 10,000 to 30,000 parts per month, using increments of 5,000 parts per month.
2. Prepare brief explanations of why the total and unit cost patterns change.

SOLUTION

1. The table can be developed using the relationships shown in Exhibit 2-5.

(1) Parts Received	(2) Equipment Cost	(3) $\text{€}0.66 \times (1)$ Fuel Cost	(4) (2) + (3) Total Cost	(5) (4) ÷ (1) Cost per Part Received
10,000	€45,000	€6,600	€51,600	€5.16
15,000	45,000	9,900	54,900	3.66
20,000	45,000	13,200	58,200	2.91
25,000	45,000	16,500	61,500	2.46
30,000	45,000	19,800	64,800	2.16

2. Column (4) shows the total cost of the receiving activity, which shows a pattern of increasing total cost. The increase in total cost is less than proportional to the activity cost driver because total cost includes both the fixed cost component from Column (2) as well as the variable cost component from Column (3). For example, a 50% increase in the number of parts received from 10,000 parts to 15,000 parts results in a 50% increase in the variable cost component in column (3) but the total cost in column (4) increases by far less than 50% because the fixed cost in column (2) does not change.

Column (5) shows the cost per part received, which shows a pattern of decreasing cost per part. The decreasing cost per part is entirely due to the fixed equipment cost being spread over increasing numbers of parts received, the cost driver. For example, consider the change in cost per part as the number of parts received increases from 10,000 to 15,000 parts. The fixed cost per part moves from €4.50 at 10,000 parts received ($\text{€}45,000 \div 10,000$) to €3.00 at 15,000 parts received ($\text{€}45,000 \div 15,000$). The variable cost per part remains constant at €0.66. Thus, the sum of the fixed and variable costs per part in column (5) decreases from €5.16 ($\text{€}4.50 + \text{€}0.66$) to €3.66 ($\text{€}3.00 + \text{€}0.66$) due entirely to the decline in the fixed cost per part.

Nike's Form 10-K

Appendix C, which offers insight on publicly available information, has been updated to reflect Nike 10-K data from 2021. In addition, each chapter has an updated problem on Nike's Form 10-K. These problems illustrate how publicly available information can lead to insights about a company, its costs, and its management decisions.

NIKE 10-K PROBLEM

2-72 Operating Leverage

Examine **Nike's** 10K report in Appendix C.

1. In Item 7 of the 10K, review the section titled Operating Segments. Prepare a table that compares the percent change in "Total revenue" to the change in "Pre-tax income" from 2020 to 2021 for the four major regions (ignore the Global Brand Divisions segment). Note that generally earnings before interest and taxes changes by a larger percentage than revenue. For example, in North America, revenue increased by 19% and earnings increased by 76%. How can operating leverage help explain the greater percent change in earnings than the percent change in total revenues?
2. Would you expect Nike's operating leverage to be high or low? Explain. Which assets do you think contribute to Nike's ability to leverage operating overhead?

Supplements for Instructors

All resources are available online at <http://www.pearsonglobaleditions.com>.

INSTRUCTOR'S RESOURCE MANUAL Substantially revised, this resource manual provides insightful and useful tips on how to best manage course content when using *Introduction to Management Accounting*, 17th edition, in class. Chapter-by-chapter explanations and pedagogical philosophies are clearly delineated and oriented to greatly aid the teaching process.

SOLUTIONS MANUAL Comprehensive solutions, prepared by the authors, are provided for all end-of-chapter material. The Solutions Manual includes a listing of problems covering each learning objective, sample assignment schedules, comments on choices of problems in each chapter, and key amounts from suggested solutions to selected problems.

TEST ITEM FILE This is a ready-to-use bank of testing material that contains, for each chapter, a variety of types of questions, including true/false, multiple-choice, and critical thinking problems. For ease of use, each question is linked to chapter objectives and provides a suggested difficulty level and references to text pages where answers can be found.

TESTGEN This testing software is designed to aid in creating custom tests in minutes. Features include question randomization, a point-and-drag interface, and extensive customizable settings.

POWERPOINT PRESENTATION Complete PowerPoint presentations are provided for each chapter. Instructors may download and use each presentation as is or customize the slides. Each presentation allows instructors to offer an interactive presentation using colorful graphics, outlines of chapter material, and graphical explanations of difficult topics.

Supplements for Students

COURSE WEBSITE This complete online resource offers a variety of Internet-based teaching and learning support. It provides a wealth of resources for students and faculty, including Excel spreadsheet templates. Access these resources by visiting <http://www.pearsonglobaleditions.com>.

MyLab Accounting

MyLab Accounting provides students with a personalized interactive learning environment where they can learn at their own pace and measure their progress.

FEATURES

- **Personalized help** is available on MyLab Accounting whenever students need it with the interactive “Help Me Solve This” tool. This tool automatically generates algorithmic versions of a particular problem and provides step-by-step assistance until the solution is obtained.
- **Dynamic learning resources** found in MyLab Accounting cater to students’ individual learning styles. All Learning Aids can be turned off by the instructor.
- **A personalized Study Plan**, for self-paced learning, links students directly to MyLab Accounting’s interactive tutorial exercises on the topics they have yet to master.
- **Excel Integration.** MyLab Accounting allows students to work through end-of-chapter or quiz problems in an Excel simulated environment. Their work is then automatically scored and reported to the MyLab Accounting Gradebook.
- **My Accounting Community.** This tool allows instructors to connect with other educators and exchange ideas and advice on courses, content, MyLab Accounting, and much more.

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Managerial Accounting, the Business Organization, and Professional Ethics

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Explain why accounting is essential for decision makers and managers.
2. Describe the major users and uses of accounting information.
3. Explain the role of budgets and performance reports in planning and control.
4. Describe the cost-benefit and behavioral issues involved in designing an accounting system.
5. Discuss the role accountants play in the company's value-chain functions.
6. Identify current trends in management accounting.
7. Explain why ethics and standards of ethical conduct are important to accountants.

► STARBUCKS

If you had asked most people a decade or two ago whether consumers around the world would pay a premium price for a “better” cup of coffee, few would have answered yes. Nevertheless, the expansion of **Starbucks** since its founding in 1971 in Seattle's Pike Place Market has been nothing short of phenomenal. In 2021, Starbucks' total revenues—the amount the company received for all items sold—were \$29.1 billion, compared with only \$700 million in 1996. Net income—the profit that Starbucks made—was \$4.8 billion, up from only \$42 million in 1996. Total assets—the recorded value of the items owned by Starbucks—grew from less than \$900 million in 1996 to more than \$31.4 billion in 2021. These numbers are accounting measures of the cumulative success of numerous managers of Starbucks stores in many countries. Managers use these figures, along with more detailed accounting numbers, to make day-to-day decisions and to measure performance.

Starbucks has established a worldwide reputation to match its financial success. It ranked fifty-first in Interbrand's 100 best global brands for 2021 and one hundred and twenty-fifth on *Fortune* magazine's Fortune 500. Starbucks was the winner of the 2020 Diversity in Advertising award run by the United Kingdom's TV Channel 4. In 2021, Starbucks was recognized as one of the *135 World's Most Ethical Companies* by The Ethisphere Institute and was also ranked the fifth most admired company in the world by *Fortune*.

How did Starbucks accomplish all this? As we embark on our journey into the world of management accounting, we will explore what it takes for companies like Starbucks to ensure that whether its products are purchased by consumers in the Ibn Battuta Mall in Dubai, a coffee house train on the Geneva–St. Gallen line in Switzerland, or near the Tower of London in the United Kingdom, they will experience the same level of service and quality. All Starbucks' managers, from baristas to store managers to the chief executive officer, use accounting reports to assess how well their units meet corporate goals and objectives. Accounting provides a common language to help managers around the world communicate and coordinate their actions. By the time you finish reading this book, you will be comfortable with the language of accounting. You will know why it is necessary to understand accounting information in order to use it wisely in your decisions. You will also understand the role of performance evaluation systems in communicating strategy and coordinating actions throughout an organization.

Managerial accounting information is used in all sorts of decisions. For example, consider decisions you might face as a manager in the following situations:

- Suppose you are a **Boeing** engineer preparing manufacturing specifications for a component of the Boeing 777 airplane. There are three possible ways to organize the assembly of the component. Which is the most cost-effective approach?
- Suppose you are a product manager at **General Mills** and you are designing a new marketing plan for Häagen-Dazs. Market research predicts that distributing free samples in the mail will increase annual sales by 4%. Will profits from the added sales be more than the cost of producing and distributing the free samples?
- On the International Day of Charity in September 2021, **Sterling Bank Plc** launched Africa's first free banking services for non governmental organizations (NGOs). The scheme is to empower non profit organizations across Nigeria.
- The Invictus Games, founded by the Duke of Sussex, is an international sporting event for wounded, injured, and sick servicemen and women. The inaugural event was launched in 2014 and inspired by the U.S. Warrior Games.
- **Wosiwosi** is an African food shop located in Essex, United Kingdom. It specializes in the wholesale distribution and sales of African and Caribbean products. Its clientele ranges from consumers to other food outlets and restaurants. Customers rely on Wosiwosi to have otherwise hard-to-find produce in stock. The business has its established and preferred suppliers, but out of season, can it find alternative suppliers that can sell it produce such that, after mark-up, the consumers will be able to afford the products?
- Many sellers on **AliExpress** offer standard free shipping anywhere in the world. Sellers will usually incorporate the shipping into the product price or offer enhanced shipping for multiple purchases. What impact does shipping using the AliExpress Standard shipping or ePacket have on profits?

For all these decisions, managers rely on managerial accounting information.

In this chapter, we provide an overview of management accounting in all types of organizations. Larry White, former chair of the **Institute of Management Accountants (IMA)**, a global association of accountants and financial professionals in business, sums up the role of management accounting as follows: "Management accountants are committed to helping their organization achieve its strategic goals by providing decision support, planning, and control for business operations with a high level of ethics and professional competence." ■

Management Accounting and Your Career

In this book we focus on **management accounting**, which is the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and communicating information that helps managers fulfill organizational objectives. In contrast, **financial accounting** produces information for external parties, such as stockholders, suppliers, banks, and government regulatory agencies. Exhibit 1-1 summarizes the major differences between management accounting and financial accounting.

This book is written primarily for managers who are not accounting specialists. All managers use information from accounting systems. By learning about accounting systems, you will better understand the relationships among different components of an organization. You also learn why it is essential to understand the system that generates accounting information in order to use that information in any of a wide variety of functional decisions (including purchasing, manufacturing, inventory management, hiring, marketing, and pricing, among others). You will learn to evaluate whether your accounting system is providing the information you need for your decisions. You will learn to evaluate performance measures generated by your accounting system and assess whether the performance measures create appropriate incentives. In sum, a thorough understanding of accounting is essential for managers in any organization.

When accounting is mentioned, most people think first of financial accounting. Independent auditors—**certified public accountants (CPAs)** in the United States and **chartered accountants (CAs)** in many other nations—provide assurance to external users about the reliability of companies'



i am Em/Shutterstock

Starbucks' coffee shops have strategic locations throughout the world, including this one in Samut Sakhon, Thailand.

Institute of Management Accountants (IMA)

A global association of accountants and financial professionals in business.

management accounting

The branch of accounting that produces information for managers within an organization. It is the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and communicating information that helps managers fulfill organizational objectives.

Objective 1

Explain why accounting is essential for decision makers and managers.

financial accounting

The branch of accounting that develops information for external decision makers, such as stockholders, suppliers, banks, and government regulatory agencies.

certified public accountant (CPA)

In the United States, independent accountants who assure the reliability of companies' published financial statements.

	Management Accounting	Financial Accounting
Primary users	Organization managers at various levels	Outside parties such as investors and government agencies but also organization managers
Freedom of choice of accounting measures	No constraints other than requiring the benefits of improved management decisions to exceed information costs	Constrained by generally accepted accounting principles (GAAP) , a set of standards to which public companies' published financial statements must adhere. The International Financial Reporting Standards (IFRS) accounting standards set out how a company prepares its financial statements.
Behavioral implications in selecting accounting measures	Choice should consider how measurements and reports will influence managers' daily behavior	Choice based on how to measure and communicate economic phenomena; behavioral considerations are secondary, although executive compensation based on reported results may have behavioral impacts
Time focus of reports	Future orientation: formal use of budgets as well as historical records. Example: 20X2 budget versus 20X2 actual performance	Past orientation: historical evaluation; example: 20X2 actual performance versus 20X1 actual performance
Time span of reports	Flexible, varying from hourly to 10–15 years	Less flexible; usually one year or one quarter
Types of reports	Detailed reports include details about products, departments, territories, etc.	Summary reports: primarily report on the entity as a whole
Influence of other functional areas	Field is less sharply defined; heavier use of economics, decision sciences, and behavioral sciences	Field is more sharply defined; lighter use of related disciplines

generally accepted accounting principles (GAAP)

A set of standards to which public companies' published financial statements must adhere.

Exhibit 1-1

Distinctions Between Management Accounting and Financial Accounting

chartered accountant (CA)

In many countries, the equivalent to the CPA in the United States—independent accountants who assure the reliability of companies' financial statements.

certified management accountant (CMA)

The management accountant's counterpart to the CPA.

published financial statements. Another, even larger, group of people work in private industry and government as management accounting specialists. Though management accountants often help to produce financial statements for external users, they primarily produce accounting information for internal users. The **certified management accountant (CMA)** designation is the management accountant's counterpart to the CPA. There are three key professional qualifications providing routes into accounting: ACA (Institute of Chartered Accountants), ACCA (Association of Chartered Certified Accountants), and CIMA (Chartered Institute of Management Accountants). Each of these qualifications is globally recognized. Each course can take between three to five years. Like the CPA designation, the CMA confers status and often opens the door to higher-level positions. Research by U.K.-based recruitment company Robert Half found that 52% of all FTSE 100 CEOs either had worked in finance or studied finance, with 27% being qualified chartered accountants. The study showed that 21% were from a retail or hospitality background, 17% were engineers or involved in natural resources, 14% were from marketing, and 11% had a technology background.

Roles of Accounting Information

One basic purpose of accounting information is to help you make decisions. Every day, you and your organization face a new and continually changing set of decisions, and many of these decisions rely on accounting information. When you understand how your decisions affect costs and revenues, you will be a better decision maker.

A second basic purpose of accounting is to help you plan and control your organization's operations. Plans describe how the organization will achieve its objectives. Control is the process of

Objective 2

Describe the major users and uses of accounting information.

implementing plans and evaluating whether your organization is achieving its objectives. When you understand how people respond to the incentives created by performance evaluation and control systems, you will be better able to assess which system creates the most appropriate incentives.

Organizations address these two purposes by designing and implementing **accounting systems**, which are formal mechanisms for gathering, organizing, and communicating information about an organization's activities. The organization of this book reflects how accounting systems address these two basic purposes. Part 1, Chapters 2 through 6, focuses on the decision-making purpose of accounting information. These chapters help you determine what costs are relevant for different decisions and how accounting systems generate relevant costs for managers, demonstrating a key concept in management accounting: "Different costs for different purposes." Part 2, Chapters 7 through 10, deals with planning and control systems. These chapters show how measuring performance affects managers' incentives, leading to a second key concept: "You get what you measure." Parts 3 and 4 explore these concepts in still more depth, as Part 3, Chapter 11, focuses on relevant costs for long-term capital investment decisions and Part 4, Chapters 12 through 14, describes systems to generate detailed product costing information. Part 5, Chapters 15 through 17, deals with the basic accounting treatments before finalizing the accounts and the technique of preparing Income Statements and Balance Sheets. It further addresses the issues relating to preparation of mandatory financial statements of individual companies and that of a group comprising the parent, subsidiaries and associates, under a regulated accounting environment.

As you progress in your study of management accounting and in your career, you move from understanding how to use information from existing accounting systems to creating systems that produce information useful to your particular decisions. Early in your studies, you initially react to the systems that are described to you, making sure that you understand how each system works and how to use the information it produces in your decisions. Early in your career, you may have little opportunity to influence the management accounting system, and your initial goal is simply to understand and use the information from the accounting system. As you advance in your studies, you learn about increasingly complex systems designed to provide information for a variety of purposes. As you learn about specific alternatives, you also develop the ability to design new alternatives that provide better information for your decision-making and performance evaluation purposes. Finally, you develop the proficiency and understanding required to evaluate the relative advantages of alternative accounting systems. You will likely see a parallel progression in the use of management accounting in your career. As you advance, you are able to suggest changes to improve the existing systems, and eventually you may be in a position to influence the systems implemented by your organization. The more you can influence management accounting systems, the more important it is to understand their role.

Information for Decision Making and Planning and Control

What types of accounting information do managers need for decision making and performance evaluation and control? For **decision making**—choosing among alternative courses of action to achieve some objective—accounting information helps answer problem-solving questions. For performance evaluation and control, accounting helps answer scorecard and attention-directing questions:

1. Scorecard questions: Is the company doing well or poorly? **Scorekeeping** is the accumulation, classification, and reporting of data that help users understand and evaluate organizational performance. Scorekeeping information must be accurate and reliable to be useful. For example, Starbucks produces numerous reports to evaluate results for stores and divisions.
2. Attention-directing questions: Which areas require additional investigation? **Attention directing** involves reporting and interpreting information that helps managers to focus on operating problems, imperfections, inefficiencies, and opportunities. For example, a manager who sees that a Starbucks store has reported profits of \$120,000 when budgeted profit was \$150,000 will look for explanations as to why the store did not achieve its budget.
3. Problem-solving questions: Of the alternatives being considered, which is the best? The **problem-solving** aspect of accounting involves analysis of alternative courses of action and identification of the best course to follow. For example, Starbucks experiments with adding various items to its menu. After an analysis of how a new product will affect revenues and costs, management decides which items to add and which to delete.

The scorecard and attention-directing uses of information are closely related. The same information that helps a manager understand and evaluate performance may also serve an attention-directing function for the manager's superior. For example, by pinpointing where

accounting system

A formal mechanism for gathering, organizing, and communicating information about an organization's activities.

decision making

Choosing among alternative courses of action designed to achieve some objective.

scorekeeping

The accumulation, classification, and reporting of data that help users understand and evaluate performance.

attention directing

Reporting and interpreting information that helps managers to focus on operating problems, imperfections, inefficiencies, and opportunities.

problem solving

Analysis of possible courses of action and identification of the best course to follow.

actual results differ from plans, performance reports show managers how they are doing and where to take action. Companies produce most scorecard and attention-directing information on a routine basis every day, month, quarter, or year.

In contrast, specific decisions often require problem-solving information beyond the information routinely generated for scorekeeping and attention directing. When organizations make decisions (such as how to price products and special orders, whether to make or to buy components, whether to add or drop a product, how to adjust product mix, or whether to keep or replace equipment), specially-prepared information is often required. For example, Tata Starbucks in India used problem-solving information to decide whether to run its 2021 ad campaign “A feeling called Starbucks” on various social media platforms rather than using TV commercials.

Decision making is the core of the management process. Decisions range from the routine (setting daily production schedules) to the non-routine (launching a new product line), and accountants are information specialists who aid the decision makers. Managers use accounting information for all types of decisions. Accountants must make sure that they produce information that is useful for these decisions and managers must work with accountants to get the information that is needed.

Making Managerial Decisions

What type of information—scorekeeping, attention-directing, or problem-solving—would managers use for each of the following decisions? Why?

1. Deciding whether to replace a traditional assembly line with a fully automated robotic process
2. Evaluating the performance of a division for the preceding year
3. Identifying which products exceeded their budgeted profitability and which ones fell short of their budgets

Answers

1. Problem-solving. This is a one-time decision for which managers need information about the potential impacts of each of the alternatives under consideration.
2. Scorekeeping. This is a routine evaluation of an organizational unit for which managers want systematic data on a regular basis.
3. Attention-directing. To identify products that need attention, managers want information that highlights deviations of actual results from pre-specified expectations in the budget.

planning

Setting objectives for an organization and determining how to attain them.

control

Implementing plans and using feedback to evaluate the attainment of objectives.

Another essential element of the management process is planning and controlling the organization's operations. **Planning** provides the answers to two questions: What objectives does the organization want to achieve? When and how will the organization achieve these objectives? **Control** refers to implementing plans and using feedback to evaluate the attainment of objectives. Thus, feedback is crucial to the cycle of planning and control. Planning determines action, action generates feedback, and the control phase uses this feedback to influence further planning and actions. Timely, systematic reports provided by the accounting system are a primary source of useful feedback.

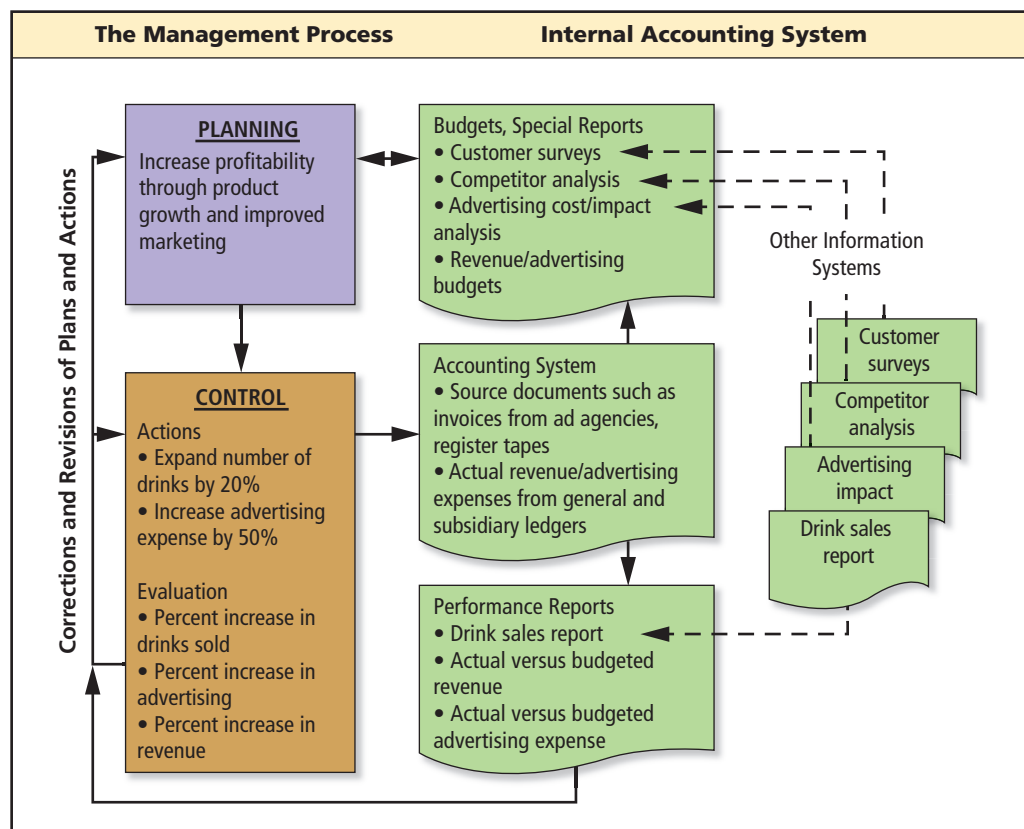
The left side of Exhibit 1-2 demonstrates the planning and control cycle of current operations that could be used by a particular Starbucks store. The planning section in Exhibit 1-2 shows an objective for the store (increase profitability) and how it will be attained (product growth and improved marketing). The control section shows the actions that are intended to increase profitability and how Starbucks will evaluate the actions. The Starbucks store will implement its plan to expand the number of drinks on its menu and increase advertising. Management will evaluate these actions based on three performance measures, the increase in drinks sold, increase in advertising expenditures, and the increase in revenue. Managers will then use the performance evaluation results for further planning and implementation.

Management by Exception

The right side of Exhibit 1-2 shows that the accounting system formalizes plans by expressing them as budgets. A **budget** is a quantitative expression of a plan of action and an aid to coordinating and implementing plans. Budgets are the chief devices for disciplining management planning. Without budgets, planning may not get the front-and-center focus that it deserves. The Starbucks store expresses its plan for product growth and improved marketing through revenue and advertising budgets.

Objective 3

Explain the role of budgets and performance reports in planning and control.

**Exhibit 1-2**

Starbucks Store—Accounting Framework for Planning and Control

The accounting system records, measures, and classifies actions to produce performance reports (the last box in Exhibit 1-2). **Performance reports** provide feedback by comparing results with plans and by highlighting **variances**, which are deviations from plans. Organizations use performance reports to judge managers' decisions and the productivity of organizational units. Performance reports compare actual results to budgets, thereby motivating managers to achieve the objectives. For example, managers of the Starbucks store evaluate the effectiveness of its advertising plan by comparing the increase in revenue and profits to the increase in advertising costs. Based on their evaluation, managers at Starbucks make corrections and revisions to their plans.

Exhibit 1-3 shows a simple performance report for a hypothetical Starbucks store, the Mayfair Starbucks. The first column of Exhibit 1-3 is the budget for March 20X1. It is based on a predicted level of sales and the estimated costs needed to support that level of sales. After managers and their superiors agree on a budget, it becomes the managers' target for the month. As the store sells its products and incurs costs, Starbucks' accounting system collects the revenue and cost information. At the end of each month (or more often if managers need more frequent feedback), the accounting department prepares a store-level performance report, such as the one in Exhibit 1-3. Managers use the performance report to help evaluate the store's operations.

The Mayfair store report shows that the store met its targeted sales, but the \$2,500 unfavorable variance for ingredients shows that these costs were \$2,500 over budget. Other variances show that store labor costs were \$400 under budget and other labor was \$50 over budget. At the Mayfair store, management would undoubtedly focus attention on ingredients, which had by far the largest unfavorable variance. However, it may also be worthwhile to investigate the \$400 favorable labor variance. By investigating favorable variances, managers may find better ways of doing things.

Performance reports spur investigation of exceptions—items for which actual amounts differ significantly from budgeted amounts. Managers then revise operations to conform with the plans or revise the plans. This process is **management by exception**, which means concentrating more on areas that deviate from the plan and less on areas that conform with plans. Thus, the management-by-exception approach frees managers from needless concern with those phases of operations that adhere to plans and are running smoothly. However, well-conceived plans incorporate enough discretion or flexibility so that the manager feels free to pursue any unforeseen opportunities.

budget

A quantitative expression of a plan of action and an aid to coordinating and implementing the plan.

performance reports

Feedback provided by comparing results with plans and by highlighting variances.

variances

Deviations from plans.

management by exception

Concentrating more on areas that deviate from the plan and less on areas that conform with plans and are presumed to be running smoothly.

	Budget	Actual	Variance
Sales	\$50,000	\$50,000	\$ 0
Less:			
Ingredients	\$22,000	\$24,500	\$2,500 U
Store labor (baristas, etc.)	12,000	11,600	400 F
Other labor (managers, supervisors)	6,000	6,050	50 U
Utilities, maintenance, etc.	4,500	4,500	0
Total expenses	<u>\$44,500</u>	<u>\$46,650</u>	<u>\$2,150 U</u>
Total operating income	<u>\$ 5,500</u>	<u>\$ 3,350</u>	<u>\$2,150 U</u>

U = unfavorable—actual cost greater than budgeted; actual revenue or profit less than budgeted
F = favorable—actual cost less than budgeted; actual revenue or profit greater than budgeted

Exhibit 1-3**Mayfair Starbucks Store—Performance Report for the Month Ended March 31, 20X1**

Notice that although budgets aid planning and performance reports aid control, it is not accountants but operating managers and their subordinates who use accounting reports to plan and control operations. Accounting assists the managerial planning and control functions by providing prompt measurements of actions and by systematically pinpointing trouble spots.

Influences on Accounting Systems

Accounting systems vary across organizations—systems must meet the needs of each particular organization. In order to reduce costs and complexity, many organizations use a general-purpose accounting system that attempts to meet the needs of both external and internal users. However, as outlined in Exhibit 1-1, there are important differences between management accounting information and financial accounting information. Systems developed primarily for external reporting may not produce the most useful information for managers.

There are three categories of requirements imposed on accounting systems designed to meet the requirements of external users. For example, under the Companies Act 2016 in Malaysia, it is a requirement of all public listed companies, private limited companies, and branch offices in Malaysia to appoint an approved auditor to audit the accounts of the company. Under Section 266, if the auditor has reason to believe that an offence involving fraud and dishonesty has been committed against the company (by officers or employees), the auditor must report their findings in writing to the Registrar. The auditor must make a judgment as to whether the financial statements of the company comply with the approved accounting standard and that they are a true and fair view of the situation. The auditor's role is to express an opinion on the financial statements; it is the responsibility of the company directors to prepare and present the financial statements and to set in place any **internal controls**, policies to protect and make the most efficient use of an organization's assets.

Post-Brexit U.K. accounting legislation has begun to revert to U.K.-only requirements. Companies in the United Kingdom are still required to appoint a U.K.-registered audit firm. It is the registered auditor that is required to sign the audit report on behalf of the company. As of January 2021, all U.K. companies are required to use U.K.-adopted international accounting standards (IAS) as opposed to those adopted by the European Union (EU).

Most companies have **internal auditors** who review and evaluate accounting systems, including companies' internal controls, and conduct **management audits**—reviews to determine whether managers are implementing the policies and procedures specified by top management. A final specific area of regulation is government contracting. Universities, defense contractors, and others contracting with the U.S. government must comply with numerous reporting requirements.

The requirements of external reporting should not take precedence over the scorekeeping, attention-directing, and problem-solving information that is generated to meet the needs of internal users. In later chapters, we will see many examples where a general-purpose accounting system designed to meet external reporting requirements does not generate the information needed for management decisions. As a decision-maker, you must recognize when information

internal controls

Policies to protect and make the most efficient use of an organization's assets.

internal auditors

Accountants who review and evaluate accounting systems, including their internal controls.

management audit

A review to determine whether managers are implementing the policies and procedures specified by top management.

from the existing accounting system is not sufficient for your decision and be prepared to ask for additional information to be generated. Your requests for more information should be balanced against the cost of obtaining the information. As explained in the following section, you should only incur the cost to acquire additional information when the expected benefit of an improved decision exceeds the cost of the information.

Cost-Benefit and Behavioral Considerations

Managers should keep two important ideas in mind when designing accounting systems: (1) the cost-benefit balance and (2) behavioral implications.

The **cost-benefit balance**—weighing estimated costs against probable benefits—is the primary consideration in choosing among accounting systems and methods. We will refer to cost-benefit considerations throughout this book. Accounting systems are economic goods—like office supplies or labor—available at various costs. Which system does a manager want to buy: a simple file drawer for amassing receipts and canceled checks, an elaborate budgeting system based on computerized models of the organization and its subunits, or something in between?

The answer depends on a straightforward concept that often becomes complex when applied to real decisions. The concept is that the manager should purchase the system that provides the largest excess of benefits over cost. Real-world applications of this concept are often complex because the expected benefits are difficult to assess. In 1999, Japanese supplier **Fujitsu** installed 40,000 Horizon Electronic Point of Sale terminals in all post offices across the United Kingdom, costing \$1.35 billion to install. Over the next decade, hundreds of sub-postmasters were accused of fraud and false accounting. Many were jailed, others left bankrupt with their reputations in ruin. Only in 2019 did the High Court prove that it was the post office to blame for pursuing these cases when they knew the system was fatally flawed. The system, according to the High Court, was not “reliable” for the first 10 years of its use and routinely created errors on the post office branch accounts. In December 2019, the post office agreed to settle with 555 claimants paying them nearly \$80 million in compensation. Horizon seemed to offer efficiency but was subject to catastrophic errors, but should it ever have been purchased? The expected benefits from the new system come from improved decisions or better controls, and it can be very difficult to develop a comprehensive assessment of these benefits, a point that will be illustrated repeatedly in later chapters.

Management accounting reports influence the decisions of managers. The system must provide accurate, timely reports in a form useful to managers. If a report is too complex, too difficult to use, or arrives too late, the manager may not use the report in making decisions. A report that goes unused creates no benefits.

Managers should also consider **behavioral implications**, that is, the system’s effect on employees’ decisions and behavior. For example, consider a performance report that a manager’s superiors use to evaluate the operations for which the manager is responsible. If the report unfairly attributes excessive costs to the manager’s operations, the manager may lose confidence in the system and not let it influence future decisions.

In a nutshell, think of management accounting as a balance between costs and benefits of accounting information coupled with an awareness of the importance of behavioral effects. Therefore, management accountants must understand related disciplines, such as economics, the decision sciences, and the behavioral sciences, to make intelligent decisions about the best information to supply to managers.

Planning and Control for Product Life Cycles and the Value Chain

To effectively plan and control production of goods or services, accountants and other managers must consider the product’s life cycle. **Product life cycle** refers to the various stages through which a product passes: conception and product development; introduction into the market; maturation of the market; and, finally, withdrawal from the market. At each stage, managers face differing costs and potential returns. Exhibit 1-4 shows a typical product life cycle.

Objective 4

Describe the cost-benefit and behavioral issues involved in designing an accounting system.

cost-benefit balance

Weighing estimated costs against probable benefits, the primary consideration in choosing among accounting systems and methods.

behavioral implications

The accounting system’s effect on the behavior, specifically the decisions, of managers.

product life cycle

The various stages through which a product passes, from conception and development to introduction into the market to maturation and, finally, withdrawal from the market.

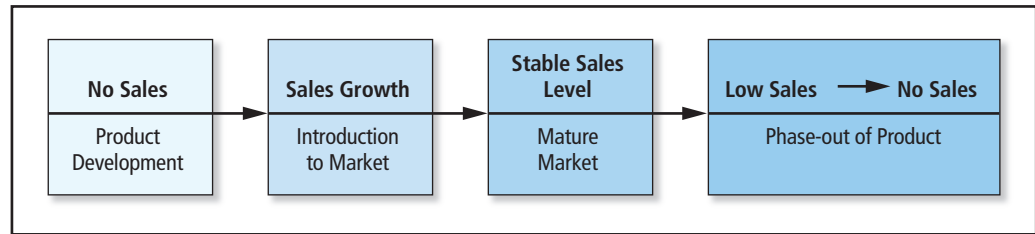


Exhibit 1-4
Typical Product Life Cycle

In the planning process, managers predict revenues and costs over the entire life cycle—however long or short. Then accounting systems track actual costs and revenues throughout the life cycle. Periodic comparisons between planned costs and revenues and actual costs and revenues allow managers to assess the current profitability of a product, determine its current product life-cycle stage, and make any needed changes in strategy.

For example, suppose Swiss-based **Roche**, the largest pharmaceutical company in the world by sales, is developing a new drug to reduce high blood pressure. There will be substantial development costs and no revenue during the product development stage. Most of the revenues from the product will be received during the introduction and mature market stages when there will also be production costs. During the phase-out of the product, there will be little revenue, but Roche will need to keep the drug on the market for those who have come to rely on it. Thus, the product pricing strategy must recognize the need for revenues during the introduction and mature market stages to cover both development and phase-out costs as well as the direct costs of producing the drug.

Product life cycles range from a few months (for fashion clothing or faddish toys) to many years (for automobiles or refrigerators). Some products, such as many computer software packages, have long development stages and relatively short market lives. Others, such as **Boeing 777X** airplanes, have a market life many times longer than their development stage. Many companies are working to shorten the product development phase, both to reduce the time during which a product generates no revenue and to bring products to market on a timelier basis.

Objective 5

Discuss the role accountants play in the company's value-chain functions.

value chain

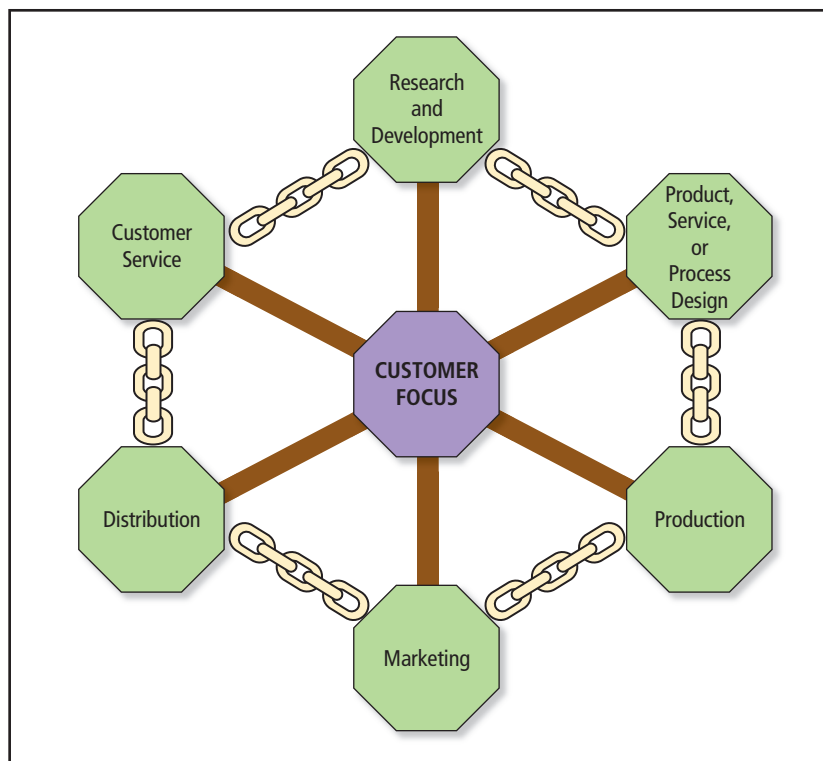
The set of business functions or activities that add value to the products or services of an organization.

The Value Chain

In addition to considering a product's life cycle, managers must recognize those activities necessary for a company to create the goods or services that it sells. These activities comprise the **value chain**, the set of business functions or activities that add value to the products or services of an organization. As shown in Exhibit 1-5 these functions include the following:

- Research and development: generation of ideas related to new products, services, or processes
- Design: detailed design and engineering of products, services, or processes
- Production: coordination and assembly of resources to produce a product or deliver a service
- Marketing: methods by which customers learn about the value and features of products or services (for example, advertising or selling activities)
- Distribution: mechanisms by which a company delivers products or services to the customer
- Customer service: support activities provided to the customer

Not all functions are of equal importance to the success of a company. Senior management must decide which functions enable the company to gain and maintain a competitive edge. For example, managers at **Dell Computers** consider the design function a critical success factor. The features designed into Dell's computers create greater value and higher quality. In addition, the design of efficient processes used to make and deliver computers lowers costs and speeds up delivery to its customers. Dell also performs the other value-chain functions, but it concentrates on being the best process designer in the computer market.

**Exhibit 1-5**

The Value Chain of Business Functions

Accountants play a role in supporting all the value-chain functions. Most obvious is the production stage, where accountants facilitate cost planning and control using budgets and performance reporting and help track the effects of continuous improvement programs. However, accounting can also have a great influence on the two pre-production value-chain functions. For example, accountants provide estimated revenue and cost data during the research and development stage and during the design stage of the value chain. Managers use these data to decide which ideas will move to the production stage and which will be dropped. These data also enable managers and engineers to reduce the life-cycle costs of products or services by changing product and process designs. Accountants can give managers feedback on ideas for cost reductions long before the company must make a commitment to purchase expensive equipment.

Accountants also play a role in post-production value-chain functions. For example, accountants analyze the trade-off between the increased revenue expected from a marketing program and its cost. In addition, accounting information can influence decisions about distributing products or services to customers. Should a company sell its products directly to a chain of retail stores, or should it sell to a wholesaler? What transportation system should be used—trucks or trains? Accountants provide important information about the costs of each alternative. Finally, accountants provide cost data for customer service activities, such as warranty and repair costs and the costs of goods returned. Managers compare these costs to the benefits generated by better customer service. As you can see, cost management is important throughout the value chain.

Note that customer focus is at the center of Exhibit 1-5. Each value-chain function should focus on activities that create value for the customer. Successful businesses never lose sight of the importance of maintaining a focus on the needs of their customers. For example, one of the main principles in **Starbucks'** mission statement is to “inspire and nurture the human spirit—one person, one cup, and one neighborhood at a time.” Customers are also the focus at **Wal-Mart**, as explained by Sam Walton, founder and former chairman:

There is only one boss—the customer. Customers can fire everybody in the company from the chairman on down, simply by spending their money somewhere else.

The value chain and the concepts of adding value and focusing on the customer are essential for success. Therefore, we will return to the value chain and use it as a focus for discussion throughout this book.

Making Managerial Decisions

Measuring costs at various stages of the value chain is important to **Starbucks**. Suppose that you are a Starbucks manager or accountant. For each of the following activities, indicate the value-chain function that is being performed and what accounting information might be helpful to managers in the function:

1. Process engineers investigate methods to reduce the time to roast coffee beans and to better preserve their flavor.
2. A direct-to-your-home mail-order system is established to sell custom-blended coffees.
3. Arabica coffee beans are purchased and transported to company processing plants.
4. Focus groups investigate the feasibility of a new line of Frappuccino drinks.
5. A telephone hotline is established for mail-order customers to call with questions and comments on the quality and speed of delivery.
6. Each company-owned retail store undertakes a campaign to provide information to customers about the processes used to make its coffee products.
2. Distribution. This provides an additional way to deliver products to customers. Managers need information on the costs of a mail-order system to compare to the added profit from mail-order sales.
3. Production. Starbucks purchases only premium beans, but the company is still concerned about the purchase price of beans and transportation. These are part of product costs incurred during production.
4. Research and development or marketing. These costs (mostly wages) are incurred prior to management's final decision to design and produce a new product. Predicted revenues and costs from the Frappuccino market can help managers design a drink that is both marketable and profitable.
5. Customer service. These costs include all expenditures made after Starbucks has delivered the product to the customer; in this case, Starbucks obtains feedback on the quality and speed of delivery. Managers will trade off the cost of the hotline and the value of the information generated from the calls.
6. Marketing. These costs are for activities that enhance the existing or potential customers' awareness and opinion of the product. Like many advertising expenses, it is easy to estimate the costs of such a program but hard to quantify the benefits.

Answers

1. Research and development or design. Both the generation of ideas for new processes and the design of new production processes are important parts of the value chain. Managers need the costs of various possible production processes to decide among the alternatives.

Accounting's Position in the Organization

How do management accountants fit into an organizational structure? Consider the following four work activities of management accountants:

- Collecting and compiling information
- Preparing standardized reports
- Interpreting and analyzing information
- Being involved in decision making

The role of management accountants in organizations is evolving. Management accountants are spending less time on the first two, data collection and reporting activities, and more time on the last two, analysis and decision-making activities. In essence, the management accountant is becoming an internal consultant on information-related issues—that is, an advisor for managers about what information is available, what additional information would be useful, and how to analyze the information and use it in decision making.

Line and Staff Authority

As an organization grows, it must divide responsibilities among a number of managers and executives, each with specific responsibilities. **Line managers** are directly involved with making and selling the organization's products or services. Their decisions lead directly to meeting (or not meeting) the organization's objectives. In contrast, **staff managers** are advisory—they have no authority over line managers, but they support the line managers by providing information and advice. The organization chart in Exhibit 1-6 shows how a traditional manufacturing company divides responsibilities between line and staff managers. The line managers in manufacturing are supported by corporate-level staff (in sales, engineering, human resources, and finance) and by factory-level staff (in receiving, inspection, tool room, purchasing, production control, and maintenance).

Many modern organizations have abandoned the type of hierarchical structure shown in Exhibit 1-6 in favor of a “flatter” organization. According to the **World Economic Forum**, Danish companies have the flattest hierarchical structures in the world. They are closely followed by Australia, Canada, Finland, Norway, Sweden, and Switzerland. While Asian companies are perceived to be more rigid, Hong Kong, Singapore, and Japan are moving away from the rigid structure. In these flatter organizations, specialization by individuals is giving way to decision making by cross-functional teams. In such an organization, management accountants are still the information specialists. However, they are not isolated in one branch of the organization chart and do not sit in their offices and issue reports. Instead, the management accountants are physically located with the line managers, and they work together to determine the optimal information support for the managers. We highlight some other recent changes in the role of accountants in the Business First box on p. 32.

line managers

Managers who are directly involved with making and selling the organization's products or services.

staff managers

Managers who are advisory to the line managers. They have no authority over line managers, but they support the line managers by providing information and advice.

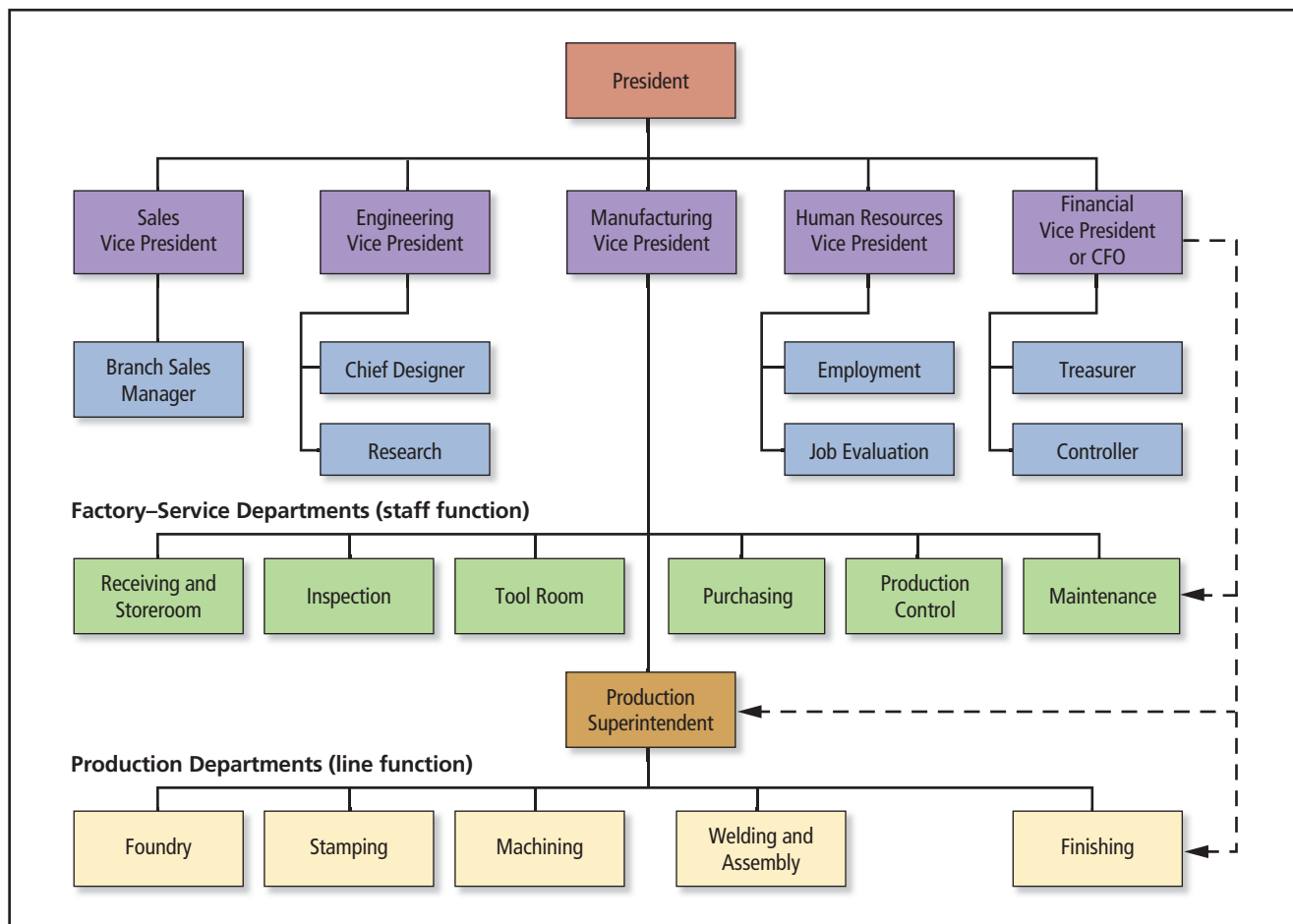


Exhibit 1-6

Partial Organization Chart of a Manufacturing Company

The Accountant's Role at the Marmon Group

The business environment across the world is increasingly becoming competitive and hence most companies are looking for an 'edge' over the competitors. Many companies are achieving this 'edge' by implementing new technology that enables the mining of vast amounts of data (Big Data) using leading-edge analytical tools.

The perceived importance of Big Data and analytics may be understood by the fact that the top organizations are using it successfully in major functional decision areas. There is a clear shift towards a data driven approach of decision making. The shift in the use and importance of data is borne out by a recent IMA survey that found that almost half (45%) of the respondents indicated their company now takes a "strong" or "very strong" data-centric approach to information technology.

Apart from its well-known application in social media marketing, organizations are deploying Big Data capabilities in strategy formulation and implementation. The same survey by IMA also indicates that more than half of the organizations in the study are currently employing Big Data for this purpose.

As one of the world's leading brands, **Starbucks** is using this Big Data and analytics in a big way. For example, to determine where stores should be located, Starbucks market planning team taps into the power of data intelligence through Atlas, a mapping and business intelligence tool developed by **Esri**. This tool evaluates massive amounts of data, such as proximity

to other Starbucks locations, demographics, traffic patterns and more, before recommending a new store location.

When Starbucks decided to expand and offer products that customers could purchase at grocery stores and enjoy at home, they turned to data to determine which products they should offer. It combined data from its stores about how customers ordered Starbucks beverages and combined that intelligence with other available industry reports about at-home consumption to create their grocery store product lines. At Starbucks data also drives special limited-offering menu items based on what's trending at the time. For example, when Memphis, Tennessee was enduring a heatwave, Starbucks launched a local Frappuccino promotion to entice people to beat the heat! Thus, even though around 87,000 drink combinations are available, Starbucks continue to monitor what drinks sell the best to make menu modifications.

With the increasing use of Big Data and analytics, managers at Starbucks are now more confident in identifying opportunities and grabbing them to enhance profitability of the company and simultaneously improving the customer experience.

Source: IMA Website (<https://www.imanet.org>); Lawson, Hatch and Desroches, "The Impact of Big Data on Finance Now and in the Future"; <https://www.tab-leau.com/about/blog/2021/1/how-starbucks-uses-analytics-enhance-customer-experience>; and Brendan Marr, "Starbucks: Using Big Data, Analytics And Artificial Intelligence To Boost Performance," *Forbes*, May 28, 2018.

chief financial officer (CFO)

The top executive who deals with all finance and accounting issues in an organization. The

CFO generally oversees the accounting function.

treasurer

The executive who is concerned mainly with the company's financial matters, such as raising and managing cash.

controller (comptroller)

The accounting officer of an organization who deals mainly with operating matters, such as aiding management decision making.

Controller and Treasurer Functions

The employees carrying out management accounting functions have a variety of titles. The **chief financial officer (CFO)**, the top executive who deals with all finance and accounting issues in an organization, oversees the accounting function in most organizations. Both the treasurer and controller generally report to the CFO, as shown in Exhibit 1-6. The **treasurer** is concerned mainly with the company's financial matters such as raising and managing cash, while the **controller** (also called **comptroller** in many government organizations) is concerned mainly with operating matters such as aiding management decision making. In a small company, one person may perform both treasury and controllership functions. Nevertheless, it is useful to differentiate the two roles. The **Financial Executives International**, an association of corporate treasurers and controllers, distinguishes the two as follows:

Controllership

1. Planning for control
2. Reporting and interpreting
3. Evaluating and consulting
4. Tax administration
5. Government reporting
6. Protection of assets
7. Economic appraisal

Treasurership

1. Provision of capital
2. Investor relations
3. Short-term financing
4. Banking and custody
5. Credit management and cash collections
6. Investments
7. Risk management (insurance)

Management accounting is the primary means of implementing the first three functions of controllership, including advice and help in budgeting, analyzing variances, pricing, and making special decisions.

Adaptation to Change

Businesses in the twenty-first century differ from those in the twentieth century. Markets have become more competitive, and access to information has become more important. Many companies today derive their competitive advantage from their information, not their physical facilities. Companies such as **Amazon.com** and **Netflix** pride themselves on managing the information obtained from their customers and suppliers. Such companies work to continually improve their accounting information. The information that supported traditional companies in the 1980s and 1990s does not adequately support the modern business environment.

We next discuss four major business trends that are influencing management accounting today:

1. Shift from a manufacturing-based to a service-based economy in the United States
2. Increased global competition
3. Advances in technology
4. Changes in business process management

Service Sector

Accountants in manufacturing organizations developed many of the basic ideas of management accounting. These ideas, however, have evolved so that they apply to all types of organizations, including service and nonprofit organizations. **Service organizations**, for our purposes, are organizations that do not make or sell tangible goods but instead provide other forms of value. Public accounting firms, law firms, management consultants, real estate firms, transportation companies, banks, insurance companies, and hotels are examples of profit-seeking service organizations. Most nonprofit organizations, such as hospitals, schools, libraries, museums, and government agencies, are also service organizations.

Common characteristics of service organizations include the following:

1. **Labor is a major component of costs:** The highest proportions of expenses in service organizations, such as schools and law firms, are typically wages, salaries, and payroll-related costs, not the costs relating to the use of equipment and physical facilities.
2. **Output is usually difficult to measure:** Because service outputs are intangible, they are often hard to measure. For example, the output of a university might be defined as the number of degrees granted, but many contend that the real output is the knowledge and beliefs the students develop during their time at the university.
3. **Service organizations cannot store their major inputs and outputs:** Services cannot usually be stockpiled. For example, an airline cannot save an empty airline seat for a later flight, and a hotel's available labor force and rooms are either used or unused as each day passes.

In 2019, the number of people working in the service sector reached 334 million globally, falling to 272 million in 2020. Service industries are extremely competitive, and their managers increasingly rely on accounting information. Many examples in this book are from service companies.

Managers and accountants in service companies, whether profit-seeking or nonprofit organizations, have much in common. They raise and spend money. They prepare budgets and design and implement control systems. They have an obligation to use resources wisely. Used intelligently, accounting information contributes to efficient operations and helps organizations achieve their objectives.

Simplicity is the watchword for accounting systems in service industries and nonprofit organizations. Why? Because many of the decision makers using these systems, such as physicians, professors, or government officials, are too busy to try to grapple with a complex system. For them to use the information, it must be in a form that is easy to understand. In fact, simplicity is an important consideration in the design of any accounting system. Complexity generates costs of gathering and interpreting data, and the costs of complexity often exceed the prospective benefits.

Global Competition

Global competition has increased in recent years as many countries have lowered international barriers to trade, such as tariffs and duties. In addition, there has been a worldwide trend toward deregulation. The result has been a shift in the balance of economic power in the world.

Objective 6

Identify current trends in management accounting.

service organizations

Organizations that do not make or sell tangible goods but instead provide other forms of value.

**electronic commerce
(e-commerce)**

Conducting business online.

**business-to-consumer
(B2C)**

Electronic commerce from business to consumer.

**business-to-business
(B2B)**

Electronic commerce from one business to another business.

**enterprise resource
planning (ERP) systems**

Integrated information systems that support all functional areas of a company.

**eXtensible Business
Reporting Language
(XBRL)**

An XML-based accounting language that helps communicate financial information electronically.

**business process
reengineering**

The fundamental rethinking and radical redesign of business processes to improve performance in areas such as cost, quality, service, and speed.

**computer-aided design
(CAD)**

The use of computer technology for the design of real or virtual objects.

**computer-aided
manufacturing (CAM)**

The use of computer-based software tools in manufacturing or prototyping.

**computer-integrated
manufacturing (CIM)
systems**

Systems that use computer-aided design, computer-aided manufacturing, robots, and computer-controlled machines.

**just-in-time (JIT)
philosophy**

A philosophy to eliminate waste by reducing the time products spend in the production process and eliminating the time products spend on activities that do not add value.

This has been evident in most markets around the world. To regain their competitive edge, many companies have redesigned their accounting systems to provide more accurate and timely information about the cost of activities, products, or services. Improved cost information helps managers better understand and predict the effects of their decisions. This move enables them to be more agile and responsive to changes.

Advances in Technology

The dominant influence on management accounting over the past two decades has been technological change, affecting both the production and the use of accounting information. The increasing capabilities and decreasing cost of computer processing and storage has changed how accountants gather, store, manipulate, and report data. In many cases, databases allow managers to access data directly and to generate their own reports and analyses. Today managers and accountants work together to assure the availability of the data needed for decisions and to be sure managers know how to assemble and use the data.

Electronic commerce, or **e-commerce**—conducting business online—including both **business-to-consumer (B2C)** and **business-to-business (B2B)** transactions—continues to grow at nearly 50% a year. The growth in B2B activities is especially significant as many companies have discovered that B2B creates real savings. For example, some companies have reduced procurement processing costs by as much as 70% by automating the process.

A major effect of technology on accounting systems has been the growing use of **enterprise resource planning (ERP)** systems—integrated information systems that support all functional areas of a company. Accounting is just one part of such a system. For example, **Oracle** describes its JD Edwards EnterpriseOne ERP system as one that “helps you integrate all aspects of your business—including customer relationship management, enterprise asset management, enterprise resource planning, supply chain management, and supplier relationship management.” Other well-known ERP system providers are **SAP**, **Microsoft Dynamics**, and **The Sage Group**. Accountants must work with managers throughout the organization to ensure that the ERP system provides the financial information that managers need.

Finally, the development and widespread adoption of **eXtensible Business Reporting Language (XBRL)**, an XML-based accounting language, helps communicate financial information electronically. This language is greatly influencing both internal and external reporting by making comparisons across companies much simpler.

Changes in Business Process Management

Because management accounting supports business decisions, accounting systems must adapt to changes in management practices. Some companies implement sweeping changes in operations through **business process reengineering**, the fundamental rethinking and radical redesign of business processes to improve performance in areas such as cost, quality, service, and speed. Companies reduce process time by redesigning, simplifying, and automating the production process. They use **computer-aided design (CAD)** to design products that can be manufactured efficiently and **computer-aided manufacturing (CAM)** to direct and control production equipment. **Computer-integrated manufacturing (CIM) systems** use CAD, CAM, robots, and computer-controlled machines. The costs of such a system are quite different from those of a less-automated system. Companies that install a full CIM system use very little labor. Instead, they acquire the robots and computer-controlled machines needed to perform the routine jobs that were previously accomplished by assembly-line workers.

One management change leading to increased efficiency in business processes has been the adoption of a **just-in-time (JIT) philosophy**. Originally, JIT referred to an inventory system that minimized inventories by arranging for materials and subcomponents to arrive just as they were needed for production and for goods to be made just in time to ship them to customers—no sooner and no later. But JIT has become the cornerstone of a broad management philosophy. It originated in Japanese companies such as **Toyota** and **Kawasaki**. JIT became the dominant mode of inventory keeping for manufacturers, but suppliers had to be totally reliable and the COVID-19 pandemic was probably the biggest factor in exposing the limitations of the system. Lockdowns, illnesses, social distancing, disruption to transportation, and quarantining led to the JIT system breakdown. Factories were shut, shelves were empty, and customers were disappointed. The approach had been the optimization of inventory, leveraging off-shore suppliers, and using JIT to cut costs. With businesses and consumers finding new ways to operate and

interact in the pandemic era, suppliers and transport networks that were used to JIT are unable to cope with the sudden demand. The digital transformation of supply chain management means that businesses can reduce risks and manage supply chains better. They can control the whole supply process and use a combination of inventory optimization tools and advanced analytics. Effective procurement in the future means redesign and the use of new suppliers and having back-up supplier on hand. Companies will also look to manufacture products in diverse geographical locations to offset the possibility of disruption in one manufacturing facility.

Another management approach focused on efficiency is **lean manufacturing**, which applies continuous process improvements to eliminate waste from the entire enterprise. For example, **Matsushita Electric**'s Saga plant on Japan's Kyushu island decreased the time it takes to produce a finished product from $2\frac{1}{2}$ days to 40 minutes by replacing conveyor belts with clusters of robots. As with JIT, lean ideas are now being extended beyond manufacturing to other business processes.

A focus on quality is also important in today's competitive environment. Many companies have implemented **total quality management (TQM)** initiatives. TQM minimizes costs by maximizing quality. It focuses on prevention of defects and customer satisfaction. Recently the focus on quality has shifted to **Six Sigma**, a disciplined, *data-driven approach* to eliminating defects in any process. Used by about 35% of major U.S. companies, Six Sigma is essentially a continuous process-improvement effort designed to reduce costs by improving quality. Pioneered in the 1980s by **Motorola**, Six Sigma has also been implemented by companies such as **General Electric** in the United States and **Samsung** in Korea to transform their business. Six Sigma seeks to ensure that internal processes are running as efficiently as possible. Staff functions, such as legal departments, also use Six Sigma today. In 2011, **Wipro Technologies** was the first Indian company to adopt Six Sigma and the **Inventec Corporation** was the first Taiwan electronics company to adopt it. Six Sigma is used by businesses around the world including Amazon.com, **Credit Suisse**, and Mumbai's *dabbawalas*.

Why do these business process changes affect management accounting? They all directly affect costs, and accountants often measure the actual cost savings, predict anticipated cost savings, and develop costs for products or services for different production environments. For example, one midwestern factory saved production time by redesigning its plant layout to reduce the distance products traveled from one operation to the next during production from 1,384 feet to just 350 feet. Accountants measured the cost the company saved by the reduced production time. As another example, a British company reduced the time to manufacture a vacuum pump from 3 weeks to 6 minutes by switching from long assembly lines to manufacturing cells that accomplish all production steps in quick succession. Again, accountants measured the benefits created by the reduced production time. In general, when companies change their production processes to accomplish economic objectives, accountants predict and measure the economic impact.

lean manufacturing

Applying continuous process improvements to eliminate waste from the entire enterprise.

total quality management (TQM)

An approach to quality that focuses on prevention of defects and on customer satisfaction.

Six Sigma

A data-driven continuous process improvement effort designed to eliminate defects and improve quality.

Making Managerial Decisions

Suppose you are a manager of a DuPont chemical plant. The plant has just undertaken a business process reengineering project and, as a result, has substantially changed its production process. It is much more automated, with newly acquired equipment replacing labor-intensive operations. The plant is also making more use of electronic commerce and moving toward a JIT inventory policy. You have a meeting with your accountant to discuss possible changes in your accounting system. What types of accounting-system changes might be warranted?

Answer

Major changes in production processes generally lead to different information needs. The old accounting system may have focused on accounting for labor, while the new system should focus on the use of the automated equipment. This will direct attention to the most important costs in the process and make sure that they are monitored and controlled. Problem-solving needs will also be different. Initially, the plant's managers will probably want comparative data on the cost of the new process versus the cost of the old. In the future, they will need information about how best to use capacity that the plant owns (the equipment) rather than how much labor to use for the planned level of production.

Implications for the Study of Management Accounting

As you read the remainder of this book, remember that accounting systems change as the world changes. Companies currently apply the techniques described in this book. However, to adapt to changes, you must understand why companies are using the techniques, not just how they are using them. Resist the temptation to simply memorize rules and techniques, and instead develop your understanding of the underlying concepts and principles. This understanding will continue to be useful no matter what new conditions you encounter.

Ethical Conduct for Professional Accountants

Objective 7

Explain why ethics and standards of ethical conduct are important to accountants.

Business processes and accounting systems change. However, the need for accountants to maintain high ethical standards of professional conduct will never change. This is because ethics deals with human conduct in relation to what is morally good and bad, right and wrong. It is the application of values to decision making.

We like to think of ethics as simply doing what is right. One way to decide whether an action is unethical is to ask yourself whether you would be embarrassed to read about your action in the newspaper the next day. Another warning sign that an action may be unethical is when the justification for the action is “Everybody else is doing it,” the phrase Warren Buffett has described as “the five most dangerous words in business.” He goes on to say that this excuse should always raise a red flag: “Why would somebody offer such a rationale for an act if there were a good reason available? Clearly the advocate harbors at least a small doubt about the act if he utilizes this verbal crutch.”

Why is it so important for accountants to have integrity? Think of it this way: If you buy a car, you can see many of the quality details. Further, if something goes wrong with the car, you will certainly know it. But accounting information is different. Users can’t see its quality. Users might not know for years that something was wrong with the information—probably not until it’s too late to do anything about it. Thus, users rely on the integrity of accountants to assure the integrity of information. If you cannot trust the information, then it is nearly worthless.

Managing ethical behavior in an organization is increasingly becoming a challenging task in the context of growing importance of diversity, equity, and inclusion (DE&I). Workforce diversity components including demographics (such as gender or age) and cultures, make it difficult to uphold a uniform ethical behavior. In addition, diversity in an organisation’s client base may pose further threat as clients’ religious and cultural beliefs often shape their decisions and priorities. Hence, DE&I considerations must also be embedded within the ethical business practices. This is, however, extremely difficult as these beliefs are often conflicting.

In the remainder of this section, we discuss ethical standards and formal codes of conduct that often help resolve ethical issues. We also provide examples of clearly unethical behavior. Finally, we turn to the difficult issue of ethical dilemmas, situations where conflicting values make it unclear which is the ethical action.

Standards of Ethical Conduct

Ethical standards require CPAs and CMAs to adhere to codes of conduct regarding integrity, objectivity, professional competence and due care, confidentiality and professional behavior. Exhibit 1-7 contains the **International Code of Ethics for Professional Accountants**, a code of conduct developed by the **International Ethics Standards Board for Accountants (IESBA)** of the **International Federation of Accountants (IFAC)**. Professional accounting organizations have procedures for reviewing alleged behavior that is not consistent with the standards.

The ethical organization also has policies in place to motivate ethical actions. Integrity and outspoken support for ethical standards by senior managers, in both word and deed, are the greatest motivators of ethical behavior throughout an organization. A **code of conduct**—a document specifying the ethical standards of an organization—is the centerpiece of most ethics programs. (See the Business First box, “Ethics and Corporate Codes of Conduct,” on p. 39.) But having a code is not sufficient. Actual policies and practices influence behavior. This means that managers’ evaluations must include an assessment of ethical conduct. Organizations cannot tolerate unethical behavior, even if it appears to lead to great financial performance. **Luckin**, a Chinese beverage retailer, opened its first stores in January 2018 in Beijing and Shanghai. By the end of 2019, it had 4,507 stores and claimed to have served more than 40 million customers. In two years, it had overtaken Starbucks in China. It was remarkable. Customer had to pay for products via a digital payment platform (WeChat Pay or Alipay) or by redeeming coupons through Luckin’s own app (bought in advance using WeChat Pay or Alipay). After a huge investigation,

International Code of Ethics for Professional Accountants

A code of conduct developed by the International Ethics Standards Board for Accountants (IESBA) of the International Federation of Accountants (IFAC).

code of conduct

A document specifying the ethical standards of an organization.

The Code sets out high quality standards of ethical behavior expected of professional accountants for adoption by professional accountancy organizations which are members of the International Federation of Accountants (IFAC), or for use by such members as a basis for their codes of ethics. The Code may also be used or adopted by those responsible for setting ethics standards for professional accountants in particular sectors or jurisdictions and by firms in developing their ethics and independence policies.

A professional accountant shall comply with the Code. If the accountant identifies a breach of any provision of the Code, he shall evaluate the significance of the breach and its impact on the ability to comply with the fundamental principles. The accountant shall also take whatever actions might be available, as soon as possible, to address the consequences of the breach satisfactorily; and determine whether to report the breach to the relevant parties. There are three parts to the Code.

Part 1 - Complying with the Code, Fundamental Principles and Conceptual Framework

There are five fundamental principles of ethics for professional accountants:

- (a) Integrity – to be straightforward and honest in all professional and business relationships.
- (b) Objectivity – to exercise professional or business judgment without being compromised by bias, conflict of interest or undue influence of, or undue reliance on, individuals, organizations, technology, or other factors.
- (c) Professional Competence and Due Care – to attain and maintain professional knowledge and skill at the level required to ensure that a client or employing organization receives competent professional service, based on current technical and professional standards and relevant legislation, and act diligently and in accordance with applicable technical and professional standards.
- (d) Confidentiality – to respect the confidentiality of information acquired as a result of professional and business relationships.
- (e) Professional Behavior – to comply with relevant laws and regulations, behave in a manner consistent with the profession's responsibility to act in the public interest in all professional activities and business relationships and avoid any conduct that the professional accountant knows or should know might discredit the profession.

A professional accountant, in business or in public practice, shall comply with each of the fundamental principles.

The fundamental principles are an appropriate frame of reference for a professional accountant in considering what constitutes unethical behavior on the part of the accountant and, if necessary, by analogy, other individuals.

A professional accountant might face a situation in which complying with one fundamental principle conflicts with one or more other fundamental principles. In such a situation, the accountant might consider consulting, on an anonymous basis, if necessary, with:

- Others within the firm or employing organization.
- Those charged with governance.
- A professional body.
- A regulatory body.
- Legal counsel.

However, such consultation does not relieve the accountant from the responsibility to exercise professional judgment to resolve the conflict or, if necessary, and unless prohibited by law or regulation, disassociate from the matter creating the conflict.

The professional accountant is encouraged to document the substance of the issue, the details of any discussions, the decisions made and the rationale for those decisions.

The Code advocates a conceptual framework which specifies an approach for a professional accountant to identify threats to compliance with the fundamental principles, evaluate the threats identified and address the threats by eliminating or reducing them to an acceptable level.

Part 2 – Professional Accountants in Business

This part of the Code deals with seven individual areas to be addressed by a professional accountant in business employed in a managerial position. These are: conflict of interest; preparation and presentation of information; acting with sufficient expertise; financial interests; compensation and incentives linked to financial reporting and decision making; inducements including gifts and hospitality, responding to non-compliance with laws and regulations, pressure to breach the fundamental principles.

Part 3 – Professional Accountants in Public Practice

This part of the Code deals with six individual areas to be addressed by a professional accountant in public practice. These are: conflict of interest; professional appointments; second opinions; fees and other types of remuneration; inducements including gifts and hospitality; custody of client assets; responding to non-compliance with laws and regulations.

Source: *Handbook of the International Code of Ethics for Professional Accountants*, 2021 edition, IFAC-IESBA (https://www.ifac.org/system/files/publications/files/IESBA-English-2021-IESBA-Handbook_Web.pdf)

Exhibit 1-7

International Code of Ethics for Professional Accountants

Luckin was found guilty of fabricating their financial data to deceive potential investors and they agreed to pay \$180 million to settle charges against them of fraud and accounting irregularities.

According to investigators, Luckin inflated their sales volume by 69% in the third quarter of 2019 and by 88% in the fourth quarter. Luckin ran two databases, one showed the real level of transactions and the other the fabricated ones that they used to create the false statements. Their own finance and accounts department only had access to the latter one, internal auditors colluded to hide the truth. Ernst & Young Hua Ming LLP (EY) was the external auditor for Luckin, they found the fabricated data in April 2020 when they looked at 2019's figures. They reported it to Luckin's board and investment banks. EY made two public statements about Luckin. The first made in April 2020, stated EY had found the fabricated revenue and expenses from 2019 and reported it to the board. The second statement, made in July 2020, provided further details and stated it recognized irregularities in January 2020 and immediately raised red flags. EY denied any responsibility in the scandal. EY audited Luckin's 2017 and 2018 financial reports, which were part of the company's IPO prospectus, but did not audit the 2019 financial statements. However, EY wrote a private letter to a number of investment banks stating it did not have an issue with the financial performance of Luckin in the first three quarters of 2019. This letter was issued before the 2019 financial statements were audited. The market value of Luckin had grown from \$1 million in July 2018 to \$3.9 billion in May 2019 on the back of three fraudulent schemes. The first involved fabricating coupons sold and redeemed using fake purchases and orders. The second related to selling coupons to fake corporate customers and the third selling coupons to third-party shell companies. The latter was the biggest scheme and accounted for \$311 million in fake revenue. Fabricated costs were created to match the over-inflated revenue to the value of \$196 million. When the scandal hit, Luckin's shares plummeted by 81%. Twelve implicated employees were fired as was the CEO, Jenny Zhiya Qian. To date, Luckin has neither admitted nor denied events.

Most companies make ethics a top priority. Japan's **Sumitomo Corporation Group** has a distinctive statement of its ethical principles in a sustainability pledge: "Achieving Sustainable Growth with Society: The Sumitomo Corporation Group aims to be a global organization that contributes broadly to society through its sound business activities." India's **Bhikhabhai's** Vision is to be "Peoples first choice for authentic Indian Delicacies." They drill down the elements of this statement with the ethical announcement: "Concern for Public Image: We will upkeep our good corporate citizenship and will be involved in local community wellness projects." PVS Chemicals Belgium Mission Statement summarizes their commitment to collaboration and team work, but specifically state that "We take pride in our job and expect to be held accountable for the results." There are many more companies with high ethical standards than there are with ethical violations, though the latter receive most of the publicity.

Ethical Dilemmas

The ethical standards of the profession leave much room for individual interpretation and judgment. A first step is to ask two questions: Is this action unethical? Would it be unethical not to take this action? If the answers to these questions are clear, then the ethical action is clear. For example, if Luckin's internal auditors had been asked whether the recording of income and expenditure was accurate, they would have answered "yes." However, a manager's ethical choice becomes more complex when there are no legal guidelines or clear-cut ethical standards. Ethical dilemmas exist when managers must choose an alternative and there are (1) significant value conflicts among differing interests, (2) several alternatives are justifiable, and (3) there are significant consequences for stakeholders in the situation.

Suppose you are an accountant and your boss has asked you to supply the company's banker with a profit forecast for the coming year. A badly needed bank loan rides on the prediction. Your boss is absolutely convinced that profits will be at least \$500,000—anything less than that and the loan is not likely to be approved.

Your analysis reveals three possible outcomes: First, if the planned introduction of a new product goes extraordinarily well, profits will exceed \$500,000. Second, if there is a modestly successful introduction, there will be a \$100,000 profit. You believe this is the most likely outcome. Third, if the product fails, the company stands to lose \$600,000. Without the loan, the new product cannot be taken to the market, and there is no way the company can avoid a loss for the year. Bankruptcy is a real possibility.

What forecast would you make? The ethical dilemma arises here because of uncertainty and disagreement about the prospects for the new product. If your boss is correct that profits will exceed \$500,000, it would be unethical to make a forecast of less than \$500,000. Such a forecast seems to guarantee that the loan will not be obtained, leading to financial problems,

Ethics and Corporate Codes of Conduct

The Sarbanes-Oxley Act of 2002 requires companies “to disclose whether or not, and if not, the reason therefore, such issuer has adopted a code of ethics for senior financial officers, applicable to its principal financial officer and comptroller or principal accounting officer, or persons performing similar functions.” This has created increased interest in corporate codes of conduct. However, a code of conduct means different things to different companies. Some of the items included in companies’ codes of conduct include maintaining a dress code, avoiding illegal drugs, following instructions of superiors, being reliable and prompt, maintaining confidentiality, not accepting personal gifts from stakeholders as a result of company role, avoiding racial or sexual discrimination, avoiding conflict of interest, complying with laws and regulations, not using an organization’s property for personal use, and reporting illegal or questionable activity. Even before **Enron** and other corporate scandals, a significant number of world’s leading companies had their code of conduct. But the codes differed in type and in level of enforcement.

A company may have a very simple and concise code of conduct. Others may have detailed lists of dos and don’ts. Some companies use consulting firms to advise them on their codes. Although the codes and their development differ, the goal is generally the same—to motivate employees to act with integrity.

Google has a simple, seven-point code: (1) serve our users, (2) support and respect each other, (3) avoid conflict of interest, (4) preserve confidentiality, (5) protect Google’s assets, (6) ensure financial integrity and responsibility, and (7) obey the law. The code is easy to read and understand. The tone is conversational, yet they make the points that need to be made with authority.

In contrast, **Pepsico’s** global code of conduct is extremely detailed. The forty-two-page document illustrates

Pepsico’s core principle, *Act with Integrity*, with reference to four broad elements—workplace, marketplace, business, and the world. Each element is further detailed into various sub-elements with minute detail. For example, in the section on business gifts, they say exactly what is considered a gift, when gifts can and cannot be given and even put additional restrictions depending on whether gift giver or recipient is a supplier or customer. Studies on corporate scams essentially indicate that deficiency in ethical behavior among some company executives is the primary reason behind corporate failure. Corporate governance consultants and academics also agree that a company needs to have a code of conduct and ethics in place, by which the employees should conduct themselves in relation to their business activities.

While having a code of conduct is important, it is not sufficient. After all, Enron’s code of conduct specified that “business is to be conducted in compliance... with the highest professional and ethical standards.” Top management must set the tone and get out the message. Management must recognize and reward honesty and integrity. As Clarence Otis, CFO of **Darden Restaurants**, says, “Our senior managers care about honesty and integrity and doing things right, and that influences how they do their job.” The corporate culture, more than codes of conduct, is the real influence on the ethical climate of an organization. Codes of conduct can be a part, but only a part, of developing a culture of integrity.

Sources: Sarbanes-Oxley Act of 2002 (<https://www.govinfo.gov/content/pkg/COMPS-1883/pdf/COMPS-1883.pdf>); Code of Conduct Examples From 4 Fortune 500 Companies (<https://everfi.com/blog/workplace-training/4-of-the-best-company-code-of-conduct-examples/>); Enron Corporation, 2000 *Corporate Responsibility Report*, p. 22.

perhaps even bankruptcy. This would hurt stockholders, management, employees, suppliers, and customers. On the other hand, if you are correct that the most likely outcome is a profit of \$100,000, a forecast of \$500,000 may not be fair and objective. It may mislead the bank.

There is no easy answer to this dilemma. It is one of those gray areas where either action includes risks. But remember that a series of gray areas can create a black area. That is, a series of actions that push the boundary of ethical behavior can add up to a clearly unethical situation. Accountants must draw the line someplace, and it is usually better to err on the side of full disclosure than to withhold important information. Enron repeatedly pushed boundaries by reporting only optimistic information. If its managers had done this once or twice, it might not have created a problem. But the pattern of exclusively optimistic projections eventually deteriorated into completely unrealistic, and unethical, projections.

To maintain high ethical standards, accountants and others need to recognize situations that create pressures for unethical behavior. Four such temptations, summarized in *Financial Executive*, are as follows:

1. **Emphasis on short-term results.** This may have been the largest issue in the recent spate of ethical breakdowns. If “making the numbers” is goal number one, accountants may do whatever is necessary to produce the expected profit numbers.
2. **Ignoring the small stuff.** Most ethical compromises start out small. The first step may seem insignificant, but large misdeeds are often the result of many small steps. Toleration of even small lapses can lead to large problems.
3. **Economic cycles.** A down market can reveal what an up market conceals. When Enron was flying high at the turn of the century, no one seemed to question its financial reports. When the economy took a downward turn, managers made ethical compromises to

keep pace with expectations of an up market. The result was a huge crisis when scrutiny revealed many questionable practices. Similarly, later in the decade companies such as **AIG**, **Fannie Mae**, and **Freddie Mac** were accused of accounting compromises after the economy started to sour in 2008. Companies need to be especially vigilant to prevent ethical lapses in good times when such lapses are more easily concealed, and thereby avoid revelation of lapses in bad times when their effects are especially damaging.

4. **Accounting rules.** Accounting rules have become more complex and less intuitive, making abuse of the rules harder to identify. Ethical accountants do not just meet the “letter of the law,” they seek full and fair disclosure—conveying to users the real economic performance and financial position of the company.

Few organizations are intentionally unethical. Even **Arthur Andersen**, the accounting firm destroyed by failed audits at Enron, **Sunbeam**, **Global Crossing**, and others, had a formal ethical structure, including a partner in charge of ethics. Nevertheless, other pressures, especially the pressure for growing revenues, overrode some of the ethical controls and caused bad decisions.

Resolution of Ethical Conflicts

Ethical dilemmas also arise when you only observe, rather than commit, unethical behavior. If you discover unethical behavior in an organization, you are obligated to try to halt that behavior. However, you still have confidentiality issues to confront. When faced with ethical issues, you should follow your organization’s established policies on the resolution of such ethical conflict. For example, the organization may have an ethics officer (often called ombudsperson) whom you may approach. However, policies do not always guarantee the resolution of ethical conflict. In such a scenario, you should first discuss the issue with your immediate supervisor except when it appears that the supervisor is involved. In that case, present the issue to the next level. If you fail to achieve a satisfactory resolution, submit the issue to the next management level. If your immediate superior is the chief executive officer, the appropriate review authority may be a group such as the audit committee, board of directors, board of trustees, or owners. Contact with levels above the immediate superior should be made

Summary Problem for Your Review

PROBLEM

Yang Electronics Company (YEC) developed a high-speed, low-cost copying machine marketed primarily for home use. However, as YEC customers learned how easy and inexpensive it was to make copies with it, sales to small businesses soared. Unfortunately, the heavier use by these companies caused breakdowns in a component of the equipment that had been designed only for light use. The copiers were warranted for 2 years, regardless of the amount of usage. Consequently, YEC began to experience high costs for replacing the damaged component.

As the quarterly meeting of YEC’s board of directors approached, the CFO asked Mark Chua, assistant controller, to prepare a report on the situation. It was hard to predict the exact effects, but it seemed that many business customers were starting to switch away from the YEC copier to more expensive copiers sold by competitors. It was also clear that the increased warranty costs would significantly affect YEC’s profitability. Mark summarized the situation in writing as best he could for the board.

Alice Martinez, YEC’s CFO, was concerned about the impact of the report on the board. She did not disagree with the analysis, but she thought it would make management look bad and might even lead the board to discontinue the product. She was convinced from conversations with the head of engineering that the copier could be slightly redesigned to meet the needs of high-volume users, so discontinuing it may pass up a potentially profitable opportunity.

Martinez called Chua into her office and asked him to delete the part of his report dealing with the component failures. She said it was all right to mention this orally to the board, noting that engineering is nearing a solution to the problem. However, Chua felt strongly that such a revision in his report would mislead the board about a potentially significant negative impact on the company’s earnings.

Use the International Code of Ethics for Professional Accountants in Exhibit 1-7 to explain why Martinez’s request to Chua is unethical. How should Chua resolve this situation?

SOLUTION

Martinez's request violates fundamental principles of professional competence and due care, integrity and professional behavior. It violates professional competence because she is asking Chua to prepare a report that is not complete and clear, and omits potentially relevant information. Therefore, the board will not have all the information it should to make a decision about the component failure problem.

The request violates integrity because the revised report may subvert the attainment of the organization's objectives to achieve Martinez's objectives. Management accountants are specifically responsible for communicating unfavorable as well as favorable information.

Finally, the revisions in the report would violate the principle of professional behavior. The report would not disclose all relevant information that could be expected to influence the board's understanding of operations and, therefore, its decisions. In that way, Chua's behavior would not be consistent with the profession's responsibility to act in the public interest in all professional activities and business relationships.

Chua's responsibility is to discuss this issue with increasingly higher levels of authority within YEC. First, he should let Martinez know about his misgivings. Possibly the issue can be resolved by her withdrawing the request. If not, he should inform her that he intends to take up the matter with the company president, and even the board, if necessary, until the issue is resolved. So that Chua does not violate the standard of confidentiality, he should not discuss the matter with persons outside of YEC.

with your superior's knowledge, assuming he or she is not involved. Communication of such issues to any authority or individual outside the organization is not considered appropriate, unless you suspect a clear violation of law. You may also consult your legal advisor as to legal obligations and rights concerning the ethical conflict. The above procedure is an industry accepted approach in resolution of ethical conflict advocated by experts and various professional associations internationally.

Highlights to Remember

- 1. Explain why accounting is essential for decision makers and managers.** Decision makers in all functional areas of an organization must understand the accounting information that they are using in their decisions and the incentives created by accounting systems.
- 2. Describe the major users and uses of accounting information.** Internal managers use accounting information for making short-term planning and control decisions, for making nonroutine decisions, and for formulating overall policies and long-range plans. External users, such as investors and regulators, use published financial statements to make investment decisions, regulatory rulings, and many other decisions. Managers use accounting information to answer scorekeeping, attention-directing, and problem-solving questions.
- 3. Explain the role of budgets and performance reports in planning and control.** Budgets and performance reports are essential tools for planning and control. Budgets result from the planning process. Managers use them to translate the organization's goals into action. A performance report compares actual results to the budget. Managers use these reports to monitor, evaluate, and reward performance and, thus, exercise control.
- 4. Describe the cost-benefit and behavioral issues involved in designing an accounting system.** Management accounting information systems should be judged by a cost-benefit criterion—the benefits of better decisions and better incentives should exceed the cost of the system. Behavioral factors—how the system affects managers and their decisions—greatly influence the benefits from a management accounting system.
- 5. Discuss the role accountants play in the company's value-chain functions.** Accountants play a key role in planning and control. Throughout the company's value chain, accountants gather and report cost and revenue information for decision makers.
- 6. Identify current trends in management accounting.** Many factors have caused changes in accounting systems in recent years. Most significant are a shift to a service-based economy, increased global competition, advances in technology, and changed business processes. Without continuous adaptation and improvement, accounting systems would soon become obsolete.
- 7. Explain why ethics and standards of ethical conduct are important to accountants.** Users of accounting information expect accountants to adhere to high standards of ethical conduct. Most users

cannot directly assess the quality of that information, and if they cannot rely on accountants to produce unbiased information, the information will have little value to them. That is why professional accounting organizations, as well as most companies, have codes of ethical conduct. Many ethical dilemmas, however, require more than codes and rules. They call for value judgments, not the simple application of standards.

Accounting Vocabulary

Vocabulary is an essential and often troublesome phase of the learning process. A fuzzy understanding of terms hampers the learning of concepts and the ability to solve accounting problems. Before proceeding to the assignment material or to the next chapter, be sure you understand the words and terms in the Accounting Vocabulary section of each chapter. Their meaning is explained within the chapter and in the glossary at the end of this book.

accounting system, p. 23	computer-integrated manufacturing (CIM) systems, p. 34	just-in-time (JIT) philosophy, p. 34
attention directing, p. 23	control, p. 24	lean manufacturing, p. 35
behavioral implications, p. 27	controller (comptroller), p. 32	line managers, p. 31
budget, p. 25	cost-benefit balance, p. 27	management accounting, p. 21
business process reengineering, p. 34	decision making, p. 23	management audit, p. 26
business-to-business (B2B), p. 34	electronic commerce (e-commerce), p. 34	management by exception, p. 25
business-to-consumer (B2C), p. 34	enterprise resource planning (ERP) system, p. 34	performance reports, p. 25
certified management accountant (CMA), p. 22	eXtensible Business Reporting Language (XBRL), p. 34	planning, p. 24
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chartered accountant (CA), p. 22	generally accepted accounting principles (GAAP), p. 22	product life cycle, p. 27
chief financial officer (CFO), p. 32	International Code of Ethics for Professional Accountants, p. 36	scorekeeping, p. 23
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computer-aided design (CAD), p. 34	internal auditors, p. 26	Six Sigma, p. 35
computer-aided manufacturing (CAM), p. 34	internal controls, p. 26	staff managers, p. 31
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MyLab Accounting

Fundamental Assignment Material

The assignment material for each chapter is divided into two groups: fundamental and additional. The fundamental assignment material consists of two sets of parallel problems that convey the essential concepts and techniques of the chapter. The additional assignment material covers the chapter in more detail and includes questions, critical thinking exercises, exercises, problems, cases, a problem based on Nike's 10-K, an Excel application exercise, a collaborative learning exercise, and an Internet exercise.

I-AI Scorekeeping, Attention Directing, and Problem Solving

For each of the following activities, identify the primary function that the accountant is performing—scorekeeping, attention directing, or problem solving—and explain why it best fits that category.

1. Preparing a schedule of depreciation for forklift trucks in the receiving department of a **General Electric** factory in Scotland
2. Analyzing, for a **Sony** production superintendent, the impact on costs of purchasing some new assembly equipment
3. Preparing a scrap report for the finishing department of a **Toyota** parts factory
4. Interpreting why the **Colville Timber Resource Company** did not adhere to its production schedule
5. Explaining the stamping department's performance report
6. Preparing a monthly statement of European sales for the **Ford Motor Company's** vice president of marketing

7. Preparing, for the manager of production control of a **Mittal Steel** plant, a cost comparison of two computerized manufacturing control systems
8. Interpreting variances on the performance report for the University of Michigan's purchasing department.
9. Analyzing, for an **Airbus** manufacturing manager, the desirability of having some parts for the A380 airplane made in Korea
10. Preparing the budget for the dermatology department of **Providence Hospital**

I-A2 Management by Exception

Beta Alpha Psi, the accounting honorary fraternity, held a homecoming party. The fraternity expected attendance of 80 persons and prepared the following budget:

Room rental	\$ 170
Food	660
Entertainment	570
Decorations	210
Total	<u>\$1,610</u>

After Beta Alpha Psi paid all the bills for the party, the total cost came to \$1,885, or \$275 over budget. Details are \$170 for room rental; \$875 for food; \$570 for entertainment; and \$270 for decorations. Ninety-six persons attended the party.

1. Prepare a performance report for the party that shows how actual costs differed from the budget. That is, include in your report the budgeted amounts, actual amounts, and variances.
2. Suppose the fraternity uses a management-by-exception rule. Which costs deserve further examination? Why?

I-A3 Professional Ethics

Exhibit 1-7 on p. 37 lists four main categories of ethical standards for management accountants: competence, confidentiality, integrity, and credibility. For each of the following situations, indicate which of these four should influence the manager and what the appropriate action should be:

1. At a dinner party, a guest asked a **General Mills** manager how a major new cereal was doing. The manager had just read a report that said sales lagged much below expectation. What should he say?
2. Felix just graduated from business school with an accounting major and joined the controller's department of Pioneer Enterprises. His boss asked him to evaluate a market analysis for a potential new product prepared by the marketing department. Felix knows very little about the industry, and he never had a class to teach him how to make a market analysis. Should he just do the best he can on the analysis without asking for help?
3. Mary Sue prepared a budget for a division of Southeastern Electronics. Her supervisor, the division manager, was not happy that she included results for an exciting new product that was to be introduced in a month. He asked her to leave the results for the product out of the budget. That way, the financial results for the product would boost actual profits well above the amount budgeted, resulting in favorable reviews for the division and its managers. What should Mary Sue do?
4. John, who has an MBA degree with a marketing major, has joined the marketing division of Supreme Enterprises. Mathew, John's immediate superior in the department, has asked him to supervise a marketing campaign for an upcoming product of the company. The campaign claims that the product is 40% more effective than the competitors', though there is no substantial evidence of the same. Mathew asked John to mention in the campaign that the claim has been substantiated by Alpha Research Foundation, an entity that does not even exist. Should John do what he has been asked?

I-B1 Scorekeeping, Attention Directing, and Problem Solving

For each of the following activities, identify the function the accountant is performing—scorekeeping, attention directing, or problem solving. Explain each of your answers.

1. Estimating the operating costs and outputs that could be expected for each of two large metal-stamping machines offered for sale by different manufacturers; only one of these machines is to be acquired by your company
2. Recording daily material purchase vouchers
3. Analyzing the expected costs of acquiring and using each of two alternate types of welding equipment
4. Preparing a report of overtime labor costs by production department
5. Estimating the costs of moving corporate headquarters to another city
6. Interpreting increases in nursing costs per patient-day in a hospital
7. Analyzing deviations from the budget of the factory maintenance department

8. Assisting in a study by the manufacturing vice president to determine whether to buy certain parts needed in large quantities for manufacturing products or to acquire facilities for manufacturing these parts
9. Preparing estimated costs for a new marketing campaign
10. Recording overtime hours of the product finishing department
11. Compiling data for a report showing the ratio of advertising expenses to sales for each branch store
12. Investigating reasons for increased returns and allowances for drugs purchased by a hospital
13. Preparing a schedule of fuel costs by months and government departments
14. Computing and recording end-of-year adjustments for expired fire insurance on the factory warehouse

I-B2 Management by Exception

The Skokomish Indian tribe sells fireworks for the 5 weeks preceding July 4. The tribe's stand on Highway 101 near Hoodspout had budgeted sales of \$80,000. Expected expenses were as follows:

Cost of fireworks	\$40,000
Labor cost	10,000
Other costs	<u>7,000</u>
Total costs	<u>\$57,000</u>

Actual sales were \$79,440, almost equal to the budget. The tribe spent \$39,400 for fireworks, \$13,100 for labor, and \$6,900 for other costs.

1. Compute budgeted profit and actual profit.
2. Prepare a performance report to help identify those costs that were significantly different from the budget.
3. Suppose the tribe uses a management-by-exception rule. What costs deserve further explanation? Why?

I-B3 Ethical Code of Conduct

According to the **Financial Executives Institute**, "corporate governance consultants and academics agree that a company needs to have a code of conduct" for its employees. Most companies, even many of those who experienced ethical breakdowns, have such a code. Answer the following questions about corporate codes of conduct.

1. What is a corporate code of conduct?
2. What types of issues are covered in a corporate code of conduct? At what level of detail?
3. In some cases, codes of conduct were not effective. What, besides simply having a code, is necessary for a code of conduct to be effective?

MyLab Accounting

Additional Assignment Material

QUESTIONS

I-1 Who uses information from an accounting system?

I-2 "The emphases of financial accounting and management accounting differ." Explain.

I-3 "The field is less sharply defined. There is heavier use of economics, decision sciences, and behavioral sciences." Identify the branch of accounting described in the quotation.

I-4 Distinguish among scorekeeping, attention directing, and problem solving.

I-5 "Three categories of requirements are imposed on accounting systems designed to meet the requirements of external users." What are these categories?

I-6 What is the role of internal auditors in an accounting system?

I-7 Why is the Sarbanes-Oxley Act controversial?

I-8 Why is integrity so important to accountants?

I-9 "Integrity is more important for business professionals than it is for business students." Do you agree? Explain.

I-10 Give three examples of service organizations. What distinguishes service organizations from other types of organizations?

I-11 What two major considerations affect the design of all accounting systems? Explain each.

I-12 "The accounting system is intertwined with operating management. Business operations would be in a hopeless tangle without the recordkeeping that is so often regarded with disdain." Do you agree? Explain, giving examples.

I-13 Distinguish among a budget, a performance report, and a variance.

I-14 “Management by exception means abdicating management responsibility for planning and control.” Do you agree? Explain.

I-15 Why are accountants concerned about product life cycles?

I-16 Name the six primary business functions (excluding support functions) that make up the value chain, and briefly describe each.

I-17 Discuss the role of accountants in post-production value chain functions.

I-18 Distinguish between the duties of line managers and staff managers.

I-19 The role of management accountants is changing, especially in companies with a “flatter” organizational structure. What are some of the changes?

I-20 Does every company have both a controller and a treasurer? Explain.

I-21 Describe the two parts of the qualifying examination for becoming a CMA.

I-22 “The problem with accounting is that accountants never get to become top managers such as CEOs.” Do you agree? Explain.

I-23 How are changes in technology affecting management accounting?

I-24 What is lean manufacturing?

I-25 Briefly describe how a change in a plant’s layout can make its operation more efficient.

I-26 International Code of Ethics for Professional Accountants sets out five fundamental principles that establish the standard of behavior expected of a professional accountant acting as a manager. Describe each of the five principles in 25 words or fewer.

I-27 “Why are there ethical dilemmas? I thought accountants had standards that specified what ethical behavior is.” Discuss this quote.

CRITICAL THINKING EXERCISES

I-28 Finance and Management Accounting

Often there is confusion between the roles played by the controller and treasurer in an organization. In many small companies, a single person performs activities related to both functions.

Distinguish between the controller and the treasurer functions by listing typical activities that are associated with each.

I-29 Accounting’s Position in the Organization: Controller and Treasurer

For each of the following activities, indicate whether it is more likely to be performed by the controller or by the treasurer. Explain each answer.

1. Prepare divisional financial statements.
2. Help managers prepare budgets.
3. Advise which alternative action is least costly.
4. Meet with financial analysts from Wall Street.
5. Arrange short-term financing.
6. Prepare tax returns.
7. Arrange insurance coverage.
8. Prepare credit checks on customers.

I-30 Marketing and Management Accounting

A cross-functional team of managers, including the management accountant, must perform the following activities. However, depending on the nature of activity, one functional area will take the leadership role. Which of these is primarily a marketing decision? What would the management accountant contribute to each of the marketing decisions?

1. Lenovo must decide whether to buy the camera to be used in its All-in-One desktop computers from an external supplier or produce the same in-house.
2. Blue Star must decide the price of the spare parts of its home air conditioner to be sold online through the company’s website.
3. Walmart must forecast the impact of a social media campaign on its online sales.
4. Apollo Hospitals, India, must decide how to finance the purchase of an MRI scanner worth a few million rupees.
5. McDonald’s must decide whether to accept a customized order from a large corporate house for an event it is hosting on its 100th anniversary.
6. Symphony must decide whether to shut down one of its retail stores in Kolkata, India, which is currently operating at a loss.

I-31 Production and Management Accounting

A cross-functional team of managers, including the management accountant, must perform the following activities. However, depending on the nature of activity, one functional area will take the leadership role. Which of these is primarily a production decision? What would the management accountant contribute to each of the production decisions?

1. Hyundai Motors must decide whether to buy the anti-intrusion bar, a passive safety device to be used in its latest SUV model or to produce the same in-house.
2. Hewlett Packard must decide the price of the spare parts of its desktop computers, to be sold online through its website.
3. The Advanced Medical Research Institute, India, must decide how to finance the purchase of 20 mechanical ventilators required to treat COVID-19 patients with acute respiratory distress syndrome.
4. Xiaomi must find out the impact of a recent online advertisement campaign on the sale of its recently launched smart home devices.
5. KFC must decide whether to accept a customized order from Tesla for a product launch event.
6. Amazon must evaluate its overall vision and define its strategic goals for its Indian arm in light of the recent competition from Walmart and JioMart.
7. ASUS must decide whether to invest in training workers to perform setups and changeovers faster, which may free up capacity that can be used to produce more smartphones without purchasing more equipment.
8. Octopus Energy must decide whether to replace a four-year-old piece of equipment in one of its plants.

EXERCISES**I-32 Management Accounting and Financial Accounting**

Consider the following short descriptions. Indicate whether each description relates more closely to a major feature of financial accounting or management accounting.

1. The field is highly regulated by standards and regulations
2. Provides important insights about the adequacy of internal control system
3. Highly flexible
4. Detailed and customized reports
5. Provides a posterior assessment only
6. Behavioral impact is primary
7. Goes beyond the financial transactions

I-33 Planning and Control, Management by Exception

Study the framework for planning and control of a **Starbucks** store in Exhibit 1-2 on p. 25. Suppose that for next year a particular store budgeted revenue of \$356,400, an 8% increase over the current revenue of \$330,000. The actions listed in Exhibit 1-2 resulted in six new budgeted products and a total advertising budget of \$33,000. Actual results were as follows:

New products added	7
Advertising	\$ 35,640
Revenues	\$351,400

1. Prepare a performance report for revenues and advertising costs using the format of Exhibit 1-3 on p. 26.
2. Suppose the remaining cost elements of net income were not available until several months after the store implemented the plan. The net income results were disappointing to management—profits declined even though revenues increased because costs increased by more than revenues. List some factors that might have caused costs to increase so much and that management may not have considered when it formulated the store's plan.

I-34 Line Versus Staff and Value-Chain Responsibilities

For each of the following, indicate whether the employee has line or staff responsibility. Also indicate whether the employee primarily provides support for other value-chain functions or performs a specific value-chain function.

1. Vice President of Manufacturing
2. Zonal Sales Manager
3. Chief Product Designer
4. Head of Human Resource Department
5. Accountant
6. Analyst in Enterprise Risk Management

I-35 Microsoft's Value Chain

Microsoft is the world's largest software company. For each of the following value-chain functions, discuss briefly what Microsoft managers would do to achieve that function and how important it is to the overall success of Microsoft.

R&D	Product (service) and process design
Production	Marketing
Distribution	Customer service
Support functions	

I-36 Objectives of Management Accounting

The Institute of Management Accountants (IMA) is composed of nearly 70,000 members. The IMA "Objectives of Management Accounting" states, "The management accountant participates, as part of management, in assuring that the organization operates as a unified whole in its long-run, intermediate, and short-run best interests."

Based on your reading in this chapter, prepare a 100-word description of the principal ways that accountants participate in managing an entity.

I-37 Cost-Benefit of the Ethical Environment

A poor ethical environment results in costs to the company. On the other hand, a good ethical environment creates benefits. List several costs of a poor ethical environment and benefits of a good ethical environment.

I-38 Early Warning Signs of Ethical Conflict

The following statements are some early warning signs of ethical conflict:

- "Everyone in the industry does it this way. So, don't worry!"
- "We must get it done at any cost."

List other statements that are early warning signs of ethical conflict.

PROBLEMS

I-39 Management and Financial Accounting

Adam Saunders was a successful marketing executive at Exclusive Furnitures. On the eve of the company's foundation day, he was informed that he would be promoted to Assistant Factory Manager from the next quarter. Adam was pleased but a bit uncomfortable. As an assistant factory manager, he might have to deal with accounts also, but unfortunately, he had no experience in accounting. He had taken one course in financial accounting to get some idea about the maintenance of factory accounts.

Adam planned to enroll himself in a management accounting course. He asked his friend Charles, a cost accountant, to state three or four principal distinctions between financial and management accounting.

Prepare Charles's written response to Adam.

I-40 Use of Accounting Information in Hospitals

Fortis Hospitals, headquartered in Gurugram, India, derives its revenue from patients in two ways. While the patients not covered by any medical insurance pay the bills directly in cash, the hospital recovers the charges from third parties such as insurance companies and government agencies for patients covered under a medical insurance or government health scheme. For the latter category, the hospital has specified treatment packages with flat fees. For example, the hospital might charge ₹50,000 for a cholecystectomy or ₹200,000 for an angioplasty (in a semi-private ward)—no more, no less.

How does the method of payment change the demand for accounting information at Fortis Hospitals? Relate your answer to the decisions of the top management.

I-41 Costs and Benefits

Marks & Spencer, a huge retailer in the United Kingdom with sales of more than £9 billion, was troubled by its paper bureaucracy. Looked at in isolation, each document seemed reasonable, but

overall a researcher reported that there was substantial effort in each department to verify the information. Basically, the effort seemed out of proportion to any value received, and, eventually, the company simplified or eliminated many of the documents.

Describe the rationale that should govern systems design. How should a company such as Marks & Spencer decide what documents it needs and which can be eliminated?

I-42 Importance of Accounting

Successful companies across the world are often led by executives who do not belong to accounting field. Rather, they specialize in one or more functional areas such as engineering, marketing, or technology. Hitachi's chairman, Hiroaki Kakanishi, is an electrical and computer engineer. Mark Zuckerberg, CEO of Facebook, is a computer scientist and software developer. Berkshire Hathaway, with Warren Buffet as CEO, has its top managerial positions filled with people from finance.

How might the role of management accountants differ in these companies?

I-43 Changes in Accounting Systems

In the last decade, **Boeing** has made several significant changes to its accounting system. None of these changes were for reporting to external parties. Management believed, however, that the new system gave more accurate costs of the airplanes and other products produced.

1. Boeing had been a very successful company using its old accounting system. What might have motivated it to change the system?
2. When Boeing changed its system, what criteria might its managers have used to decide whether to invest in the new system?
3. Is changing to a system that provides more accurate product costs always a good strategy? Why or why not?

I-44 Value Chain

Nike is an Oregon-based company that focuses on the design, development, and worldwide marketing of high-quality sports footwear, apparel, equipment, and accessory products. Nike is the largest seller of athletic footwear and athletic apparel in the world. The company sells its products to more than 20,000 retail accounts in the United States and through a mix of independent distributors, licensees, and subsidiaries in approximately 170 countries around the world. Nike contracts with hundreds of factories around the world to manufacture virtually all the company's products. Nike produces most footwear and branded apparel products outside the United States.

1. Identify one decision that Nike managers make in each of the six value-chain functions.
2. For each decision in requirement 1, identify one piece of accounting information that would aid the manager's decision.

I-45 Role of Controller

Michigan Industries was extremely concerned about its shrinking profit margin over the recent few quarters. To find out the lapses, it appointed Daniel Jones as the new head of its controller's department. On his first day in the controller's office, Daniel found that there were large adverse cost variances with respect to the Detroit factory unit, which contributes more than 70% of the total production of the company. Since pricing decisions are linked with the cost estimates, underestimation of costs had led to a faulty pricing decision and, as a result, the profit margin had shrunk despite an increase in sales volumes. Since budgets were made based on the information submitted by the factory itself, Daniel arranged a meeting with the production supervisor of Detroit factory unit, John Smith, to understand the reason behind the unrealistic cost estimation. In the meeting, Smith appeared reluctant to talk to Daniel. When Daniel asked Smith about the adverse deviation from the budget cost figures, Smith became angry and replied, "I really don't want to talk to anyone from the controller's department. The only time we see those accountants is when our costs go over their budget. They wave what they call a 'performance report,' but their numbers never reflect the reality. Moreover, my men in the factory don't have the time to fill out the paperwork that you send. So I just plug in some numbers and send it back." Smith then left the meeting.

1. Identify some of the problems in the relationship between the controller's department and the production department (the Detroit factory unit in this case).
2. What should Daniel do next?

I-46 The Accountant's Role in an Organization

In order to tap opportunities and at the same time minimize risks, successful companies around the world have diversified their product portfolio. Today, many companies have emerged as successful conglomerates producing diverse products and providing varied services locally as well as internationally. In such companies, the accountant's role has also undergone significant changes. Accountants are

increasingly recognized as internal consultants by experts. In this context, discuss how accountants can act as internal consultants in these companies. What kind of background and knowledge would an accountant require to be an effective internal consultant?

I-47 Ethics and Accounting Personnel

McMillan Shipping Company has an equal opportunity employment policy. This policy has the full support of the company's president, Rosemary Creighton, and is included in all advertisements for employee positions.

Hiring in the accounting department is done by the controller, D. W. "Butch" Brigham. The assistant controller, Jack Merton, also interviews candidates, but Brigham makes all decisions. In the last year, the department hired 5 new people from a pool of 175 applicants. Thirteen had been interviewed, including four minority candidates. The five hired included three sons of Brigham's close friends and no minorities. Merton had felt that at least two of the minority candidates were very well qualified and that the three sons of Brigham's friends were definitely not among the most qualified.

When Merton questioned Brigham concerning his reservations about the hiring practices, he was told that these decisions were Brigham's and not his, so he should not question them.

1. Explain why Brigham's hiring practices were probably unethical.
2. What should Merton do about this situation?

I-48 Ethical Issues

Suppose you are the controller of a leading natural gas exploration and distribution company. You strictly adhere to the standards of ethical conduct for management accountants. How would those standards affect your behavior in each of the following situations?

1. Your company has previously discontinued the extraction of natural gas at a few sites and is about to sell the property. However, on Friday you receive a geologist's report that a few other spots on the same property have huge natural gas reserves. You are the only one to read the report that day. At a party on Saturday, one of your friends asks you about the prospects for the property.
2. A stock analyst invites you and your spouse to his weekend party. At the party, he offers you a four-day Europe tour at the cost of his company. In return, all that he wants is your company's annual performance figures that the company is going to soon announce to the public.
3. In the AGM scheduled next Friday, the chairman of the company is going to announce the company's plan and prospects for the next fiscal year. You have been entrusted with making a forecast of the company's annual revenue and earnings. You know that some additional losses incurred by your offshore division will be recognized before the company prepares the financial statements for the current period. The CEO of the company has asked you to ignore those losses while making your predictions because a grim forecast of revenue and earnings will displease the financial institutions with whom the company is negotiating a loan agreement that is expected to be completed before the actual earnings are announced.
4. Your company has received a dividend from its investment in some shares of an offshore company. A withholding tax has been deducted on the income before remittance. You are not sure whether income from that foreign source is taxable in your country. You are debating whether to research the tax laws or to simply assume that such income is not taxable as the withholding tax has already been deducted. If the accounts are not audited, no one will know the difference. If they are audited, you can plead ignorance of the law.

I-49 Hundred Best Corporate Citizens

Each year *Corporate Responsibility* magazine publishes its list of the 100 best corporate citizens. The magazine rates companies on performance in seven stakeholder categories: (1) environment, (2) climate change, (3) human rights, (4) employee relations, (5) corporate governance, (6) philanthropy, and (7) financial. In 2011, the top 10 corporate citizens were **Johnson Controls**, **Campbell Soup**, **International Business Machines**, **Bristol-Myers Squibb**, **Mattel**, **3M**, **Accenture**, **Kimberly-Clark**, **Hewlett-Packard**, and **Nike**.

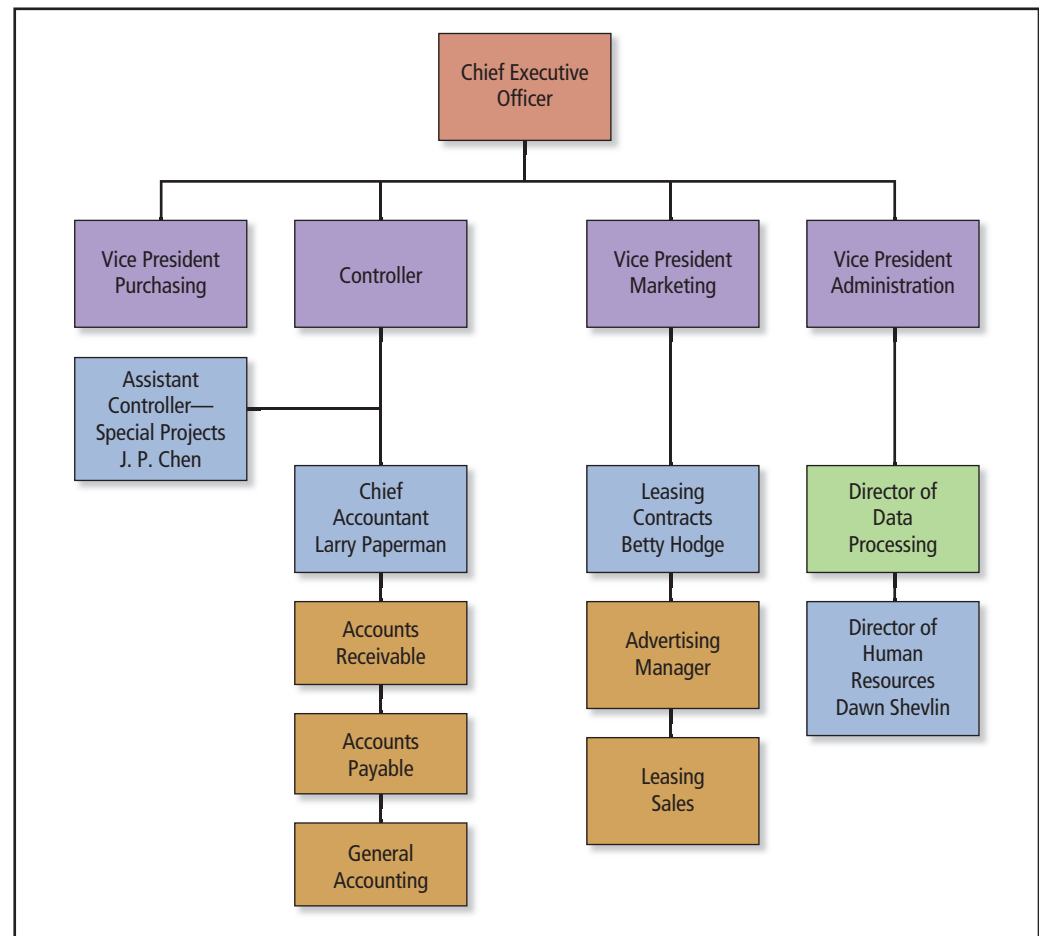
For each of the seven dimensions on which the magazine reported ratings, give a one-sentence description of what you think would make for good corporate citizenship. Based on your knowledge of these 10 companies, however limited that is, predict the top 2 companies in each of the seven rated categories.

CASES

I-50 Line and Staff Authority

Fidelity Leasing Company (FLC) leases office equipment to a variety of customers. The company's organization chart is shown on the following page. The responsibilities of the four positions in blue in the chart are:

- J. P. Chen, Assistant Controller—Special Projects. Chen works on projects assigned to him by the controller. The most recent project was to design a new accounts payable system.
 - Betty Hodge, Leasing Contracts Manager. Hodge coordinates and implements leasing transactions. Her department handles all transactions after the sales department gets a signed contract. This includes requisitioning equipment from the purchasing department, maintaining appropriate insurance, delivering equipment, issuing billing statements, and seeking renewal of leases.
 - Larry Paperman, Chief Accountant. Paperman supervises all the accounting functions. He produces reports for the four supervisors in the functional areas.
 - Dawn Shevlin, Director of Human Resources. Shevlin works with all departments of FLC in hiring personnel. Her department advertises all positions and screens candidates, but the individual departments conduct interviews and make hiring decisions. Shevlin also coordinates employee evaluations and administers the company's salary schedule and fringe benefit program.
1. Distinguish between line and staff positions in an organization and discuss why conflicts might arise between line and staff managers.
 2. For each of the four managers described, identify whether their position is a line or staff position and explain why you classified it that way. Also, indicate any potential conflicts that might arise with other managers in the organization.



Fidelity Leasing Organization Chart

I-51 Professional Ethics and Toxic Waste

Alberta Mining Company extracts and processes a variety of ores and minerals. One of its operations is a coal-cleaning plant that produces toxic wastes. For many years, the wastes have been properly disposed of through Canadian Disposal, an experienced company. However, disposal of the toxic wastes is becoming an economic hardship because increasing government regulations caused the cost of such disposal to quadruple in the last 6 years.

Rachel O'Casey, director of financial reporting for Alberta Mining, was preparing the company's financial statements for the current year. In researching the material needed for preparing a footnote on environmental contingencies, Rachel found the following note scribbled in pencil at the bottom of a memo to the general manager of the coal-cleaning plant. The body of the memo gave details on the increases in the cost of toxic waste disposals:

Ralph—We've got to keep these costs down or we won't meet budget. Can we mix more of these wastes with the shipments of refuse to the Oak Hill landfill? Nobody seems to notice the coal-cleaning fluids when we mix it in well.

Rachel was bothered by the note. She considered ignoring it, pretending that she had not seen it. But after a couple of hours, her conscience would not let her do it. Therefore, she pondered the following three alternative courses of action:

- Seek the advice of her boss, the vice president of finance for Alberta.
 - Anonymously release the information to the local newspaper.
 - Give the information to an outside member of Alberta's board of directors, whom she knew because he lived in her neighborhood.
1. Discuss why Rachel has an ethical responsibility to take some action about her suspicion of the illegal dumping of toxic wastes.
 2. For each of the three alternative courses of action, explain whether the action is appropriate.
 3. Assume that Rachel sought the advice of the vice president of finance and discovered that he both knew about and approved of the dumping of toxic wastes. What steps should she take to resolve the conflict in this situation?

NIKE 10K PROBLEM

I-52 Information in Nike's 10K Report

U.S. companies file 10K reports annually with the SEC. These reports contain the company's annual financial reports and much additional information about the company. Examine Nike's 10K report that is presented in Appendix C. Answer the following questions about Nike:

1. What is Nike's principal business activity?
2. What proportion of Nike revenue comes from sales in the United States? What proportion from other countries? How many retail outlets does Nike have in the United States?
3. Who is Nike's CFO? What is his accounting background?
4. Where does Nike manufacture most of its footwear? What ethical issues might result from this manufacturing philosophy?

EXCEL APPLICATION EXERCISE

I-53 Budgets and Performance Evaluation

Goal: Create an Excel spreadsheet to prepare a performance report, and use the results to answer questions about your findings.

Scenario: Beta Alpha Psi, the accounting honorary fraternity, has asked you to prepare a performance report about a homecoming party that it recently held. The background data for Beta Alpha Psi's performance report appears in the Fundamental Assignment Material 1-A2.

When you have completed your spreadsheet, answer the following questions:

1. Based on the formatting option used in the exercise, do the negative (red) variances represent amounts that are over or under budget?
2. Which cost/costs changed because the number of attendees increased?
3. Did the fraternity stay within the budgeted amount for food on a per person basis?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 1 Decision Guideline
Row 2: Beta Alpha Psi Homecoming Party
Row 3: Performance Report
Row 4: Today's Date
3. Merge and center the date across columns A–D.
4. In row 7, create the following bold-faced, right-justified column headings:
Column B: Budget
Column C: Actual
Column D: Variance
5. In column A, create the following row headings:
Row 8: Room rental
Row 9: Food
Row 10: Entertainment
Row 11: Decorations
Row 12: Total costs
Skip a row.
Row 14: Attendees
Skip a row.
Row 16: Food per person
6. Use the data from Fundamental Assignment Material 1-A2 and enter the budget and actual amounts for room, food, entertainment, decorations, and attendees.
7. Use budget minus actual formulas to generate variances for each of the cost categories.
8. Use the SUM function to generate total costs for the budget, actual, and variance columns.
9. Use a formula to generate the “per person” food amount for the budget and actual columns.
10. Format all amounts as follows:

Number tab:	Category:	Currency
	Decimal places:	0
	Symbol:	None
	Negative numbers:	Red with parentheses

11. Change the format of the food per person amounts to display two decimal places and a dollar symbol.
12. Change the format of the room rental and total cost amounts to display a dollar symbol.
13. Change the format of the total costs data (row 12) to display as bold faced.
14. Change the format of the total costs heading to display as indented:

Alignment tab:	Horizontal:	Left (Indent)
	Indent:	1

15. Save your work, and print a copy for your files.

COLLABORATIVE LEARNING EXERCISE**I-54 The Future Management Accountant**

Students should gather in groups of three to six. One-third of each group should read each of the following articles. (Alternatively, you can do this exercise as a whole class, with one-third of the class reading each article.)

- Roth, R. T., “The CFO’s Great Balancing Act,” *Financial Executive*, July/August 2004, pp. 60–61.
- Johnsson, M., “The Changing Role of the CFO,” *Strategic Finance*, June 2002, pp. 54–57, 67.
- Russell, K., G. Siegel, and C. Kulesza, “Counting More, Counting Less: Transformations in the Management Accounting Profession,” *Strategic Finance*, September 1999, pp. 39–44.

1. Individually, write down the three most important lessons you learned from the article you read.
2. As a group, list all the lessons identified in requirement 1. Combine those that are essentially the same.
3. Prioritize the list you developed in requirement 2 in terms of their importance to someone considering a career in management accounting.
4. Discuss whether this exercise has changed your impression of management accounting and, if so, how your impression has changed.

INTERNET EXERCISE

I-55 International Ethics Standard Board for Accountants (IESBA)

The International Ethics Standard Board for Accountants (IESBA) is an independent standard setting body under the aegis of the International Federation of Accountants (IFAC). It sets high quality, internationally appropriate ethics standards for professional accountants, including auditor independence requirements. The IESBA's long-term objective is convergence of the Code's ethical standards with those issued by regulators and national standard setters. Log on to www.ifac.org the Website for the IFAC and under the Standard-Setting Boards tab, go to IESBA.

1. Click on About IESBA and follow the link Terms of Reference. What is the objective of the IESBA?
2. Go to Membership section within the Terms of Reference link stated above. Discuss the structure of the IESBA?
3. Click on the Standards & Pronouncements link. What is the latest version of IESBA Handbook of the International Code of Ethics for Professional Accountants available? Download and read the code and comment on its importance to professional accountants in managerial positions of a business.

Introduction to Cost Behavior and Cost-Volume-Profit Relationships

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Explain how cost drivers affect cost behavior.
2. Show how changes in cost-driver levels affect variable and fixed costs.
3. Explain step- and mixed-cost behavior.
4. Create a cost-volume-profit (CVP) graph and understand the assumptions behind it.
5. Calculate break-even sales volume expressed in terms of total sales revenue earned and total units produced at break-even.
6. Calculate the sales volume needed to reach a target profit in terms of units produced and in sales revenues earned.
7. Differentiate between contribution margin and gross margin.
8. Explain the effects of sales mix on profits (Appendix 2A).
9. Compute cost-volume-profit (CVP) relationships on an after-tax basis (Appendix 2B).

► AIRBUS

Delivering a record-breaking 863 aircrafts in 2019, European aerospace consortium **Airbus** surpassed American rival **Boeing** to become the world's largest producer of aircrafts. Founded in 1970, the company has grown and evolved over the last 50 years, establishing itself as a pioneer in designing and manufacturing aerospace products and services spanning commercial **aircraft**, helicopters, defense aviation, and space.

Despite earning over €70 billion of revenues in 2019, the company reported a loss for the year. With commercial airlines largely grounded in 2020 and much of 2021 due to the global COVID-19 pandemic and most governments funneling resources into the healthcare sector to combat the spread of the virus, how will Airbus return to profitability?

Consider Airbus' decision to develop the pioneering, full-length double-deck A380 jumbo jet. Large enough to accommodate over 850 passengers, along with onboard amenities including lounge areas as well as private suites with beds and showers, the plane's size and configuration were unprecedented, surpassing Boeing's 747, when it was introduced on the market in 2007. It was estimated that the company spent between €25 and €30 billion to develop the aircraft. With post-pandemic travelers more aware of the health benefits of social distancing and the need to ensure good hygiene in shared spaces, it would seem that the A380 would be the aircraft most able to meet these expectations for space and cleanliness. However, in 2019, the company announced its decision to discontinue the model, with delivery of the last planes produced scheduled for 2022. Bob Lange, Head of market and product strategy, once described the plane as "the most passenger preferred aircraft in the world." Confident that passenger demand would translate into orders from airlines, sales of 1,200 planes were initially forecasted. Ultimately, only 251 A380s were eventually sold, of which 123 were sold to **Emirates**, by far the biggest buyer, followed

by **Singapore Airlines** with 24 in its fleet. No U.S. airline purchased the A380. “In the end, you have to face facts, and we could see that we were building A380s faster than people were ordering them,” said Lange.

What lessons can be learned from the A380 and how can Airbus avoid making similar mistakes in the future? To answer these questions, Airbus must understand not only its own production costs but also the costs that will be incurred by customers and other key stakeholders, such as airports. In the case of the A380, research and development costs far exceeded Airbus’ initial estimates, while high operational costs dampened enthusiasm from airlines and airports. In retrospect, the characteristics of the plane’s biggest buyer, Emirates, illustrates the limited appeal of the aircraft to the broader market. According to an interview with Emirates’ CEO Tim Clark, the company could profitably make use of the A380 because it bought a large fleet, reaping economies of scale in maintenance and crew costs, and because of its strategy as a hub-based, medium and long-haul operator providing high-occupancy flights to busy airports with limited landing slots.

With intense competition from Boeing, Airbus can improve its future profitability by both controlling (reducing) its own costs as well as understanding how the operational costs of its aircraft will impact customers’ profitability and, consequently, their decision whether to buy from Airbus or Boeing.

This chapter begins your study of costs. One of the main goals of management accounting is to help managers understand **cost behavior**—how the activities of an organization affect its costs—as they make crucial decisions about their production and service activities. For example, how much would it cost Boeing to produce each 787? How much cost does **Ryanair** incur when it adds one more passenger at the last moment to an existing flight, or when it adds one more flight to the schedule? What does it cost **Tesla** to develop a new category of electric automobiles, such as lorries? How much does it cost to produce one more Model S? How will an increase in Dublin’s population affect the costs to run the government’s department of transport? What does it cost **Nestlé Purina** to meet **Carrefour**’s specifications for shipments of pet-care products? What activities contribute most to Nestlé Purina’s cost to serve Carrefour stores? These are all specific forms of the general question: What will be the incremental effects if an organization changes its activities? ■

Identifying Activities, Resources, Costs, and Cost Drivers

Different types of costs behave in different ways. Consider the costs of making the Airbus A320, which in 2019 overtook Boeing’s model 737 as the best-selling commercial aircraft. As Airbus produces more airplanes, it buys and uses more resources, such as electrical wire, seats, aluminum, and labor. Therefore, each additional airplane requires Airbus to incur more of these resource costs. In contrast, the cost of other resources such as the factory and salaries of key managers stay the same, regardless of the number of airplanes made. To predict costs for decision making and to control costs on a day-to-day basis, managers at companies such as Airbus managers identify

- key activities performed,
- resources used in performing these activities,
- costs of the resources used, and
- **cost drivers**, measures of activities that require the use of resources and thereby generate costs.

Exhibit 2-1 shows how activities link resources and their costs with the output of products or services. For example, an activity that requires resources and therefore causes costs for Airbus is installing seats. This activity uses many resources, but let’s consider just two: 1) the seats themselves, which Airbus purchases from a subcontractor, and 2) labor for installing the seats. One measure of activity, number of seats installed, is an appropriate cost driver for the cost of the seats. A different measure of activity, labor hours used in installing the seats, is a cost driver for the cost of labor resources.

An organization may have many activities as part of its value chain and many cost drivers for those activities. For example, suppose a pet food manufacturer has a plant with more than 50



Antony Nettle/Alamy Stock Photo

The design and production of an airplane is a complex process. This is an example of the Airbus A380 jumbo jet, which was assembled at the company’s facility in Toulouse, France.

cost behavior

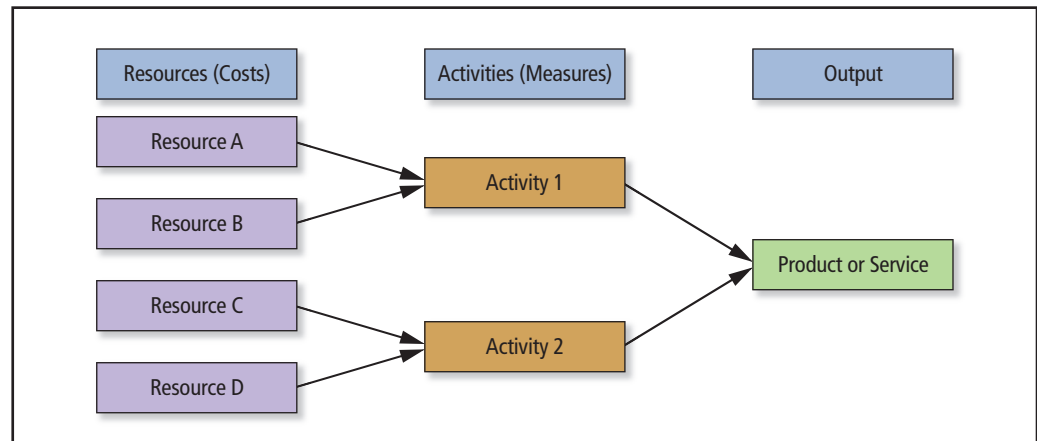
How the activities of an organization affect its costs.

Objective 1

Explain how cost drivers affect cost behavior.

cost driver

A measure of activities that requires the use of resources and thereby generate costs.

**Exhibit 2-1**

Linking Resource Costs to Outputs via Activities

production activities and a total of 21 cost drivers. Exhibit 2-2 lists examples of resource costs and potential cost drivers for activities in each of the value-chain functions. How well we identify the most appropriate cost drivers determines how well managers understand cost behavior and how well managers can control costs.

In this chapter we focus on a simple situation of one activity and one cost driver to produce a particular product or service. The activity includes all aspects of the production and sale of the product or service. The cost driver is the number of units produced and sold, which we assume drives all the resource costs. Therefore, the analysis will examine how decisions about the volume of production or service and volume of sales affect costs. This simplified analysis is useful to managers who want an estimate of the general relationship between production volume and costs.

Value-Chain Functions and Resource Costs	Example Cost Drivers
Research and development - Salaries of sales personnel, costs of market surveys - Salaries of product and process engineers	Number of new product proposals Complexity of proposed products
Design of products, services, and processes - Salaries of product and process engineers - Cost of computer-aided design equipment used to develop prototype of product for testing	Number of engineering hours Number of distinct parts per product
Production - Labor wages - Supervisory salaries - Maintenance wages - Depreciation of plant and machinery, supplies - Energy cost	Labor hours Number of people supervised Number of mechanic hours Number of machine hours Kilowatt hours
Marketing - Cost of advertisements - Salaries of marketing personnel, travel costs, entertainment costs	Number of advertisements Sales revenue
Distribution - Wages of shipping personnel - Transportation costs including depreciation of vehicles and fuel	Labor hours Weight of items delivered
Customer service - Salaries of service personnel - Costs of supplies, travel	Hours spent servicing products Number of service calls

Exhibit 2-2

Examples of Value-Chain Functions, Resource Costs, and Cost Drivers

Variable-Cost and Fixed-Cost Behavior

Accountants classify costs as variable or fixed depending on whether the cost changes with respect to a particular cost driver. A **variable cost** changes in direct proportion to changes in the cost driver. In contrast, changes in the cost driver do not affect a **fixed cost**. Suppose the cost driver is units of goods or services produced. A 10% increase in units produced would result in a 10% increase in total variable costs. However, the fixed costs would remain unchanged.

Consider an example of variable costs for telecommunications giant **T-Mobile**. Suppose the company pays its sales personnel a 10% commission on sales, the total cost of sales to T-Mobile includes the 10% commission—a variable cost with respect to sales revenues. Or suppose that Ara Coffee Roasters packages its organic coffee beans in bags that it buys from a supplier for NZ\$0.10 each. The total cost of packing is a function of the number of bags purchased and, therefore, represents a variable cost. Notice that variable costs do not change per unit of the cost driver, but the total variable costs change in direct proportion to the cost-driver activity.

Now consider an example of a fixed cost. Suppose Amsterdam-based eyewear company **Ace & Tate** leases a factory for €500,000 per year to produce glasses frames. The number of frames produced does not affect the total fixed cost of €500,000. The unit cost of rent applicable to each pair of glasses, however, does depend on the total number of frames produced. If Ace & Tate produces 50,000 frames, the unit cost will be $€500,000 \div 50,000 = €10$. If Ace & Tate produces 100,000 frames, the unit cost will be $€500,000 \div 100,000 = €5$. Therefore, while the fixed cost per-unit of the cost-driver becomes progressively smaller as the volume increases, the total fixed cost does not change with volume.

The term “fixed cost” describes the behavior of cost with respect to the cost driver, but a fixed cost can change due to factors other than changes in the cost driver. For example, heating costs are commonly fixed and do not change with respect to the production volume cost driver. Nonetheless, heating costs change with respect to factors not related to the cost driver, such as changes in the price of oil or electricity, or unusually warm or unusually cold weather.

Pay special attention to the fact that the terms “variable” or “fixed” describe the behavior of the total costs, not the per-unit cost, which has the opposite behavior. Total variable costs increase as the cost driver increases but variable costs per unit remain constant. Total fixed costs remain constant as cost driver activity increases but fixed costs per unit decrease. Exhibit 2-3 summarizes these relationships.

Objective 2

Show how changes in cost-driver levels affect variable and fixed costs.

variable cost

A cost that changes in direct proportion to changes in the cost-driver level.

fixed cost

A cost that is not affected by changes in the cost-driver level.

Making Managerial Decisions

Test your understanding of the distinction between variable and fixed costs by answering the following questions.

1. A producer of premium ice cream uses “liters of ice cream produced” as a cost driver for the production activity. One of the main resources this activity uses is dairy ingredients. Is the cost of dairy ingredients a variable or a fixed cost with respect to production volume?
2. Another resource used by this activity is supervisory salaries. If supervisory salaries do not change with the level of production of ice cream, is the supervisory salaries cost variable or fixed with respect to production volume?

Answer

The way to determine whether the cost of a resource is fixed or variable with respect to a cost driver is to ask the question, “If the level of the cost driver changes, what will happen to the cost?”

If the company increases or decreases its production of ice cream, the cost of dairy ingredients will increase or decrease in proportion to production volume. Thus, the cost of dairy ingredients is a variable cost. If the production of ice cream increases or decreases, supervisory salaries will not change. Thus, the cost of supervisory salaries is a fixed cost.

Exhibit 2-3

Cost Behavior of Fixed and Variable Costs

Type of Cost	If Cost-Driver Level Increases (or Decreases)	
	Total Cost	Cost per Unit*
Fixed costs	No change	Decrease (or increase)
Variable costs	Increase (or decrease)	No change

*Per unit of activity volume, for example, product units, passenger-miles, orders processed, or sales revenue

To plan and control costs, managers focus on the activities required to make, sell, and deliver products or services and the resources needed to support these activities. Consider one of the many activities performed as part of the production function at Airbus' assembly facility in Toulouse—receiving parts that production workers install on an airplane. Managers need to know how the receiving activity affects production costs. For example, how does the increase or decrease in receiving activity affect the lease payment for renting the equipment used to move parts from the receiving area to the production floor? How does it affect the cost of fuel for the moving equipment? Similarly, how does it affect costs of receiving labor, supplies, and other resources?

Consider the behavior of just two of these resource costs, equipment and fuel costs, ignoring other resource costs such as labor and supplies. Suppose equipment costs of €45,000 are fixed and do not vary with increases or decreases in the number of parts received, while fuel cost is a variable cost that increases or decreases by €0.66 with each part received. Exhibit 2-4 shows how these resource costs relate to the receiving activity.

Exhibit 2-5 illustrates the relationship between the receiving activity and resource costs. The equipment costs represent the total fixed lease cost of €45,000. The fuel costs are variable to €0.66 per part received. We can use the descriptions of cost behavior in Exhibits 2-4 and 2-5 to find total fuel and equipment cost at any other level of receiving activity. For example, the total equipment and fuel costs of receiving 30,000 parts is $€45,000 + (30,000 \times €0.66) = €64,800$. Similarly, the total cost of receiving 27,500 parts is $€45,000 + (27,500 \times €0.66) = €63,150$. Notice how we used the respective costs in these calculations. We used the total cost of €45,000 for the fixed equipment lease cost and the unit cost of €0.66 for variable fuel cost.

Exhibit 2-4
Receiving Activity and
Resources Used

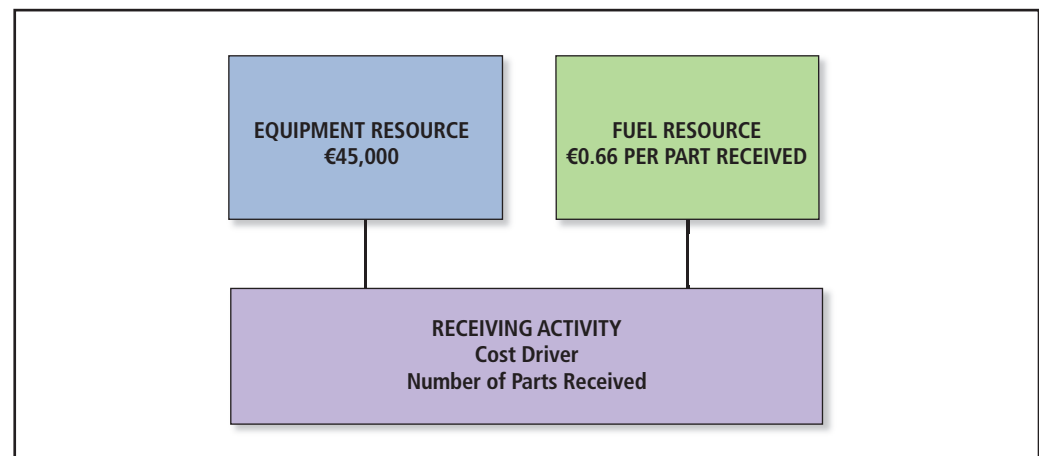
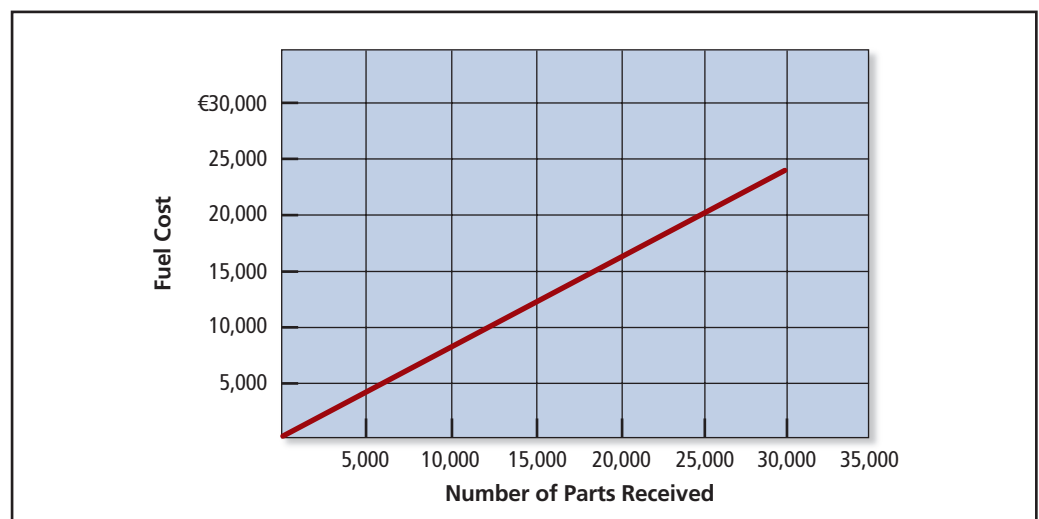


Exhibit 2-5
Total Fuel and Equipment
Lease Costs



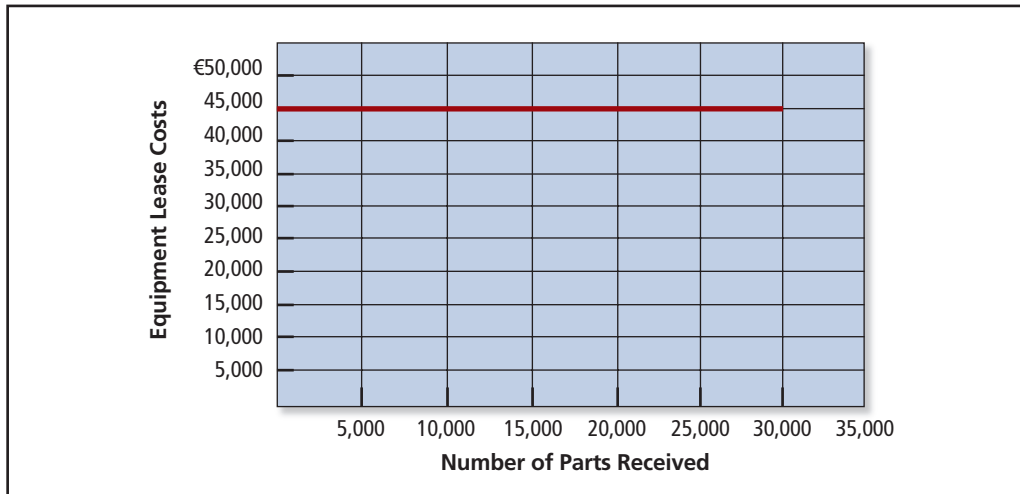


Exhibit 2-5
(continued)

Summary Problem for Your Review

PROBLEM

The manager at the **Airbus** assembly plant in Toulouse is looking at a monthly report of plant costs. He notices that the receiving activity costs vary substantially from month to month and is interested in knowing more about why the total cost and unit cost of the receiving activity change. The number of parts received has ranged from 10,000 to 30,000 parts per month over the last several months.

1. Prepare a table that shows the cost of equipment, the cost of fuel, the total of equipment and fuel costs, and the cost per-part-received for 10,000 to 30,000 parts per month, using increments of 5,000 parts per month.
2. Prepare brief explanations of why the total and unit cost patterns change.

SOLUTION

1. The table can be developed using the relationships shown in Exhibit 2-5.

(1) Parts Received	(2) Equipment Cost	(3) €0.66 × (1) Fuel Cost	(4) (2) + (3) Total Cost	(5) (4) ÷ (1) Cost per Part Received
10,000	€45,000	€6,600	€51,600	€5.16
15,000	45,000	9,900	54,900	3.66
20,000	45,000	13,200	58,200	2.91
25,000	45,000	16,500	61,500	2.46
30,000	45,000	19,800	64,800	2.16

2. Column (4) shows the total cost of the receiving activity, which shows a pattern of increasing total cost. The increase in total cost is less than proportional to the activity cost driver because total cost includes both the fixed cost component from Column (2) as well as the variable cost component from Column (3). For example, a 50% increase in the number of parts received from 10,000 parts to 15,000 parts results in a 50% increase in the variable cost component in column (3) but the total cost in column (4) increases by far less than 50% because the fixed cost in column (2) does not change.

Column (5) shows the cost per part received, which shows a pattern of decreasing cost per part. The decreasing cost per part is entirely due to the fixed equipment cost being spread over increasing numbers of parts received, the cost driver. For example, consider the change in cost per part as the number of parts received increases from 10,000 to 15,000 parts. The fixed cost per part moves from €4.50 at 10,000 parts received ($€45,000 \div 10,000$) to €3.00 at 15,000 parts received ($€45,000 \div 15,000$). The variable cost per part remains constant at €0.66. Thus, the sum of the fixed and variable costs per part in column (5) decreases from €5.16 ($€4.50 + €0.66$) to €3.66 ($€3.00 + €0.66$) due entirely to the decline in the fixed cost per part.

Cost Behavior: Further Considerations

decision context

The circumstances surrounding the decision for which the cost will be incurred.

For a variety of reasons, cost behavior cannot always be accurately described as simply variable or fixed. Cost behavior depends on the **decision context**, the circumstances surrounding the decision for which the cost will be incurred, as illustrated by examples in the discussion that follows. Further, cost behavior also depends on management decisions—management choices determine cost behavior, as explained briefly in the final section of this chapter and in more detail in Chapter 3.

Complicating Factors for Fixed and Variable Costs

In this section, we illustrate and explain some of the factors that complicate cost behavior for fixed and variable costs.

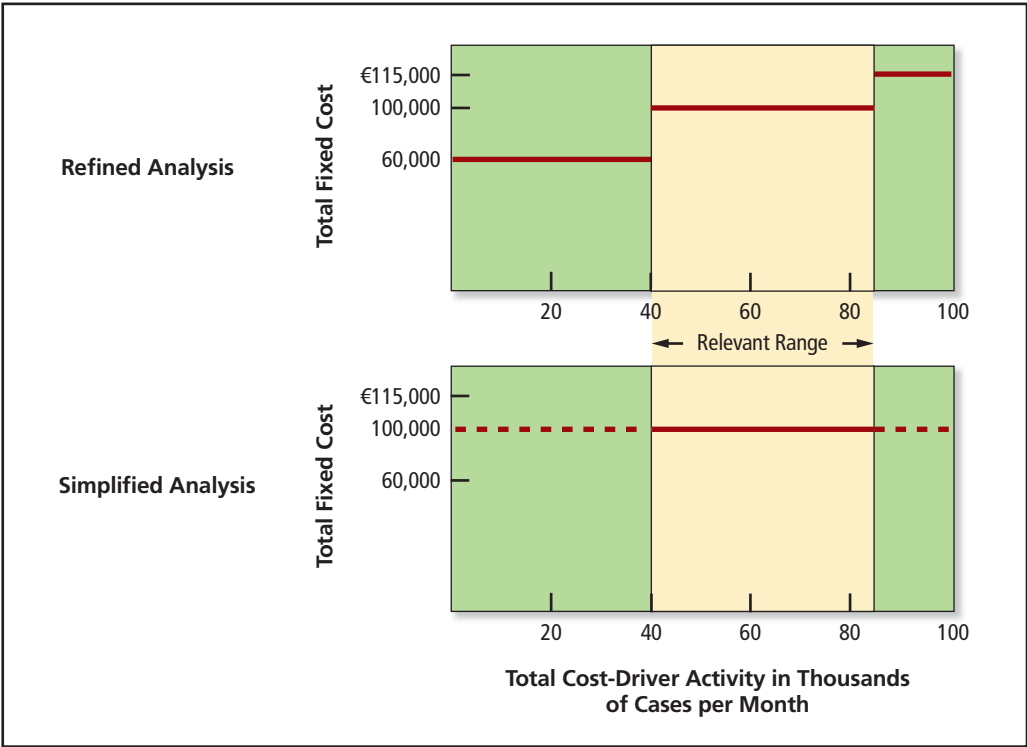
relevant range

The limits of the cost-driver level within which a specific relationship between costs and the cost driver is valid.

FIXED COSTS Although we described fixed costs as unchanging regardless of changes in the cost driver, this description holds true only within limits. For example, the costs for leasing a building to house manufacturing operations are generally fixed within a limited range of activity but may rise if activity increases enough to require leasing additional space or may decline if activity decreases so much that it allows the company to rent less space or relocate to smaller premises. The **relevant range** is the limits of the cost-driver level within which a specific relationship between costs and the cost driver is valid.

Consider **Osram Licht AG**, a photonics company headquartered in Munich, Germany. Suppose that total monthly fixed costs are €100,000 for an Osram lightbulb plant if production is between 40,000 and 85,000 cases of lightbulbs per month. However, if production falls below 40,000 cases, changes in production processes will slash fixed costs to €60,000 per month. On the other hand, if production exceeds 85,000 cases, leasing of additional facilities will raise fixed costs to €115,000 per month. Exhibit 2-6 graphs these assumptions about cost behavior. The top figure shows a refined analysis that reflects all the complexities described previously. The bottom figure shows a simplified analysis that focuses only on the cost in the relevant range, ignoring the issue of cost behavior outside the relevant range. Within the relevant range highlighted in yellow, the refined and simplified analyses coincide. However, the refined description at the top of Exhibit 2-6 explicitly shows the leasing costs at the levels of activity outside the relevant range. The simplified description at the bottom of the exhibit shows only the leasing costs for the relevant range and uses a dashed line outside the relevant range to remind the user that the graphed cost is outside the limits of the relevant range.

Exhibit 2-6
Fixed Costs and Relevant Range



As a decision maker, it is essential to recognize when your decision will move outside the relevant range. In that case, it is essential that you obtain the information included in the refined analysis, showing how costs behave outside the relevant range.

VARIABLE COSTS The idea of a relevant range is obviously important for fixed costs, but a corresponding issue may also arise for variable costs. For example, if Osram obtains volume discounts for purchasing larger quantities of input materials such as glass and tungsten, the materials cost per case for the Osram lightbulb plant would be lower, and the slope of the variable cost function would become flatter, at higher levels of production. As another example, labor cost per case will decrease at higher levels of production if expansion to achieve higher levels of production results in a new production process with higher labor efficiency. When costs vary with changes in the cost driver but not in direct proportion to the change in the cost driver, the variable cost function does not produce a straight-line graph.

Step- and Mixed-Cost Behavior Patterns

Some costs are neither purely fixed nor purely variable. For example, two types of costs that combine characteristics of both fixed- and variable-cost behavior are step costs and mixed costs.

STEP COSTS Costs that change abruptly at different levels of activity because the resources are available only in indivisible chunks are **step costs**. For decisions where the range of activity is limited to a single step of the cost function, we consider the cost a fixed cost. For decisions where the range of activity encompasses many steps, the cost behaves more like a variable cost.

Panel A of Exhibit 2-7 illustrates a decision where a step cost could be treated as a fixed cost. In this example, when oil and gas exploration activity reaches a certain level, the company must lease an additional rig. Each additional rig leased defines a new step in the cost function, which supports a new, higher volume of exploration activity. This step cost behaves as a fixed cost as long as all the decision alternatives remain within the relevant range of a single step, such as within the highlighted relevant range of the second step in the cost function shown in Panel A of Exhibit 2-7.

Panel B of Exhibit 2-7 illustrates a decision where a step cost could be treated as a variable cost. The cost function shows the wage cost of cashiers at a supermarket where the individual cost steps are uniform. Each cashier can serve an average of 20 shoppers per hour. In a decision about staffing, where the number of shoppers is expected to range from 40 per hour to 440 per hour, the required number of cashiers to match the number of shoppers would range between 2 and 22. Because the range of the number of shoppers in this decision spans a large number of equal-sized steps, this step cost behaves much like a variable cost, and for this decision there is only a small loss of accuracy when we assume the step cost is variable.

Objective 3

Explain step- and mixed-cost behavior.

step cost

A cost that changes abruptly at different intervals of activity because the resources and their costs come in indivisible chunks.

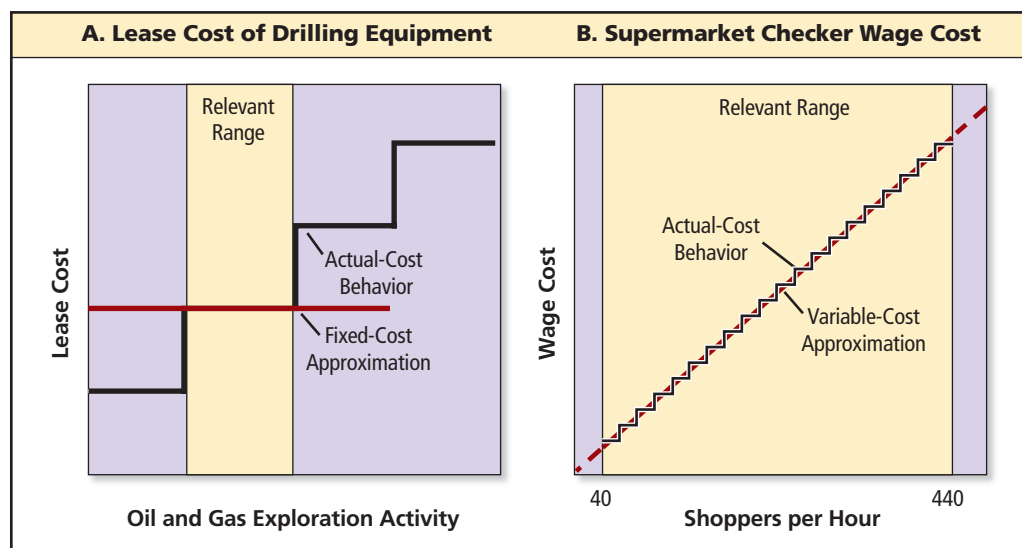


Exhibit 2-7

Step-Cost Behavior

Note that the decision context dictates whether a step cost can be treated as fixed or variable. For example, in the cashier staffing example, suppose we are deciding whether to implement a promotional offer expected to attract 5 more shoppers per hour during mid- afternoon when there are currently about 70 shoppers per hour. Because this decision will not span more than one step in the cashier cost function, for this decision we can assume cashier wages are a fixed cost.

mixed cost

A cost that contains elements of both fixed- and variable-cost behavior.

MIXED COSTS Many costs are **mixed costs**, which contain elements of both fixed- and variable-cost behavior. The fixed-cost element is unchanged over the relevant range of activity levels while the variable-cost element of the mixed cost varies proportionately with cost-driver activity. You might think of the fixed cost element as the cost of creating the capacity to operate and the variable cost element as the additional cost of actually using that capacity.

For example, the cost of providing diagnostic imaging services at the **American Hospital of Paris** is a mixed cost. There is a substantial fixed cost of having expensive imaging equipment available and ready for use. There is also a variable cost associated with actual use of the equipment, such as the costs of power, technicians to operate the equipment, and physicians to interpret the results. As another example, the cost of running an evening dinner cruise on the Seine River in Paris is a mixed cost. There is a fixed cost of having the boat and crew available to travel along the river. There is also a variable cost of having service staff, food, and beverages to match the number of passengers on the cruise.

Effect of Time Horizon and Magnitude on Cost Behavior

Whether costs behave as fixed or variable often depends on the time frame affected by a decision and on the magnitude of the change in cost-driver activity. For long time spans or large changes in activity level, more costs behave as variable. For short time spans or small changes in activity level, more costs behave as fixed. The preceding discussion of step costs shows how cashier wage costs can be variable in large magnitude decisions about staffing but fixed in small magnitude decisions.

To illustrate the effects of time horizon, suppose a **Transavia** plane with several empty seats is scheduled to depart from its gate. A potential passenger is running down a corridor bearing a transferable ticket from a competing airline. Unless the gate attendant holds the airplane for an extra 2 minutes, the passenger will miss the departure and will not switch to Transavia for the planned trip. What are the variable costs in the gate agent's decision whether to delay the departure and place one more passenger in an otherwise empty seat? Virtually all the costs in this situation are fixed. The number of passenger meals carried on the flight will not change at the last moment, and the flight crew salaries and maintenance costs will not change. Only the cost of jet fuel will change, but this change will be relatively small, and the additional fuel used when one more passenger is added is far less than proportional to the increase in the number of passengers. This is a decision that has a short time horizon, a small change in the cost driver (number of passengers), and therefore mainly fixed costs.

Now consider decisions that Transavia makes that involve longer time horizons and larger magnitudes, such as the decision whether to temporarily add a few extra flights to serve the city hosting the FIFA World Cup tournament. In this longer term and larger magnitude decision, many more costs are variable with respect to the relevant cost driver and fewer costs are fixed. Fuel costs and the salaries of the flight and maintenance crews now vary with respect to the number of flights, and meal costs vary with respect to the number of passengers.

Summary

Many costs cannot accurately be described as simply fixed or variable. Several factors make the behavior of these costs more complex. First, cost behavior sometimes differs across different ranges of activity, and it is important to always consider whether the assumptions about cost behavior apply in the relevant range for your decision. Second, different cost drivers sometimes apply to different components of cost, as in the Transavia flight cost example. Further, sometimes multiple cost drivers apply simultaneously to the same cost. For example, labor costs at an **Amazon.com** warehouse are driven by package weight, package volume, and the number of packages handled. Third, cost behavior depends on the decision context. Whether costs are “fixed” or “variable” or “step” or “mixed” depends on the relevant range, the time horizon and magnitude of the decision, and other characteristics of the context. It is essential that you understand and evaluate the effects of decision context on cost behavior as you make decisions.

Cost-Volume-Profit Analysis

For the remainder of this chapter, we consider only decisions where costs are fixed, variable, or mixed. The models developed assume the fixed cost components of cost do not change with the cost driver and the variable cost components change in direct proportion to a single cost driver. These models serve as useful starting points in decisions where the assumptions do not hold exactly but are reasonable approximations. For example, the models apply to step costs where the decision spans a large enough number of steps and the steps in the cost function are proportional to the cost driver so that the steps can be reasonably approximated as a variable cost.

Consider situations where managers are trying to evaluate the effects of changes in the volume of goods or services produced. For example, managers might be interested in upward changes such as increased sales expected from increases in promotion or advertising. On the other hand, managers might be interested in downward changes such as decreased sales expected due to a new competitor entering the market or due to a decline in economic conditions. While such changes in volume have many effects, managers are always interested in the relationship between volume and revenue (sales), expenses (costs), and net income (net profit). We call this **cost-volume-profit (CVP) analysis**.

CVP Scenario

Miranda Hobbema, the manager of food and beverage services for a major European airport, is trying to decide whether or not to rent a line of new snack vending machines that would enable international travelers to pay with foreign debit cards and mobile banking apps. The vending machines would be placed throughout the airport. Although individual snack items have various acquisition costs and selling prices, Miranda has determined that an average selling price of €1.50 per unit and an average acquisition cost of €1.20 per unit will suffice for purposes of this analysis. She predicts the following revenue and expense relationships:

	Per Unit	Percentage of Sales
Selling price	€ 1.50	100%
Variable cost of each item	1.20	80
Selling price less variable cost	<u>€ 0.30</u>	<u>20%</u>
Monthly fixed expenses		
Rent	€ 3,000	
Wages for replenishing and servicing	13,500	
Other fixed expenses	<u>1,500</u>	
Total fixed expenses per month	<u>€18,000</u>	

Graphing the CVP Relationship

Exhibit 2-8 is a graph of the cost-volume-profit relationship in our vending machine example. Most students find it easiest to begin the study of CVP relationships with graphs. After introducing the relationships with a graph, we will turn to equations that describe the same CVP concepts. The equations are usually the better way to find the quantitative answer to a specific question. On the other hand, when you need to explain a CVP model to an audience, graphs more quickly convey the break-even point and more easily show profits expected over a range of volume.

As you read the following procedure for constructing the graph, visualize the revenues and costs that correspond to the points and lines you are plotting.

1. Draw the axes. The horizontal axis is sales volume and the vertical axis is euros of cost and revenue.
2. Plot revenue. Select a convenient value at the upper end of the relevant range for sales volume, say, 100,000 units, and plot point A for total sales euros at that volume: $100,000 \times €1.50 = €150,000$. Draw the revenue line from the origin (the point corresponding to €0 and 0 units) to point A.
3. Plot fixed costs. Draw the horizontal line showing the €18,000 fixed portion of cost. The point where the horizontal fixed cost line intersects the vertical axis is point B.

cost-volume-profit (CVP) analysis

The study of the effects of output volume on revenue (sales), expenses (costs), and net income (net profit).

Objective 4

Create a cost-volume-profit (CVP) graph and understand the assumptions behind it.

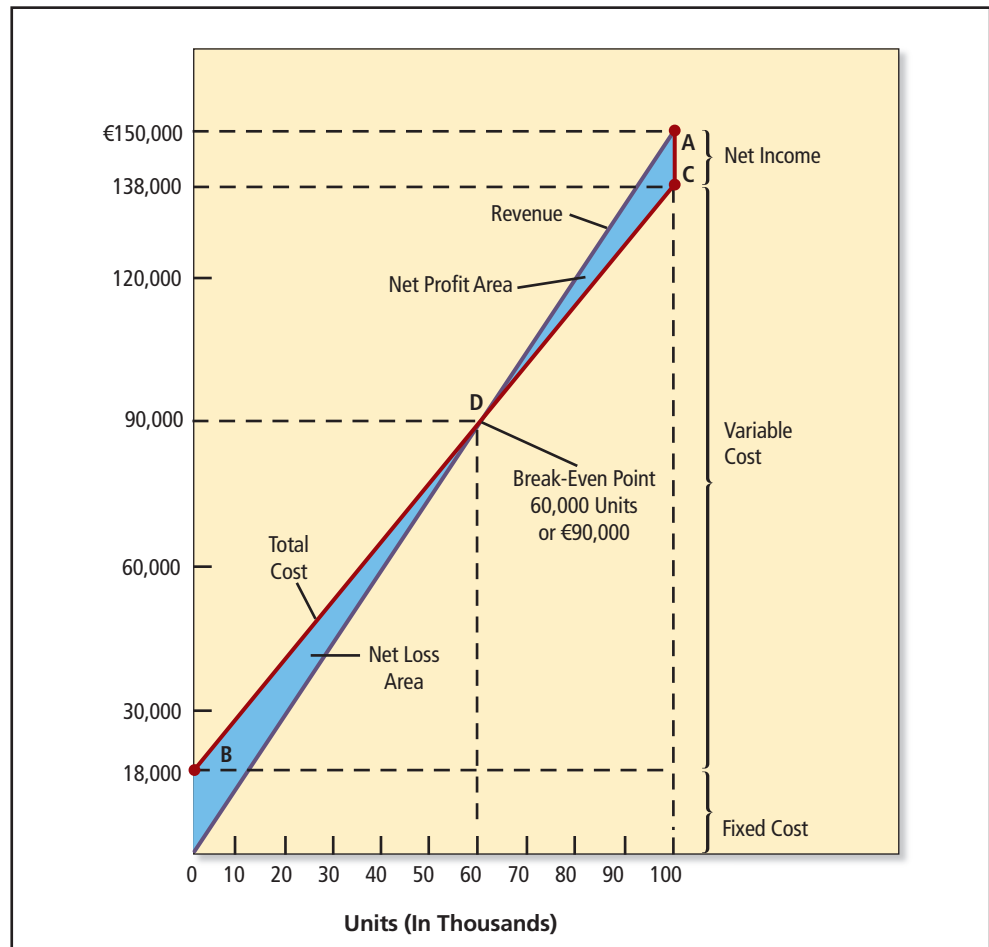


Exhibit 2-8
Cost-Volume-Profit (CVP) Graph

break-even point

The level of sales at which revenue equals total cost and net income is zero.

- Plot fixed costs plus variable costs. Determine the variable portion of cost at the volume you used to plot point A: $100,000 \text{ units} \times €1.20 = €120,000$. Plot point C, the fixed plus variable costs for 100,000 units, $€18,000 + €120,000 = €138,000$. Then draw a line between this point and point B, the fixed plus variable costs for 0 units, $€18,000 + €0 = €18,000$. This line shows the total cost (fixed cost plus variable cost) at volumes between 0 and 100,000 units.
- Locate the **break-even point**—the volume of sales at which revenue equals total cost and therefore income is zero. Graphically, this is the point at 60,000 units where the sales revenue line and the total cost line cross. At 60,000 units, total revenue ($60,000 \times €1.50 = €90,000$) is equal to total cost ($[60,000 \times €1.20] + €18,000 = €90,000$). On the graph, the break-even point is labeled point D.

CVP analysis is sometimes also referred to as break-even analysis. However, this term is misleading. Why? Because CVP analysis reveals more than just the break-even point. At any volume of activity, the vertical distance between the revenue line and the total cost line represents the profit or loss at that volume.

Throughout the remainder of the book, we will see that CVP analysis plays an important role in management decision making and in planning for the effects of changes in competitive and economic conditions on sales, costs, and net income. The business press frequently discusses break-even points, especially during economic downturns. The Business First box on p. 65 describes the importance of break-even analysis for some hotel and auto-industry firms during the global COVID-19 pandemic.

Hotels and Auto Makers Cut Costs, Lower Break-Even Point During Global Pandemic

The COVID-19 pandemic that began in late 2019 caused many countries to prohibit travel, both international and domestic, and issue strict shelter-in-place policies on their residents well into 2021. From services to manufacturing, many industries were negatively impacted. Faced with a rapid and severe decline in sales, managers accustomed to thinking in terms of profit maximization quickly shifted their focus to simply breaking even. The hotel and the automobile industries offer insightful examples.

Consider the hotel industry. When hotels are closed to guests, they still incur many fixed costs, such as depreciation expenses, property taxes, insurance, debt servicing expenses, and some utilities. In addition, the nature of the pandemic resulted in a need to comply with new, stricter standards for hygiene, which led to an increase in variable costs for cleaning guest rooms and common areas such as the lobby and elevators. Unlike the 2008 recession, which saw many hotels reduce their room rates to stimulate demand, low demand during the pandemic was due to regulatory restrictions on travel, so the focus this time around was on cost management. Consequently, “hotels were forced to significantly reduce expenses, including labor, which lowered the break-even point—the percentage of occupancy required for a property to remain open and not lose money.” In other words, hoteliers needed to determine the break-even occupancy rate that would sustain hotel operations. An analysis conducted by a leading industry consultancy noted that, “after years and quarters of positive profit gain for hotels, COVID-19 has forced hoteliers to think differently and consider break-even modeling.” Given the uncertain outlook for travel and tourism, “COVID-19 has made breaking-even more tolerable than the alternative—going broke.”

Much like the hotel industry, the pandemic’s impact on the automobile industry was unprecedented. In its coverage of the early phase of the pandemic, German news outlet **Deutsche Welle** (DW) reported that the pandemic had wreaked havoc on the global automobile industry, with carmakers halting production and dealerships closing as countries went into lockdown. According to the European Automobile Manufacturers Association (ACEA), “the first full month with COVID-19 restrictions in place resulted in the strongest monthly drop in car demand since records began,” with EU automotive sales plummeting by 76% in April. In Spain and Italy, that number was closer to 97%. DW reported that “Germany’s **Volkswagen Group**, which also owns Audi, Porsche, and Skoda, amongst other brands, said their sales in Europe fell by 61% in April.” Faced with the need to cut costs to breakeven at a lower sales volume, the company announced plans to reduce variable costs for materials by 7% and to reduce fixed costs by 5% by 2023 in its 2020 annual report.

The global pandemic has challenged companies to reduce both fixed costs and variable costs to breakeven and eventually return to profitability.

Sources: R. McCune, “Hotels Cut Expenses to Lower Break-Even Occupancy Ratio,” *Hotel News Now*, April 12, 2021; D. Eisen and L. Resco, “Analysis: At What Occupancy Rate Can a Hotel Break-even?” <https://www.hotstats.com>, May 13, 2020; “Coronavirus Pandemic Fuels Comeback of Cars,” <https://www.dw.com/>, June 10, 2020; “EU Car Sales Sink to Record-low Levels,” <https://www.dw.com/>, May 19, 2020; “The Future on Hand: Annual Report 2020,” <https://annualreport2020.volkswagenag.com/>; “Volkswagen Group Closes 2020 Stronger than Expected and Accelerates Transformation,” <https://www.volkswagenag.com/>, February 26, 2021.

It is important to remember that CVP analysis is based on a set of important assumptions. Some of these assumptions follow:

1. We can classify costs into variable and fixed categories. The variable costs vary in direct proportion to activity level. Fixed costs do not change with activity level.
2. We expect no change in costs due to changes in efficiency or productivity.
3. The behavior of revenues and costs is linear over the relevant range. This means that selling prices per unit and variable costs per unit do not change with the level of sales. Note that almost all break-even graphs show revenue and cost lines extending back to the vertical axis as shown in Exhibit 2-8. As illustrated by the earlier discussion of Exhibits 2-6 and 2-7, this approach is misleading in cases where the relevant range does not extend all the way back to zero volume.
4. In multiproduct companies, the sales mix remains constant. The **sales mix** is the relative proportions or combinations of quantities of different products that constitute total sales. (See Appendix 2A for more on sales mixes.)
5. The inventory level does not change significantly during the period. That is, the number of units sold equals the number of units produced.

sales mix

The relative proportions or combinations of quantities of products that constitute total sales.

Computing the Break-Even Point

We next illustrate how to compute the break-even point using an equation that describes the CVP relationship. The discussion begins with the general approach, and then moves to a method that focuses on the contribution margin, which often leads more quickly to solutions.

Objective 5

Calculate break-even sales volume in total dollars and total units.

GENERAL EQUATION APPROACH We begin with a general approach that you can adapt to any conceivable cost-volume-profit situation. You are familiar with a typical income statement. We can express an income statement in equation form as follows:

$$\text{sales} - \text{variable expenses} - \text{fixed expenses} = \text{net income} \quad (1)$$

That is,

$$\left(\frac{\text{unit sales}}{\text{price}} \times \frac{\text{number of}}{\text{units sold}} \right) - \left(\frac{\text{unit}}{\text{variable cost}} \times \frac{\text{number of}}{\text{units sold}} \right) - \frac{\text{fixed}}{\text{expenses}} = \frac{\text{net}}{\text{income}}$$

To find the break-even point, set net income on the right-hand-side of the equation to zero:

$$\text{sales} - \text{variable expenses} - \text{fixed expenses} = 0$$

Let N = number of units to be sold to break even. Then, for the vending machine example,

$$€1.50 N - €1.20 N - €18,000 = 0$$

$$€0.30 N = €18,000$$

$$N = €18,000 \div €0.30$$

$$N = 60,000 \text{ units}$$

To express the break-even point in terms of sales revenue rather than number of units sold, multiply the number of units (60,000) by the selling price per unit (€1.50) to find the break-even point expressed in terms of the sales revenue of €90,000.

CONTRIBUTION-MARGIN METHOD The general equation can also be reformulated in terms of the **unit contribution margin** or **marginal income per unit** that every unit sold generates, which is the unit sales price minus the variable cost per unit. For the vending machine snack items, the unit contribution margin is €0.30:

unit contribution margin (marginal income per unit)

The sales price per unit minus
the variable cost per unit.

Unit sales price	€1.50
– Unit variable cost	<u>1.20</u>
= Unit contribution margin	€0.30

total contribution margin

Total number of units sold times
the unit contribution margin.

variable-cost percentage

Total variable costs divided by
total sales revenue multiplied by
100.

contribution-margin percentage

Total contribution margin
divided by total sales revenue
multiplied by 100 or 100%
minus the variable cost percentage.

variable-cost ratio

The ratio of variable cost per
unit to sales price per unit or
total variable cost to totals sales
revenue.

contribution-margin ratio

The ratio of contribution margin
per unit to sales price per unit or
total contribution margin to total
sales revenue.

When do we reach the break-even point? When we sell enough units to generate a **total contribution margin** (total number of units sold $\times$ unit contribution margin) that is sufficient to cover the total fixed costs. Think about the contribution margin of the snack items. Each unit sold generates extra revenue of €1.50 and extra cost of €1.20. Fixed costs are unaffected. If we sell zero units, we incur a loss equal to the fixed cost of €18,000. Each additional unit sold reduces the loss by €0.30 until sales reach the break-even point. After that point, each unit sold adds (or contributes) €0.30 to profit.

To find the break-even number of units, divide the fixed costs of €18,000 by the unit contribution margin of €0.30. The number of units that we must sell to break even is $€18,000 \div €0.30 = 60,000$ units. The sales revenue at the break-even point is $60,000 \text{ units} \times €1.50 \text{ per unit}$, or €90,000.

Instead of using per unit variable costs and contribution margins, it is sometimes more convenient to use percentages. The variable cost percentage and the contribution margin percentage can be computed using either total or per unit costs:

$$\text{Variable-cost percentage} = \text{total variable costs} \div \text{total sales revenue} \times 100$$

$$= \text{variable cost per unit} \div \text{sales price per unit} \times 100$$

$$\text{Contribution-margin percentage} = \text{total contribution margin} \div \text{total sales revenue}$$

$$= \text{contribution margin per unit} \div \text{sales price per unit}$$

Note that the contribution-margin percentage = $100\% - \text{variable cost percentage}$. We can also express these percentages as ratios, the **variable-cost ratio** and **contribution-margin ratio**.

Now let's solve for break-even sales in euros in our vending machine example without computing the unit break-even point by using the contribution-margin ratio or percentage:

$$\text{contribution margin ratio or percentage} = \frac{\text{contribution margin per unit}}{\text{sales price per unit}} = \frac{€0.30}{€1.50} = 0.20 \text{ or } 20\%$$

Let S = sales revenue needed to break even. Then variable expenses = $0.80S$. Setting the right-hand-side of equation (1) to the break-even level of net income (zero),

$$\text{sales} - \text{variable expenses} - \text{fixed costs} = 0$$

$$S - 0.80S - \text{€}18,000 = 0$$

$$0.20S = \text{€}18,000$$

$$S = \text{€}18,000 \div 0.20$$

$$S = \text{€}90,000$$

The 20% contribution-margin ratio or percentage implies that €0.20 of each euro of the sales revenue is available for the recovery of fixed costs. Thus, we need $\text{€}18,000 \div 0.20 = \text{€}90,000$ of sales to break even. The condensed income statement at the break-even point is

	Total	Per Unit	Percentage
Units	<u>60,000</u>		
Sales	€90,000	€1.50	100%
Variable costs	<u>72,000</u>	<u>1.20</u>	<u>80</u>
Contribution margin*	€18,000	<u>€0.30</u>	<u>20%</u>
Fixed costs	<u>18,000</u>		
Net income	<u>€ 0</u>		

*Sales less variable costs

The preceding income statement shows three different ways the term **contribution margin** can be used. The term can refer to total contribution margin (€18,000), unit contribution margin (€0.30 per unit), or contribution-margin ratio or percentage (0.20 or 20%). The context generally makes it clear which meaning is intended.

The contribution margin method is often used to evaluate the overall effect of changes in volume for companies that sell multiple products with different unit prices and different unit variable costs. You can use the preceding formula to assess the effect of a change in euro volume of sales. For example, you can use the formula to assess the effect of an increase in euro sales for a grocery store selling hundreds of products at many different prices assuming that the variable-cost percentage stays the same. Note that the variable-cost percentage might change if the sales mix changes, an issue that we discuss further in Appendix 2A.

RELATIONSHIP BETWEEN THE TWO METHODS The contribution-margin method is a specific version of the general equation method. Look at the last three lines in the two solutions given for equation (1). They read

Break-Even Volume	
Units	Euros
€0.30N = €18,000	0.20S = €18,000
N = <u>€18,000</u>	S = <u>€18,000</u>
€0.30	0.20
N = 60,000 units	S = €90,000

From these equations, we can derive the following shortcut formulas:

$$\text{Break-even sales volume in units} = \frac{\text{fixed costs}}{\text{unit contribution margin}} \quad (2)$$

$$\text{Sales revenue at break-even volume} = \frac{\text{fixed costs}}{\text{contribution-margin ratio}} \quad (3)$$

Should you use the general equation method or the contribution-margin method? Use whichever is easier for you to understand or apply to a particular case. Both yield the same results, so the choice is a matter of personal preference.

contribution margin

A term used for either total contribution margin, unit contribution margin, or contribution margin percentage.

Making Managerial Decisions

Managers use CVP analysis to predict the effect of changes in sales or costs on the break-even point. Using shortcut formulas and (3), answer the following questions. Remember that the contribution margin per unit equals the sales price per unit minus the variable costs per unit.

1. What would be the effect on the unit and currency break-even level if fixed costs increase (and there are no other changes)?
2. What would be the effect on the unit and currency break-even level if variable cost per unit decreases (and there are no other changes)?
3. What would be the effect on the unit and currency break-even level if sales volume increases? (Think carefully before answering this question.)

Answer

1. The break-even level in both units and sales would increase if fixed costs increase.
2. The break-even level in both units and sales would decrease if variable cost per unit decreases.
3. The actual (or even planned) volume of sales in units has nothing to do with determining the break-even point. This is why unit sales volume does not appear in either equation (2) or (3).

Effects of Changes in Fixed Expenses or Contribution Margin

In addition to determining profit at various volume levels, we can use CVP to examine the effects of changes in fixed costs, variable costs, or selling prices.

CHANGES IN FIXED EXPENSES Changes in fixed expenses cause changes in the break-even point. For example, if we double the €3,000 monthly rent of the vending machines, what is the monthly break-even point in number of units and sales in euros?

The fixed expenses increase from €18,000 to €21,000, so

$$\begin{aligned}\text{break-even volume in units} &= \frac{\text{fixed expenses}}{\text{unit contribution margin}} \\ &= \frac{€21,000}{€0.30} \\ &= 70,000 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{sales revenue} &= \frac{\text{fixed expenses}}{\text{contribution-margin ratio}} \\ &= \frac{€21,000}{0.20} \\ &= €105,000\end{aligned}$$

Note that a one-sixth increase in fixed expenses increases the break-even point by one-sixth, from 60,000 to 70,000 units and from €90,000 to €105,000. This type of relationship always exists between fixed expenses and the break-even point, assuming everything else remains constant.

Companies frequently lower their break-even points by reducing their total fixed costs. For example, when demand for cars fell because of the slumping economy in 2008 and 2009, the “Big Three” auto companies in the United States closed factories to decrease fixed costs such as property taxes, insurance, depreciation, and managers’ salaries. If they had merely produced fewer cars and trucks with the same fixed costs, their volume would have fallen below the break-even point. By reducing fixed costs, the companies lowered their break-even points and reduced their losses.

CHANGES IN UNIT CONTRIBUTION MARGIN Companies can also reduce their break-even points by increasing their unit contribution margins, by either increasing unit sales prices or decreasing unit variable costs, or both.

For example, assume the fixed costs for the vending machine example remain at €18,000. (1) If Miranda increases the selling price from €1.50 to €1.60 per unit and the original variable costs per unit are unchanged at €1.20 per unit, find the monthly break-even point in number of units and in sales in euros. (2) If Miranda reduces variable costs per unit by €0.10 per unit and the selling price remains unchanged at €1.50 per unit, find the monthly break-even point in number of units and in sales in euros.

Here's what happens to the break-even point:

1. If Miranda increases the selling price from €1.50 to €1.60 per unit and the original variable expenses are unchanged, the unit contribution margin would increase from €1.50 – €1.20 = €0.30 to €1.60 – €1.20 = €0.40, and the break-even point would fall to €18,000 ÷ €0.40 = 45,000 units. The break-even point in euros would also change because of the selling price per unit and contribution-margin ratio change. The contribution-margin ratio would be €0.40 ÷ €1.60 = 0.25. The break-even point in euros would be 45,000 units × €1.60 = €72,000 or, using the formula,

$$\text{break-even volume in euros} = \frac{\text{€18,000}}{0.25} = \text{€72,000}$$

2. The variable expenses decrease from €1.20 to €1.10 per unit, the unit contribution margin increases from €0.30 to €0.40, and the contribution-margin ratio become €0.40 ÷ €1.50 = 0.26667. The original fixed expenses of €18,000 would stay the same, but the denominators would change from those previously used. Thus,

$$\begin{aligned}\text{break-even point in units} &= \frac{\text{€18,000}}{\text{€0.40}} = 45,000 \text{ units} \\ \text{break-even point in euros} &= \frac{\text{€18,000}}{0.26667} = \text{€67,500}\end{aligned}$$

Note that the break-even point in units in (2) is the same as the break-even point in units in (1), because both examples have the same fixed costs and the same contribution margin. However, the break-even points in euros differ because the selling prices per unit differ.

You can see that small percentage changes in price or variable costs can lead to large percentage changes in the unit contribution margin and, hence, to large changes in the break-even point.

Target Net Profit and an Incremental Approach

Managers also use CVP analysis to determine the sales volume needed to reach a target profit. For example, in our vending example, suppose Miranda considers €1,440 per month the minimum acceptable net income. How many units will she have to sell to justify the adoption of the vending machine plan? How does the number of units “translate” into euro sales?

To compute the target sales volume in units needed to meet the desired or target net income, we adapt the general approach (equation (1) on p. 66) by setting profit on the right-hand side to the target net income:

$$\text{target sales} - \text{variable expenses} - \text{fixed expenses} = \text{target net income} \quad (4)$$

or

$$\begin{aligned}\text{target sales volume in units} &= \frac{\text{fixed expenses} + \text{target net income}}{\text{unit contribution margin}} \\ &= \frac{\text{€18,000} + \text{€1,440}}{0.30} = 64,800 \text{ units}\end{aligned} \quad (5)$$

The only real difference from the normal break-even analysis is that we are solving for a target net income of €1,440 instead of a target of €0, which is the definition of break-even net income.

Another way of finding the volume required to achieve a target level of net income is to start with the break-even point and adopt an incremental approach. The phrase **incremental effect** refers to the change in total results (such as revenue, expenses, or income) under a new condition in comparison with some given or known condition. In this case, the known condition is the 60,000-unit break-even point. The change or increment in net income for every unit of sales beyond 60,000 is the unit contribution margin of €1.50 – €1.20 = €0.30. The incremental volume required to generate incremental profit of €1,440 is €1,440 ÷ €0.30 = 4,800 units. Thus, the volume required to achieve target profit of €1,440 must exceed the break-even volume by 4,800 units; it would therefore be 60,000 + 4,800 = 64,800 units. Multiply 64,800 units by sales price of €1.50 per unit to get the volume in euro sales, €97,200.

Objective 6

Calculate sales volume in total dollars and total units to reach a target profit.

incremental effect

The change in total results (such as revenue, expenses, or income) under a new condition in comparison with some given or known condition.

To solve directly for sales dollars with the incremental approach, start at the break-even point in euro sales of €90,000. Every sale in euros beyond that point contributes €0.20 to net profit. Divide €1,440 by €0.20 to find the incremental euro sales (€7,200) required to produce incremental net profit of €1,440. Thus, the total euro sales is €90,000 + €7,200 = €97,200.

Finally, you can solve directly for the volume in euro sales using the formula

$$\begin{aligned}\text{target sales volume in units} &= \frac{\text{fixed expenses} + \text{target net income}}{\text{contribution-margin ratio}} \\ &= \frac{€18,000 + €1,440}{0.20} = €97,200 \quad (6)\end{aligned}$$

The following table summarizes these alternative computations:

	Break-Even Point	Increment	New Condition
Volume in units	<u>60,000</u>	<u>4,800</u>	<u>64,800</u>
Sales	€90,000	€7,200	€97,200
Variable expenses	<u>72,000</u>	<u>5,760</u>	<u>77,760</u>
Contribution margin	€18,000	€1,440	€19,440
Fixed expenses	<u>18,000</u>	<u>—</u>	<u>18,000</u>
Net income	<u>€ 0</u>	<u>€1,440</u>	<u>€ 1,440</u>

Multiple Changes in Key Factors

So far, we have seen changes in only one CVP factor at a time. In the real world, managers often make decisions about the probable effects of multiple factor changes. For example, Airbus may cut the price of its airplanes to increase sales volume, affecting total revenue and total variable costs. **Mars** might decrease the size of its Kit Kat candy bar, saving variable costs and increasing the unit contribution margin, but also decreasing sales volume. Or **Medtronic** might automate the production of its insulin infusion pump, replacing variable costs of labor with fixed costs of equipment.

Consider our vending example. Suppose Miranda is considering locking the vending machines from midnight until 5:00 AM to deter vandalism, which she estimates will save €2,460 in wages monthly. However, she also estimates the cutback from 24-hour service would reduce volume by 10,000 units because many passengers arriving on flights that land during the late night and early morning hours use the machines. Should the machines remain available 24 hours per day? We will perform the analysis for two months representing the lowest and highest predicted sales volume: (1) 62,000 units and (2) 90,000 units.

We will consider two approaches. The first is to construct and solve equations for conditions that prevail under each alternative and select the volume level that yields the highest net income.

Regardless of the current volume level, be it 62,000 or 90,000 units, if we accept the prediction that sales will decline by 10,000 units, closing from midnight to 5:00 AM will decrease net income by €540:

	Decline from 62,000 to 52,000 Units		Decline from 90,000 to 80,000 Units	
Units	<u>62,000</u>	<u>52,000</u>	<u>90,000</u>	<u>80,000</u>
Sales	€93,000	€78,000	€135,000	€120,000
Variable expenses	<u>74,400</u>	<u>62,400</u>	<u>108,000</u>	<u>96,000</u>
Total contribution margin	€18,600	€15,600	€ 27,000	€ 24,000
Fixed expenses	<u>18,000</u>	<u>15,540</u>	<u>18,000</u>	<u>15,540</u>
Net income	<u>€ 600</u>	<u>€ 60</u>	<u>€ 9,000</u>	<u>€ 8,460</u>
Change in net income	(€540)		(€540)	

A second approach—an incremental approach—is quicker and simpler. Simplicity is important to managers because it keeps the analysis from being cluttered by irrelevant and potentially confusing data.

What does the insightful manager see in this situation? The effect of a 10,000 unit decline in volume does not depend on whether the initial volume is 62,000 or 90,000 units. The essence of this decision is whether the savings in fixed costs exceed the loss in total contribution-margin dollars.

Savings in fixed expenses	€2,460
Less: Lost contribution margin, 10,000 units at €0.30	<u>-3,000</u>
Prospective decline in net income	<u>€ -540</u>

As in the first analysis, the incremental analysis also shows that locking the vending machines from midnight until 5:00 AM would cause a €540 decrease in monthly net income. Whichever way you analyze it, locking the machines is not a sound financial decision.

Nonprofit Application

The managers of nonprofit organizations also benefit from the study of CVP relationships. For example, administrators of nonprofit hospitals are concerned about the behavior of costs as the volume of patients fluctuates. Many nonprofit organizations do not derive revenue from selling goods or services, so their revenue function is not simply number of units sold multiplied by selling price per unit. For example, some nonprofit organizations receive a fixed allocation of funds to cover their costs, and must plan operations based on that fixed budget. Other nonprofit organizations use CVP analysis to plan how to adjust operations in response to changes in the level of donations received. Still other nonprofits receive a fixed allocation of funds and a revenue subsidy that covers a portion of the cost of the services provided. CVP analysis can be adapted to reflect the source or form of the organization's revenue.

To illustrate CVP analysis for a nonprofit organization with a fixed budget allocation, suppose a city has a \$100,000 lump-sum budget appropriation for a no-kill animal shelter that rescues stray cats and dogs and places them with new adoptive owners. The shelter incurs variable costs of approximately \$400 per animal per year. Fixed costs are \$60,000 within the relevant range of 50 to 150 animals. If the city spends the entire budget appropriation, how many animals can it rescue per year?

We can use the break-even equation to solve the problem. Let N be the number of animals, substitute the \$100,000 lump-sum budget for sales, and note that the lump-sum budget equals variable costs plus fixed expenses if the city completely spends its budget.

$$\text{sales} = \text{variable costs} + \text{fixed expenses}$$

$$\$100,000 \text{ lump sum} = \$400N + \$60,000$$

$$\$400N = \$100,000 - \$60,000$$

$$N = \$40,000 \div \$400$$

$$N = 100 \text{ animals}$$

The city can serve 100 animals. Now, suppose the city cuts the total budget appropriation for the following year by 10%. Fixed costs will be unaffected, but service will decline.

$$\text{sales} = \text{variable costs} + \text{fixed expenses}$$

$$\$90,000 = \$400N + \$60,000$$

$$\$400N = \$90,000 - \$60,000$$

$$N = \$30,000 \div \$400$$

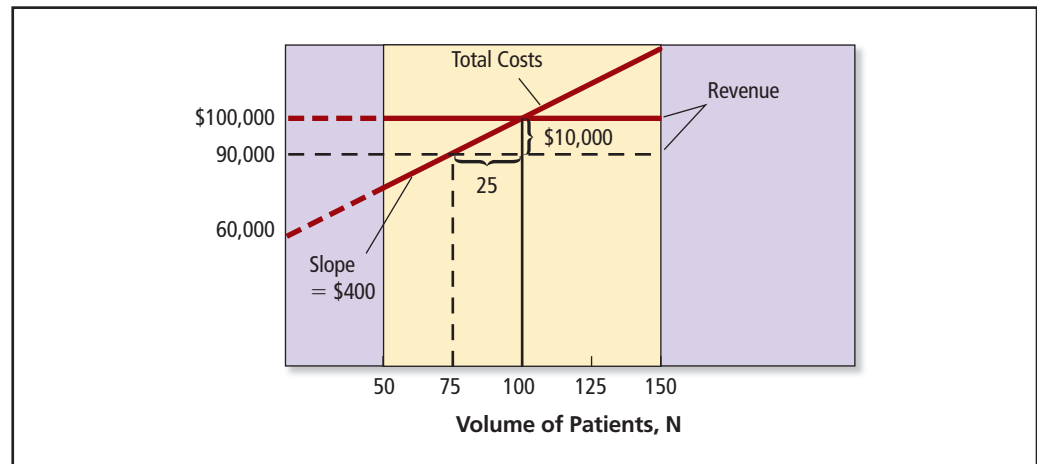
$$N = 75 \text{ patients}$$

The percentage reduction in service is $(100 - 75) \div 100 = 25\%$, which is more than the 10% reduction in the budget. Unless the city restructures its operations, the service volume must fall by 25% to stay within budget.

A graphical presentation of this analysis is in Exhibit 2-9. Note that lump-sum revenue is a horizontal line on the graph.

CVP Analysis and Spreadsheets

Spreadsheets simplify analysis of multiple changes in key factors in a CVP model. Managers use a spreadsheet-based CVP modeling program to study combinations of changes in selling prices,

**Exhibit 2-9**

Graphical Presentation of Nonprofit Application

unit variable costs, fixed costs, and desired profits. Spreadsheets quickly calculate results for alternative assumptions and can display results both numerically and graphically.

Consider Exhibit 2-10, which is a sample spreadsheet that computes the required sales level for all possible combinations of three fixed cost levels (€4,000, €6,000, or €8,000), three variable cost percentages (40%, 44%, or 48% of sales), and three target income levels (€2,000, €4,000, or €6,000). For the 27 different combinations of fixed costs, variable costs, and target income, the spreadsheet calculates the required sales levels rapidly and without error. Further, managers can quickly substitute different numbers for fixed costs (column A), variable cost percentage (column B), and target net income (row 3 of columns C, D, and E) and the spreadsheet will immediately re-compute the required sales level.

In addition to speed and accuracy, spreadsheets allow a more sophisticated approach to CVP analysis than the one illustrated in this chapter. The assumptions we listed on p. 65 are necessary to simplify the analysis enough to construct a CVP model by hand. Computer models can be more complex and include multiple cost drivers, nonlinear relationships between costs and cost drivers, varying sales mixes, and analyses for multiple relevant ranges.

	A	B	C	D	E
1				Sales Required to Earn	
2	Fixed	Variable Cost		Annual Net Income of	
3	Cost	as % of Sales	€ 2,000	€ 4,000	€ 6,000
4					
5	€4,000	0.40	€10,000*	€13,333	€16,667
6	€4,000	0.44	€10,714*	€14,286	€17,857
7	€4,000	0.48	€11,538*	€15,385	€19,231
8	€6,000	0.40	€13,333	€16,667	€20,000
9	€6,000	0.44	€14,286	€17,857	€21,429
10	€6,000	0.48	€15,385	€19,231	€23,077
11	€8,000	0.40	€16,667	€20,000	€23,333
12	€8,000	0.44	€17,857	€21,429	€25,000
13	€8,000	0.48	€19,231	€23,077	€26,923
	*(A5 + C3)/(1 - B5) = (€4,000 + €2,000)/(1 - €0.40) = €10,000 (A6 + C3)/(1 - B6) = (€4,000 + €2,000)/(1 - €0.44) = €10,714 (A7 + C3)/(1 - B7) = (€4,000 + €2,000)/(1 - €0.48) = €11,538				

Exhibit 2-10

Spreadsheet Analysis of CVP Relationships

The use of computer models is a cost-benefit issue. The validity of these models depends on the accuracy of the underlying assumptions about revenue and cost behavior. More complex models often require fewer assumptions and, thus, are valid in more general circumstances. However, sometimes the costs of modeling exceed the value of the improved quality of management decisions. In small organizations, simplified CVP models often are accurate enough; the cost of more sophisticated modeling may exceed the benefit.

Additional Uses of CVP Analysis

Margin of Safety

CVP analysis can help managers assess risk. One measure of risk is the **margin of safety**. The margin of safety measures how far sales can fall before losses occur and is the difference between the level of planned sales and the break-even point. The margin of safety can be defined in either units or dollars:

$$\text{margin of safety in units} = \text{planned unit sales} - \text{break-even unit sales}$$

$$\text{margin of safety in dollars} = \text{planned dollar sales} - \text{break-even dollar sales}$$

For example, if Miranda in our vending machine example predicts sales volume of 80,000 units or €120,000, the margin of safety in units is 20,000 units and the margin of safety in dollars is €30,000:

$$\text{margin of safety in units} = 80,000 \text{ units} - 60,000 \text{ units} = 20,000 \text{ units}$$

$$\text{margin of safety in dollars} = €120,000 - €90,000 = €30,000$$

The larger the margin of safety, the less likely it is that volume will fall to the point where the company has an operating loss, that is, below the break-even point. Conversely, a smaller margin of safety indicates greater risk of incurring a loss.

Operating Leverage

In addition to weighing the varied effects of changes in fixed and variable costs, managers need to consider the firm's **cost structure**—the combination of variable- and fixed- cost resources used to carry out the organization's activities. There is typically a tradeoff between variable and fixed costs in choosing a cost structure. Lower variable costs are often achieved by incurring higher fixed costs. For example, highly automated factories with high fixed overhead costs typically have lower variable labor costs compared to less automated factories. Firms with higher fixed costs and lower variable costs are said to have greater **operating leverage**—the sensitivity of a firm's profit to changes in volume of sales. In highly leveraged companies with lower variable costs, small changes in sales volume result in large changes in net income. In companies with less leverage and higher variable costs, changes in sales volume have a smaller effect on income.

Exhibit 2-11 shows cost behavior relationships at two firms, one with higher operating leverage and one with lower leverage. The firm with higher leverage has fixed costs of €14,000 and variable cost per unit of €0.10. The firm with lower leverage has fixed costs of only €2,000 but variable costs of €0.25 per unit. For both firms, the sales price is €0.30 per unit.

The amount by which profit changes with sales volume is determined by the respective contribution margins. The contribution margin per unit for the firm with higher operating leverage is €0.30 – €0.10 = €0.20 per unit. The contribution margin per unit for the firms with lower operating leverage is €0.30 – €0.25 = €0.05 per unit. Thus, each unit change in sales results in a €0.20 change in profit for the firm with higher operating leverage and a €0.05 change in profit for the firm with lower operating leverage.

To illustrate the effect of operating leverage in the preceding example, suppose expected sales at both companies are 80,000 units. At this sales level, both firms have net incomes of €2,000. If sales fall short of 80,000 units, profits drop more sharply for the more highly leveraged cost structure. If sales exceed 80,000 units, however, profits also increase more sharply. For example, at sales of 70,000 units, the higher-leveraged firm has zero profits, compared to €1,500 for the lower-leveraged firm. At sales of 90,000 units, however, net income is €4,000 for the higher-leveraged firm but only €2,500 for the lower-leveraged firm.

margin of safety

Planned unit sales less the break-even unit sales; a measure of how far sales can fall below the planned level before losses occur.

cost structure

The combination of variable- and fixed-cost resources used to carry out the organization's activities.

operating leverage

The sensitivity of a firm's profit to changes in volume of sales.

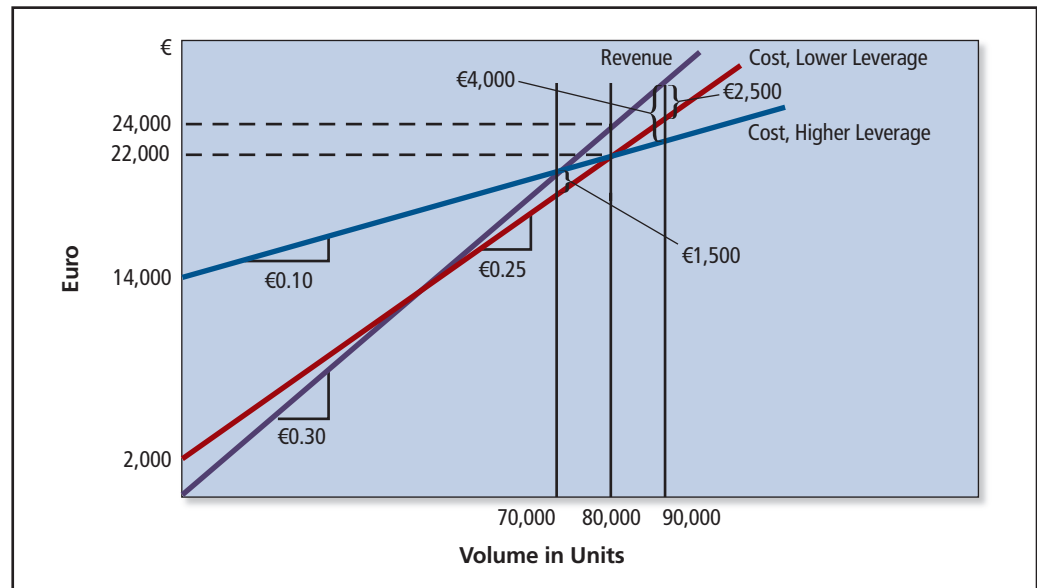


Exhibit 2-11
High Versus Low Operating Leverage

degree of operating leverage

The ratio of contribution margin to profit, defined at a specific volume of sales.

The effect of operating leverage on the variability of profit is captured by **degree of operating leverage**—the ratio of contribution margin to profit, defined at a specific volume of sales. The degree of operating leverage at a specific volume describes how a percentage change in sales will translate into a percentage change in profit.

For example, for the firm with lower operating leverage in Exhibit 2-11, the degree of operating leverage at 80,000 units is contribution margin at 80,000 units ($80,000 \times €0.05$) divided by profit at 80,000 units (€2,000), or $€4,000/€2,000 = 2$. In our example, a degree of operating leverage of 2 means that the percentage change in profit will be 2 times the percentage change in sales. If sales volume increases by 12.5%, increasing by 10,000 units from 80,000 units to 90,000 units, profit will increase by $2 \times 12.5\% = 25\%$, moving from €2,000 at 80,000 units to €2,500 at 90,000 units. Similarly, if sales volume decreases by 12.5%, decreasing from 80,000 units to 70,000 units, profit will decrease by $2 \times -12.5\% = -25\%$, moving from €2,000 to €1,500.

For the firm with higher operating leverage in Exhibit 2-11, the degree of operating leverage at 80,000 units is $€16,000/€2,000 = 8$, which means that the percentage change in profit will be 8 times the percentage change in sales. If sales volume increases by 12.5%, increasing by 10,000 units from 80,000 units to 90,000 units, profit will increase by $8 \times 12.5\% = 100\%$, moving from €2,000 at 80,000 units to €4,000 at 90,000 units. Similarly, if sales volume decreases by 12.5%, profit will decrease by $8 \times -12.5\% = -100\%$, moving from €2,000 to €0.

The higher-leverage cost structure is riskier. Why? Because it results in more variability of income—it might lead to a higher net income but it also might lead to a larger net loss. The lower-leverage alternative is less risky because variations in sales volume lead to smaller variability in net income. Is lower risk always better? Not necessarily. Suppose in the preceding example that managers are sure that volume will be greater than 80,000 units. Then the higher operating leverage (and higher risk) cost structure is better because it will yield higher profits. On the other hand, suppose there is a possibility that volume will be lower than 80,000 units. For volume lower than 80,000 units, the lower operating leverage (and lower risk) cost structure yields higher profits. Thus, if managers are unsure whether volume will be greater or lower than 80,000 units, they should evaluate the expected profit and should also take into account the effects of risk.

Best Cost Structure

Analyzing and managing the organization's cost structure is an important management responsibility. For example, purchasing automated machinery may increase fixed costs but reduce variable cost, labor cost per unit. Conversely, it may be wise to reduce fixed costs to obtain a more

favorable combination. For example, a company may decide to compensate its sales force via sales commissions rather than pay them salaries, thus reducing salaries (a fixed cost) but increasing sales commissions (a variable cost).

A thorough understanding of cost-volume-profit relationships is essential in choosing a cost structure. The best combination of variable- and fixed-cost resources depends on many factors—the current level of sales, expected level of future sales, and the set of alternatives available now and in the future.

Generally, companies that spend heavily on the fixed costs of advertising are willing to do so because they have high contribution-margin percentages (e.g., airlines, cigarette, and cosmetic companies). Conversely, companies with low contribution-margin percentages usually spend less for advertising and promotion (e.g., manufacturers of industrial equipment). As a result, two companies with the same unit sales volumes at the same unit prices could have different attitudes toward risking an advertising outlay. Assume the following:

	Perfume Company	Janitorial Service Company
Unit sales volume	200,000 bottles	200,000 square feet
Euro sales at €10 per unit	€2,000,000	€2,000,000
Variable costs	<u>200,000</u>	<u>1,700,000</u>
Total contribution margin	<u>€1,800,000</u>	<u>€ 300,000</u>
Contribution-margin percentage	90%	15%

Suppose each company can increase sales volume by 10% by spending €100,000 for advertising:

	Perfume Company	Janitorial Service Company
Increase in sales volume, 20,000 × €10	€200,000	€200,000
Increase in total contribution margin, 90%, 15%	180,000	30,000

By spending €100,000 on advertising, the perfume company would increase the total contribution margin by \$180,000, thus increasing total profit by $€180,000 - €100,000 = €80,000$. In contrast, the janitorial service company would increase the total contribution margin by only €30,000, resulting in a change in total profit of $€30,000 - €100,000 = -€70,000$.

Note that when the contribution margin as a percentage of sales is low, large increases in volume are necessary to generate increases in net profits. At the same time, decreases in volume also generate smaller decreases in profit when contribution-margin percentages are low. High contribution-margin ratios have the opposite effect—large increases in profits if sales grow but large decreases in profits if sales fall. The best cost structure depends on multiple factors.

The best cost structure is not necessarily the cost structure with the greatest margin of safety, or the lowest break-even point, or the highest operating leverage, or the lowest operating leverage. The best cost structure depends on the impact of risk and on the expected volume of sales, both in the current period and in future periods. Further, as explained in later chapters, the expected volume of sales may be different for different cost structures. Managers must have a thorough understanding of all these factors to choose the best cost structure. As illustrated in the Business First box on p. 77, this can be particularly challenging for a start-up firm with an innovative and untested business model.

Objective 7

Differentiate between contribution margin and gross margin.

gross margin (gross profit)

The excess of sales over the total cost of goods sold.

cost of goods sold

The cost of the merchandise that a company acquires or produces and sells.

Contribution Margin and Gross Margin

This chapter has focused on the contribution margin. However, accountants also use a similar term, *gross margin*, to mean something quite different. Too often people confuse the terms *contribution margin* and *gross margin*. **Gross margin**, also called **gross profit**, is the excess of sales over the cost of goods sold. **Cost of goods sold** is the cost of the merchandise that a company acquires or produces and then sells. Compare the gross margin with the contribution margin:

$$\text{gross margin} = \text{sales revenue} - \text{cost of goods sold}$$

$$\text{contribution margin} = \text{sales revenue} - \text{all variable expenses}$$

Exhibit 2-12 shows costs divided on two different dimensions. As shown at the bottom of the exhibit, the gross margin uses the division on the production or acquisition cost versus selling and administrative cost dimension, and the contribution margin uses the division based on the variable-cost versus fixed-cost dimension.

In our vending-machine illustration, the contribution margin and the gross margin are identical because the cost of goods sold is the only variable cost:

Sales	€1.50
Variable costs: acquisition cost of unit sold	<u>1.20</u>
Contribution margin and gross margin are equal	<u>€0.30</u>

Now, suppose the firm had to pay a maintenance and replenishment fee of €0.12 per unit sold:

	Contribution Margin	Gross Margin
Sales	€1.50	€1.50
Acquisition cost of unit sold	€1.20	1.20
Variable fee	<u>0.12</u>	
Total variable costs	<u>1.32</u>	
Contribution margin	<u>€0.18</u>	
Gross margin		<u>€0.30</u>

	Variable Costs	Fixed Costs	
Production or Acquisition Costs	A Variable Production or Acquisition Costs	B Fixed Production or Acquisition Costs	Total Production or Acquisition Costs
Selling & Administrative (Nonproduction) Costs	C Variable Selling & Administrative Costs	D Fixed Selling & Administrative Costs	Total Selling & Administrative (Nonproduction) Costs
	Total Variable Costs	Total Fixed Costs	
Contribution margin = sales – total variable costs = sales – (A + C)			
Gross margin = sales – total production or acquisition cost = sales – (A + B)			

Exhibit 2-12

Costs for Gross Margin and Contribution Margin

Business First

For Start-ups, Survival Depends on Determining the Best Cost Structure

When it was launched in 2009 by two Harvard Business School graduates, New York-based **Rent the Runway** disrupted the fashion industry, taking the decades-old, brick-and-mortar clothing rental business online, and making high-end designer fashion accessible to a broader public for the first time. The company started off by offering high-end designer dresses for short-term rental via its e-commerce site. Since then, it has extended its inventory to include leisure wear, work attire, and a range of accessories, and has introduced a monthly subscription option. As the company has evolved, so too has its cost structure.

Initially, the company outsourced the cleaning and repair of its clothing inventory to a third party (customers are not responsible for cleaning the garments they rent; this is done by Rent the Runway). However, the founders quickly realized that control of the cleaning and repair process was key to quality assurance and to guaranteeing that items ordered were delivered on time and in pristine condition, thereby ensuring high levels of customer satisfaction. An average dress on Rent the Runway goes home to 30 different customers. Seems impossible? 'It is possible when you own the dry cleaning process,' according to co-founder and CEO, Jennifer Hyman. According to an article in *The Economist*, the company's dry-cleaning facility is the largest in the world. In addition to cleaning, the facility is staffed

with seventy-five seamstresses, who immediately repair items that are returned damaged, as well as 'spotters', who remove difficult stains from the clothing. With a large and growing base of eager customers and fashion trends constantly changing, how does the company keep up? According to Chief Analytics Officer Vijay Subramanian, the key to success is being data-driven. From generating personalized style recommendations for customers to the efficient cleaning and distribution of the clothing, data is an integral part of the company's DNA.

Developing a highly sophisticated, customer-friendly e-commerce site is a challenge for any firm, as is developing a highly sophisticated and efficient order fulfillment and inventory management system. Part fashion industry disruptor, part data and logistics powerhouse, Rent the Runway has succeeded in combining both in its innovative business model.

Sources: "I'm Like a Drug Dealer; Drug Dealer of Fashion," CBS News, September 16, 2014, <https://www.cbsnews.com/news/high-fashion-at-a-low-price-with-rent-the-runway/>; "Rent the Runway Is Taking Clothes-sharing Mainstream," *The Economist*, June 9, 2018; Vijay Subramanian, Deciding by Data Web site, <https://decidingbydata.indicative.com/rent-the-runway-chief-analytics-officer-vijay-subramanian/>; S. Bertoni, "How Mixing Data And Fashion Can Make Rent The Runway Tech's Next Billion Dollar Star," *Forbes*, August 20, 2014; and R. Kestenbaum, "Rent The Runway's Outsized \$1 Billion Valuation Is Reportedly Coming Down to Earth," *Forbes*, May 27, 2020.

Summary Problem for Your Review

PROBLEM

The budgeted income statement of Port Williams Gift Shop follows:

Net revenue	A\$800,000
Less expenses, including A\$400,000 of fixed costs	<u>880,000</u>
Net loss	<u><u>A\$(80,000)</u></u>

The manager believes that an additional outlay of A\$200,000 for advertising will increase sales but is wondering how much sales will have to increase to achieve 1) breakeven, or 2) a A\$40,000 profit.

1. At what sales volume in Australian dollars will the shop break even after spending A\$200,000 on advertising?
2. What sales volume in Australian dollars will result in a net profit of A\$40,000 after spending the A\$200,000 on advertising?

SOLUTION

1. Note that all data are in dollars, not units. The variable costs are $A\$880,000 - A\$400,000 = A\$480,000$ and the variable-cost ratio is $A\$480,000 \div A\$800,000 = 0.60$.

(Remember to divide variable costs by sales, not by total costs.) Therefore, the contribution-margin ratio is 0.40. Let S = break-even sales in Australian dollars. Then

$$\text{Sales} - \text{variable costs} - \text{fixed costs} = \text{net profit}$$

$$S - 0.60S - (\text{A\$}400,000 + \text{A\$}200,000) = 0$$

$$0.40S = \text{A\$}600,000$$

$$S = \frac{\$600,000}{0.40} = \frac{\text{fixed costs}}{\text{contribution-margin ratio}}$$

$$S = \text{A\$}1,500,000$$

$$2. \quad \text{required sales} = \frac{(\text{fixed costs} + \text{target net profit})}{\text{contribution-margin ratio}}$$

$$\text{required sales} = \frac{(\text{A\$}600,000 + \text{A\$}40,000)}{0.40} = \frac{\text{A\$}640,000}{0.40}$$

$$\text{required sales} = \text{A\$}1,600,000$$

Alternatively, we can use an incremental approach and reason that all Australian dollar sales beyond the A\$1.5 million break-even point will result in a 40% contribution to net profit. Divide A\$40,000 by 0.40. Therefore, sales must be A\$100,000 beyond the A\$1.5 million break-even point to produce a net profit of A\$40,000.

Highlights to Remember

- 1. Explain how cost drivers affect cost behavior.** A cost driver is an output measure that causes the use of costly resources. When the level of an activity changes, the level of the cost driver or output measure will also change, causing changes in costs.
- 2. Show how changes in cost-driver levels affect variable and fixed costs.** Cost behavior refers to how costs change as levels of an organization's activities change. If the cost of the resource used changes in proportion to changes in the cost-driver level, the resource is a variable-cost resource (its costs are variable). If the cost of the resource used does not change because of cost-driver level changes, the resource is a fixed-cost resource (its costs are fixed).
- 3. Explain step- and mixed-cost behavior.** Step and mixed costs combine aspects of variable- and fixed-cost behavior. Graphs of step costs look like steps. Costs remain fixed within a given range of activity or cost-driver level, but then rise or fall abruptly when the cost-driver level moves outside this range. Mixed costs involve a fixed element and a variable element of cost behavior. Unlike step costs, mixed costs have a single fixed cost at all levels of activity and in addition have a variable cost element that increases proportional to the level of activity.
- 4. Create a cost-volume-profit (CVP) graph and understand the assumptions behind it.** We can approach CVP analysis (sometimes called break-even analysis) graphically or with equations. We create a CVP graph by drawing revenue and total cost lines as functions of the volume of activity. Be sure to recognize the limitations of CVP analysis and that it assumes efficiency, sales mix, and inventory levels are all held constant.
- 5. Calculate break-even sales revenues and unit sales.** To calculate the break-even point in total units, divide the fixed costs by the unit contribution margin. To calculate the break-even point expressed in terms of break-even sales revenues, divide the fixed costs by the contribution-margin ratio.
- 6. Calculate sales revenues and unit sales volumes to reach a target profit.** Managers use CVP analysis to compute the sales needed to achieve a target profit or to examine the effects on profit of changes in factors such as fixed costs, variable costs, or cost-driver volume.
- 7. Differentiate between contribution margin and gross margin.** The contribution margin—the difference between sales price and variable costs—is an important concept. Do not confuse it with gross margin, the difference between sales price and cost of goods sold.

Appendix 2A: Sales-Mix Analysis

The cost-volume-profit analysis in this chapter focused on the case of a single product. However, nearly all companies produce more than one product or service. For these companies, volume is determined not just by total sales but also by sales mix, which you will recall from p. 65 is the relative proportions or combinations of quantities of products that comprise total sales. If the proportions of the mix change, the cost-volume-profit relationships also change.

Suppose the South African company On the Go Accessories has two products, wallets (W) and smartphone cases (S) and the following budget:

	Wallets (W)	Smartphone Cases (S)	Total
Sales in units	300,000	75,000	375,000
Sales @ R80 and R50	R24,000,000	R3,750,000	R27,750,000
Variable costs @ R70 and R30	21,000,000	2,250,000	23,250,000
Contribution margins @ R10 and R20	<u>R3,000,000</u>	<u>R1,500,000</u>	R4,500,000
Fixed expenses			<u>1,800,000</u>
Net income			<u>R2,700,000</u>

The rand (R) is the official currency of South Africa

What is the break-even point for On the Go Accessories? The answer depends on the mix of products. For example, you can use the approach outlined in the chapter to find the break-even point if the mix is 100% W or 100% S. For instance, suppose On the Go Accessories sells only smartphone cases, and fixed expenses stay at R180,000.

$$\begin{aligned}
 \text{break-even point in units of S} &= \frac{\text{fixed costs}}{\text{contribution margin per unit}} \\
 &= \frac{\text{R1,800,000}}{\text{R20}} \\
 &= 90,000 \text{ smartphone cases}
 \end{aligned}$$

If On the Go Accessories sells only wallets,

$$\text{break-even point in units of W} = \frac{\text{R1,800,000}}{\text{R10}} = 180,000 \text{ wallets}$$

We can also generalize the approach used in the chapter to find breakeven for any other fixed proportion of smartphone cases and wallets. For example, consider a sales mix of four wallets for every smartphone case. Letting S and W denote the number of units of smartphone cases and wallets, respectively, the assumed sales mix implies $W = 4S$. The calculation of total volume to break even is as follows:

$$\begin{aligned}
 \text{sales} - \text{variable expenses} - \text{fixed expenses} &= \text{zero net income} \\
 [\text{R80}(4S) + \text{R50}(S)] - [\text{R70}(4S) + \text{R30}(S)] - \text{R1,800,000} &= 0 \\
 \text{R320S} + \text{R50S} - \text{R280S} - \text{R30S} - \text{R1,800,000} &= 0 \\
 \text{R60S} &= \text{R1,800,000} \\
 S &= 300,000 \\
 W = 4S &= 1,200,000
 \end{aligned}$$

The break-even point for a sales mix of four wallets for every smartphone case is 300,000 smartphone cases and 1,200,000 wallets, or 1,500,000 total units.

These examples show that each sales mix has a break-even point. The break-even point if On the Go Accessories produces only wallets is 180,000 wallets, the break-even point if the company produces only smartphones cases is 90,000 units, and the break-even point if the company produces four wallets for every smartphone case is a total of 1,500,000 units (300,000 smartphone cases and 1,200,000 wallets).

Changes in sales mix affect the break-even point and the expected net income at various sales levels. For example, consider a revised On the Go Accessories budget where the budgeted

Objective 8

Explain the effects of sales mix on profits.

number of units remains at 3,750,000 units but the mix is revised to 3,250,000 wallets and 500,000 smartphone cases:

	Wallets (W)	Smartphone Cases (S)	Total
Sales in units	3,250,000	500,000	3,750,000
Sales @ R80 and R50	R26,000,000	R2,500,000	R28,500,000
Variable costs @ R70 and R30	22,750,000	1,500,000	24,250,000
Contribution margins @ R10 and R20	R3,250,000	R1,000,000	R4,250,000
Fixed expenses			1,800,000
Net income			R2,450,000

The revised budget shows that the change in sales mix results in net income of R2,450,000, rather than R2,700,000 for the original mix of 3,000,000 wallets and 750,000 smartphone cases. Although both budgets have identical total numbers of units, the revised budget has a smaller proportion of sales of the product bearing the higher unit contribution margin, smartphone cases. Relative to the original budget, the revised budget has 250,000 fewer smartphone cases with a contribution margin of R20 per unit (R50 – R30) and 250,000 more wallets with a contribution margin of R10 per unit (R80 – R70). As a result, budgeted net income is R250,000 lower in the revised budget.

The effect of sales mix on profit is often an important element of strategy. For example, a recent annual report for **Neenah Paper Inc.** described the role of product mix in its strategy to grow margins and improve profitability: “Margin improvement will come through optimizing our product mix, faster growth of higher margin products, new product sales generated through innovation/R&D efforts and overall benefits of volume and scale efficiencies.”

Contribution margins help guide executives who must decide to emphasize or deemphasize particular products. For example, given limited production facilities or limited time of sales personnel, should we emphasize wallets or key cases? Contribution margins, along with other factors, affect these decisions. Chapter 5 explores these factors, including the importance of the contribution margin per unit of time (or per unit of other constrained resource) rather than per unit of product.

Appendix 2B: Impact of Income Taxes

Objective 9

Compute cost-volume-profit (CVP) relationships on an after-tax basis.

Thus far we have ignored income taxes, but most companies must pay income taxes. Income taxes do not affect the break-even point. Why? Because there is no income tax at a level of zero income. However, income taxes do affect calculation of the volume required to achieve a specified after-tax target profit.

Reconsider the vending machine example from earlier in this chapter. If the vending machine company pays income tax at a rate of 40%, the before-tax income of €1,440 corresponds to after-tax net income of €864, as shown by the following calculations:

Income before income tax	€1,440	100%
Income tax	<u>576</u>	<u>40%</u>
After-tax net income	<u>€ 864</u>	<u>60%</u>

This example illustrates the general relationship between income before tax and net income after tax:

$$\text{after-tax net income} = \text{income before income taxes} \times (1 - \text{tax rate})$$

or

$$\text{income before income taxes} = \frac{\text{after-tax net income}}{1 - \text{tax rate}}$$

The only change required to introduce taxes into the general equation illustrated in the chapter for calculation of volume required to achieve a given target income is to substitute

$\frac{\text{target after-tax net income}}{1 - \text{tax rate}}$ on the right-hand side of the equation:

$$\text{target sales} - \text{variable expenses} - \text{fixed expenses} = \frac{\text{target after-tax net income}}{1 - \text{tax rate}}$$

Return to the target income example from the chapter where selling price is €1.50 per unit, variable cost is €1.20 per unit, and total fixed cost is €18,000. Assume that target after-tax net income is €864. The equation to find N , the number of units to be sold to achieve the after-tax income target of €864 is as follows:

$$\begin{aligned}\text{€}1.50N - \text{€}1.20N - \text{€}18,000 &= \frac{\text{€}864}{1 - 0.4} \\ \text{€}0.30N - \text{€}18,000 &= \text{€}1,440 \\ \text{€}0.30N &= \text{€}1,440 + \text{€}18,000 \\ \text{€}0.30N &= \text{€}19,440 \\ N &= 64,800 \text{ units}\end{aligned}$$

Sales of 64,800 units produce an after-tax profit of €864 as shown here, which of course corresponds to the volume required to produce before-tax profit of €1,440, as shown in the chapter. Now suppose the target after-tax net income is €1,800. The volume required for this higher level of after-tax income would rise to 70,000 units:

$$\begin{aligned}\text{€}1.50N - \text{€}1.20N - \text{€}18,000 &= \frac{\text{€}1,800}{1 - 0.4} \\ \text{€}0.30N - \text{€}18,000 &= \text{€}3,000 \\ \text{€}0.30N &= \text{€}3,000 + \text{€}18,000 \\ \text{€}0.30N &= \text{€}21,000 \\ N &= 70,000 \text{ units}\end{aligned}$$

The formula from the chapter for the effect of a change in volume on income can also be adapted to show the effect on after-tax net income:

$$\text{change in net income} = \left(\frac{\text{change in volume}}{\text{in units}} \right) \times \left(\frac{\text{contribution margin}}{\text{per unit}} \right) \times (1 - \text{tax rate})$$

Apply this formula to verify how net income should change when we increase volume from a level of 64,800 units (which produced €864 after-tax net income) to a level of 70,000 units in our example:

$$\begin{aligned}\text{change in net income} &= (70,000 - 64,800) \times \text{€}0.30 \times (1 - 0.4) \\ &= 5,200 \times 0.30 \times 0.60 = 5,200 \times \text{€}0.18 \\ &= \text{€}936\end{aligned}$$

The formula verifies our earlier calculations. When volume increases from 64,800 units to 70,000 units, after-tax net income increases by €936, moving from €864 to €1,800.

Accounting Vocabulary

break-even point, p. 64
contribution margin, p. 67
contribution-margin percentage, p. 66
contribution-margin ratio, p. 66
cost behavior, p. 55
cost driver, p. 55
cost of goods sold, p. 76
cost structure, p. 73
cost-volume-profit (CVP) analysis, p. 63

decision context, p. 60
degree of operating leverage, p. 74
fixed cost, p. 57
gross margin, p. 76
gross profit, p. 76
incremental effect, p. 69
margin of safety, p. 73
marginal income per unit, p. 66
mixed cost, p. 62
operating leverage, p. 73

relevant range, p. 60
sales mix, p. 65
step cost, p. 61
total contribution margin, p. 66
unit contribution margin, p. 66
variable cost, p. 57
variable-cost percentage, p. 66
variable-cost ratio, p. 66

Fundamental Assignment Material

2-A1 Fixed- and Variable-Cost Behavior

Maintaining a clean working environment is important to Napco, an industrial parts manufacturer. Cleaning the plant is the responsibility of the maintenance department. The 50,000 square foot plant is thoroughly cleaned from four to eight times a month depending on the level and stage of production. For the most recent month, March, the plant was cleaned four times. The production schedule for the next quarter (April through June) indicates that the plant will need to be cleaned five, six, and eight times respectively.

Two of the resources needed to clean the plant are labor and cleaning supplies. The cost driver for both resources is number of times the plant is cleaned. Plant cleaning laborers are full-time employees who are paid the same wages regardless of the number of times the plant is cleaned. Cleaning supplies is a variable cost. The March cost of labor was \$21,000 and cleaning supplies used cost \$8,000.

1. Prepare a table that shows how labor cost, cleaning supplies cost, total cost, and total cost per cleaning changes in response to the number of times the plant is cleaned. What is the predicted total cost of plant cleaning for the next quarter?
2. Suppose Napco can hire an outside cleaning company to clean the plant as needed. The charge rate for cleaning is \$5,700 per plant cleaning. If the outside cleaning company is hired, Napco can lay off the workers who are now cleaning the plant and will spend nothing for cleaning supplies. Will Napco save money with the outside cleaning company over the next quarter? Prepare a schedule that supports your answer.

2-A2 Cost-Volume-Profit and Vending Machines

Vendmart Food Services Company operates and services snack vending machines located in restaurants, gas stations, and factories in four southwestern states. The machines are rented from the manufacturer. In addition, Vendmart must rent the space occupied by its machines. The following expense and revenue relationships pertain to a contemplated expansion program of 80 machines.

Fixed monthly expenses follow:

Machine rental: 80 machines @ \$22.10	\$1,768
Space rental: 80 locations @ \$20.00	1,600
Part-time wages to service the additional 80 machines	500
Other fixed costs	<u>132</u>
Total monthly fixed costs	<u>\$4,000</u>

Other data follow:

	Per Unit (Snack)	Per \$100 of Sales
Selling price	\$1.00	100%
Cost of snack	<u>0.68</u>	<u>68</u>
Contribution margin	<u>\$0.32</u>	<u>32%</u>

These questions relate to the given data unless otherwise noted. Consider each question independently.

1. What is the monthly break-even point in number of units (snacks)? In dollar sales?
2. If 45,000 units were sold, what would be the company's net income?
3. If the space rental cost was doubled, what would be the monthly break-even point in number of units? In dollar sales?
4. Refer to the original data. If, in addition to the fixed space rent, Vendmart Food Services Company paid the vending machine manufacturer \$0.07 per unit sold, what would be the monthly break-even point in number of units? In dollar sales?
5. Refer to the original data. If, in addition to the fixed rent, Vendmart paid the machine manufacturer \$0.11 for each unit sold in excess of the break-even point, what would the new net income be if 45,000 units were sold?

2-A3 Exercises in Cost-Volume-Profit Relationships

Upcraft Moving Company specializes in hauling heavy goods over long distances. The company's revenues and expenses depend on revenue-miles, a measure that combines both weights and mileage.

Summarized budget data for next year are based on predicted total revenue miles of 500,000. At that level of volume, and at any level of volume between 300,000 and 700,000 revenue miles, the company's fixed costs are \$50,000. The selling price and variable costs are as follows:

Per Revenue-Mile	
Average selling price (revenue)	\$2.00
Average variable expenses	1.60

1. Compute the budgeted net income. Ignore income taxes.
2. Management is trying to decide how various possible conditions or decisions might affect net income. Compute the new net income for each of the following changes. Consider each case independently.
 - a. A 30% increase in sales price.
 - b. A 30% increase in revenue miles.
 - c. A 30% increase in variable expenses.
 - d. A 30% increase in fixed expenses.
 - e. An average decrease in selling price of \$0.05 per revenue mile and a 15% increase in revenue miles. Refer to the original data.
 - f. An average increase in selling price of \$0.01 and a 30% decrease in revenue miles.
 - g. A 30% increase in fixed expenses in the form of more advertising and a 15% increase in revenue miles.

2-A4 Types of Cost Behavior

Identify the following planned costs as (a) variable costs, (b) fixed costs, (c) mixed costs, or (d) step costs. For variable costs and mixed costs, indicate the most likely cost driver.

1. Public relations employee compensation to be paid by **Intel**
2. Crew supervisor in a **Lands' End** mail-order house; a new supervisor is added for every 12 workers employed
3. Sales commissions based on revenue dollars; payments to be made to advertising salespersons employed by radio station **WCCO**, Minneapolis
4. Jet fuel costs of **Southwest Airlines**
5. Total costs of renting trucks by the city of Nashville; charge is a lump sum of \$300 per month plus \$0.20 per mile
6. Straight-line depreciation on desks in the office of an attorney
7. Advertising costs, a lump sum, planned by **ABC, Inc.**
8. Rental payment by the Internal Revenue Service on a five-year lease for office space in a private office building
9. Advertising allowance granted to wholesalers by **7-Up Bottling** on a per-case basis
10. Compensation of lawyers employed internally by **Microsoft**
11. Total repairs and maintenance of a university classroom building

2-B1 Fixed- and Variable-Cost Behavior

Applejack Fine Dining has 970 restaurants across the United States. Maintaining a clean environment for customers is a key success factor at Applejack. Each restaurant is cleaned regularly after closing. In addition to regular cleaning, from 5 to 20 times a month, depending on various factors including the amount of business, a special treatment is given to the floors consisting of breaking down the old wax and rewaxing. So the total number of times a restaurant is cleaned varies from 35 to 50 times a month.

The two most costly resources needed to clean an Applejack restaurant are labor and supplies. The cost driver for both resources is number of times a restaurant is cleaned. Cleaning laborers are paid the same wages regardless of the number of times a restaurant is cleaned. Cleaning supplies is a variable cost. The cost of supplies used per regular cleaning and per special cleaning is about the same.

Suppose one of the local Applejack restaurants in Orlando has 6,000 square feet. In October, the restaurant was cleaned 35 times. The cost of cleaning labor was \$21,000 for October, and cleaning supplies cost \$16,800. The months of November and December are typically much busier, so the restaurant manager expects to clean 45 times and 50 times in November and December, respectively.

1. Prepare a table that shows how labor cost, cleaning supplies cost, total cost, and total cost per cleaning changes in response to number of times the restaurant is cleaned. Use volumes of 35, 40, 45, and 50 times cleaned. What is the predicted total cost of cleaning for November and December?

- Suppose Applejack can hire an outside cleaning company to clean the restaurant as needed. The charge rate for cleaning is \$0.25 per square foot. If the outside cleaning company is hired, Applejack can lay off the workers who are now cleaning and will spend nothing on cleaning supplies. Will Applejack save money with the outside cleaning company over the next two months? Prepare a schedule that supports your answer. What information would you need to make a recommendation about hiring the outside cleaning company on a permanent basis?

2-B2 Cost-Volume-Profit at a Day Care Facility

Luke Morrison opened Luke's Corner, a small day care facility, just over two years ago. After a rocky start, Luke's Corner has been thriving. Morrison is now preparing a budget for November 20X7.

Monthly fixed costs for Luke's Corner are as follows:

Rent	\$ 800
Salaries	1,400
Other fixed costs	140
Total fixed costs	<u>\$ 2,340</u>

The salary is for Anna Dukes, the only employee, who works with Morrison by caring for the children. Morrison does not pay himself a salary, but he receives the excess of revenues over costs each month.

The cost driver for variable costs is "child-days." One child-day is one day in day care for one child, and the variable cost is \$12 per child-day. The facility is open from 6:00 AM to 6:00 PM weekdays (that is, Monday–Friday), and there are 22 weekdays in November 20X7. An average day has 8 children attending Luke's Corner. State law prohibits Luke's Corner from having more than 14 children, a limit it has never reached. Morrison charges \$30 per day per child, regardless of how long the child is at the facility.

- What is the break-even point for November in child-days? In revenue dollars?
- Suppose attendance for November 20X7 is equal to the average, resulting in $22 \times 8 = 176$ child-days. What amount will Morrison have left after paying all expenses?
- Suppose both costs and attendance are difficult to predict. Compute the amount Morrison will have left after paying all expenses for each of the following situations. Consider each case independently.
 - Average attendance is 9 children per day instead of 8, generating 198 child-days.
 - Variable costs increase to \$14 per child-day.
 - Rent increases by \$220 per month.
 - Morrison spends \$300 on advertising (a fixed cost) in November, which increases average daily attendance to 9.5 children.
 - Morrison begins charging \$33 per day on November 1, and average daily attendance slips to 7 children.

2-B3 Exercises in Cost-Volume-Profit Relationships

Each problem is unrelated to the others.

- Given: Selling price per unit, \$25; total fixed expenses, \$9,100; variable expenses per unit, \$18. Find break-even sales in units.
- Given: Sales, \$43,000; variable expenses, \$30,100; fixed expenses, \$8,400; net income, \$4,500. Find break-even sales in dollars.
- Given: Selling price per unit, \$29; total fixed expenses, \$30,400; variable expenses per unit, \$13. Find total sales in units to achieve a profit of \$8,000, assuming no change in selling price.
- Given: Sales, \$51,000; variable expenses, \$18,000; fixed expenses, \$18,000; net income, \$15,000. Assume no change in selling price; find net income if activity volume increases by 20%.
- Given: Selling price per unit, \$48; total fixed expenses, \$106,000; variable expenses per unit, \$36. Assume that variable expenses are reduced by 25% per unit, and the total fixed expenses are increased by 15%. Find the sales in units to achieve a profit of \$23,000, assuming no change in selling price.

2-B4 Identifying Cost Behavior Patterns

At a seminar, a cost accountant spoke on identification of different kinds of cost behavior. Tammy Li, a hospital administrator who heard the lecture, identified several hospital costs of concern to her. After her classification, Li presented you with the following list of costs and asked you to (1) classify its behavior as one of the following: variable, step, mixed, or fixed; and (2) identify a likely cost driver for each variable or mixed cost.

1. Operating costs of X-ray equipment (\$95,000 a year plus \$3 per film)
2. Health insurance for all full-time employees
3. Costs incurred by Dr. Rath in cancer research
4. Repairs made on hospital furniture
5. Training costs of an administrative resident
6. Straight-line depreciation of operating room equipment
7. Costs of services of King Hospital Consulting
8. Nursing supervisors' salaries (a supervisor is needed for each 45 nursing personnel)

Additional Assignment Material

MyLab Accounting

QUESTIONS

- 2-1** “Cost behavior is simply identification of cost drivers and their relationships to costs.” Comment.
- 2-2** Give two rules of thumb to use when analyzing cost behavior.
- 2-3** Give three examples of variable costs and of fixed costs.
- 2-4** Why is the word *immediately* used in the definition of *fixed cost* and not in the definition of *variable cost*?
- 2-5** “It is confusing to think of fixed costs on a per-unit basis.” Do you agree? Why or why not?
- 2-6** “All costs are either fixed or variable. The only difficulty in cost analysis is determining which of the two categories each cost belongs to.” Do you agree? Explain.
- 2-7** “The relevant range pertains to fixed costs, not variable costs.” Do you agree? Explain.
- 2-8** Identify the major simplifying assumption that underlies CVP analysis.
- 2-9** “Classification of costs into variable and fixed categories depends on the decision situation.” Explain.
- 2-10** “Contribution margin is the excess of sales over fixed costs.” Do you agree? Explain.
- 2-11** Why is *break-even analysis* a misnomer?
- 2-12** “Companies in the same industry generally have about the same break-even point.” Do you agree? Explain.
- 2-13** “It is essential to choose the right CVP method—equation, contribution margin, or graphical. If you pick the wrong one, your analysis will be faulty.” Do you agree? Explain.
- 2-14** How will a change in the fixed expenses or unit contribution margin affect the break-even point?
- 2-15** How is spreadsheet-based CVP modeling beneficial in break-even analysis?
- 2-16** Define operating leverage and explain why a highly leveraged company may be risky.
- 2-17** Suppose a company with high operating leverage is also operating at near capacity for all its fixed-cost resources. How could an increase in sales volume result in decreasing economies of scale for this company?
- 2-18** What is the relationship between the margin of safety and the break-even point?
- 2-19** “The contribution margin and gross margin are always equal.” Do you agree? Explain.
- 2-20** “CVP relationships are unimportant in nonprofit organizations.” Do you agree? Explain.
- 2-21** Study Appendix 2A. A company sold two products. Total budgeted sales and total actual sales in number of units were identical. Actual unit variable costs and sales prices were the same as budgeted. Actual total contribution margin was lower than budgeted. What could be the reason for the lower contribution margin?
- 2-22** Study Appendix 2B. Given a target after-tax net income, present the CVP formula for computing the income before income taxes.
- 2-23** Study Appendix 2B. Present the CVP formula for computing the effects of a change in volume on after-tax income.

CRITICAL THINKING EXERCISES

2-24 Mixed Costs and the Sales Force

Wysocki Company pays its sales force a fixed salary plus a 5% commission on all sales. Explain why sales force costs would be considered a mixed cost.

2-25 Marketing Function of Value-Chain and Cost Behavior

Refer to Exhibit 2-2. For the two examples of marketing costs given in Exhibit 2-2, describe their cost behavior in relation to the cost driver listed.

2-26 Production Function of Value-Chain and Cost Behavior

Refer to Exhibit 2-2. For the labor wages and depreciation of plant and machinery examples of production costs given in Exhibit 2-2, describe their cost behavior in relation to the cost driver listed.

2-27 Marico Engineering's Value Chain

Marico Engineering is a leading producer of Megatron Tubes for microwave manufacturers and the replacement market, with their annual revenue reaching £2.5 billion. After reporting weak earnings and revenue in the previous two quarters, the company undertook a strategy to reduce its break-even point by 20% by selling excess capacity, reducing head count, and introducing new product variants with a high contribution margin. The company's senior vice president listed the key elements of the company's strategy, stating, "We are gaining momentum and transforming our European aftermarket business with new products, new technology, new positioning strategy, and new pricing." For each of these "new" elements of Marico's aftermarket strategy, list the value-chain functions that are most applicable.

EXERCISES

2-28 Identifying Cost Drivers

The following list identifies several potential cost drivers for a manufacturing company that makes eight products. The company uses a JIT production system so it stores finished products for a very limited time. The eight products vary substantially in size from small (plastic casings for pens) to large (plastic casings for truck instrument panels). The company uses order-processing labor to process all orders from customers.

- Number of setups
- Setup time
- Square feet
- Cubic feet
- Cubic feet weeks
- Number of orders
- Number or order line items

For each of the following situations (activity and related resource), identify the best cost driver from the list and briefly justify your choice.

1. To produce a product, production mechanics must set up machinery. It takes about the same time to set up for a production run regardless of the product being produced. What is the best cost driver for the resources used during the setup activity?
2. Instead of the situation described in number 1, what driver should the company use for the setup activity if it takes longer to set up for complex products, such as the instrument panel casings, than for simple products, such as pen casings?
3. What driver should the company use for warehouse occupancy costs (depreciation and insurance)? The company uses the warehouse to store finished products.
4. What driver should the company use for the warehouse occupancy costs if it did not use a JIT system (that is, the company maintains inventories), and upon inspection one of the products had a thick layer of dust on it?
5. What driver should the company use for order processing cost? All orders are similar in terms of types of products ordered and it takes about the same time to process each type of product.
6. What driver should the company use for order processing cost if orders vary substantially in terms of types of products ordered and it takes about the same time to process each type of product?

2-29 Basic Review Exercises

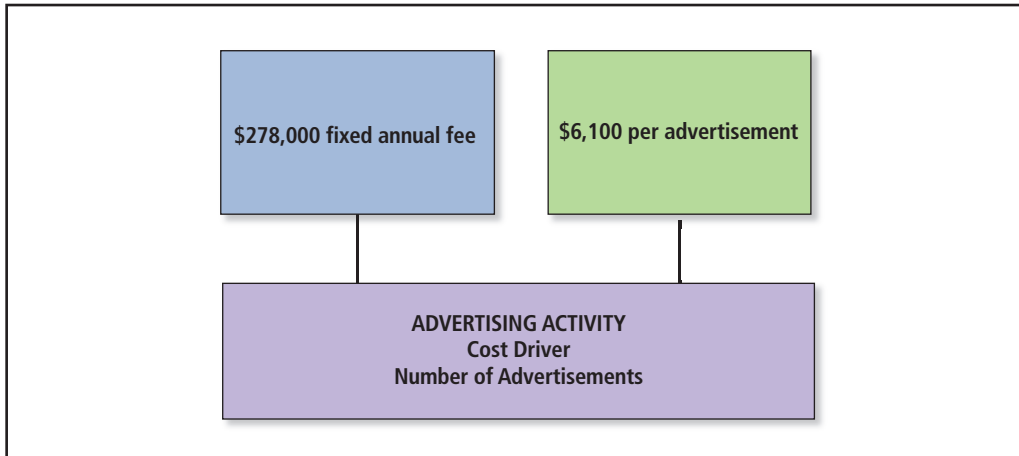
Fill in the blanks for each of the following independent cases (ignore income taxes):

	Sales	Variable Expenses	Contribution Margin	Fixed Expenses	Net Income
1.	\$960,000	\$533,000	\$ —	\$310,000	\$ —
2.	550,000	—	300,000	—	46,000
3.	—	500,000	520,000	200,000	—

2-30 Variable- and Fixed-Cost Behavior

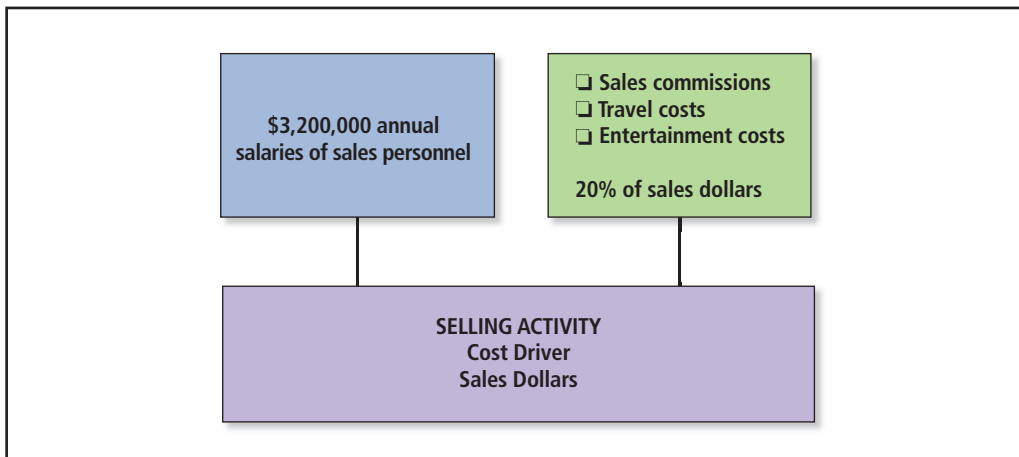
Refer to Exhibits 2-2 and 2-3 on p. 56 and p. 57. Part of a company's marketing function is as described in Exhibit 2-2. Two of the many marketing-function activities are advertising and selling. The annual cost behavior of the resources used to perform the advertising activity is depicted in the following diagram. With respect to the cost driver number of advertisements, which of the two costs

is fixed? Which cost is variable? What is the total cost of advertising if the number of advertisements is 46? 92? Does the total cost of advertising double in response to a doubling of the cost driver level? Why or why not?



2-31 Variable- and Fixed-Cost Behavior

Refer to Exhibits 2-2 and 2-3 on p. 56 and p. 57. Part of a company's marketing function is as described in Exhibit 2-2. Two of the many marketing-function activities are advertising and selling. The annual cost behavior of the resources used to perform the selling activity is depicted in the following diagram. With respect to the cost driver sales dollars, which of the two costs is fixed? Which cost is variable? What is the total cost of the selling activity if sales dollars are \$24,000,000? What is the total cost of selling if sales dollars are \$12,000,000? Does the total cost of selling decrease by half in response to a 50% decrease in the cost driver level? Why or why not?



2-32 Basic Review Exercises

Fill in the blanks for each of the following independent cases:

Case	(a) Selling Price per Unit	(b) Variable Cost per Unit	(c) Total Sales Units	(d) Total contribution Margin	(e) Total Fixed Costs	(f) Net income
1	£25	£—	120,000	£720,000	£650,000	£—
2	11	7	100,000	—	300,000	100,000
3	20	17	—	60,000	—	15,000
4	25	15	60,000	—	—	50,000
5	—	13	80,000	160,000	120,000	—

2-33 Basic Cost-Volume-Profit Graph

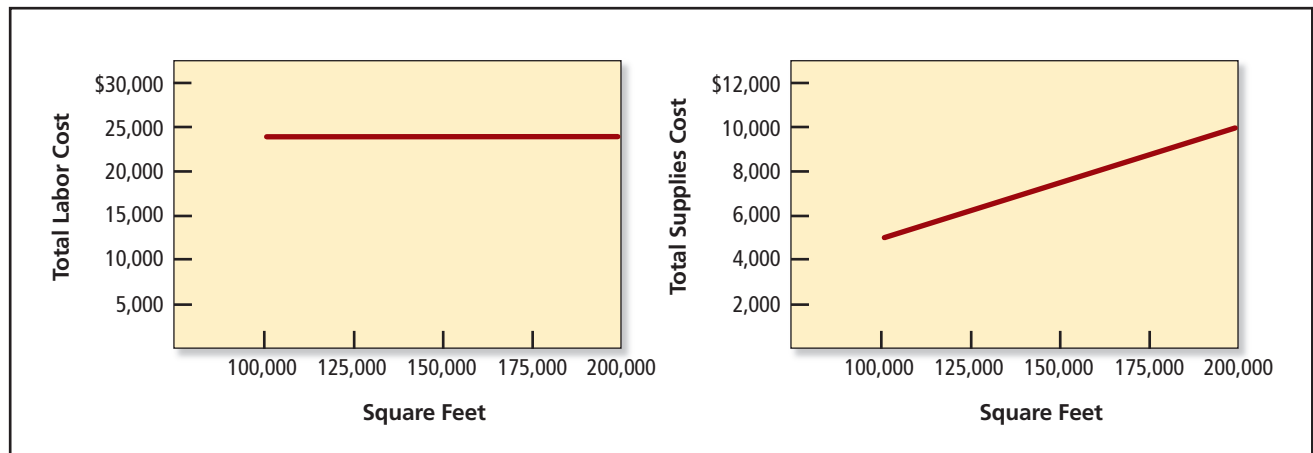
Refer to Exercise 2-32. Construct a cost-volume-profit graph for Case 2 that depicts the total revenue, total variable cost, total fixed cost, and total cost lines. Estimate the break-even point in total units sold and the net income for 100,000 units sold.

2-34 Basic Cost-Volume-Profit Graph

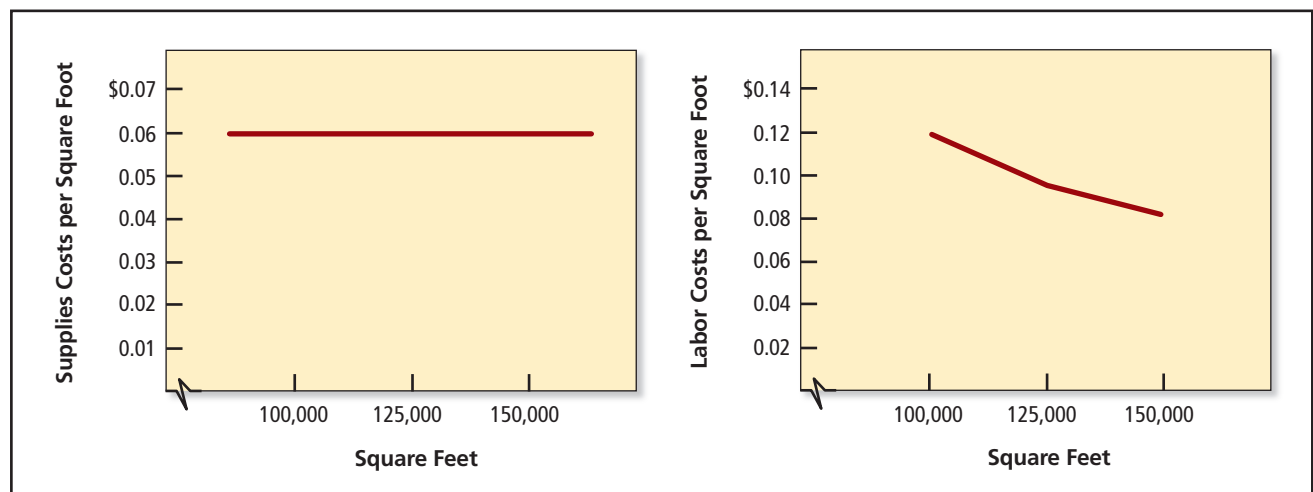
Refer to Exercise 2-32. Construct a cost-volume-profit graph for Case 4 that depicts the total revenue, total variable cost, total fixed cost, and total cost lines. Estimate the break-even point in total units sold and the net income (loss) for 50,000 units sold.

2-35 Basic Cost-Volume Graphs

From the following two graphs, construct two graphs that depict the cost behavior on a per-square-foot basis for volumes ranging from 100,000 to 200,000 square feet. (Note that the Total Labor Cost in these graphs is \$24,000 for all volumes, while Total Supplies Cost ranges from \$5,000 for 100,000 square feet to \$10,000 for 200,000 square feet.) Which of the two constructed graphs show fixed-cost behavior? Variable-cost behavior?

**2-36 Basic Cost-Volume Graphs**

From the following two graphs, construct two graphs that depict the cost behavior on a total cost basis for volumes ranging from 100,000 to 150,000 square feet. (Note that the Supplies Costs per Square Foot in these graphs are \$0.06 for all volumes, while Labor Costs per Square Foot range from \$0.12 for 100,000 square feet to \$0.096 for 125,000 square feet to \$0.08 for 150,000 square feet.) Which of the two constructed graphs show fixed-cost behavior? Variable-cost behavior?

**2-37 Step Costs**

Which of the following are step costs? Why?

1. Fees for an annual maintenance contract on factory equipment used in production throughout the year

2. Cost of maintaining ticket counters in a soccer tournament where a new counter must be opened for every 200 spectators that come in
3. Cost of cotton cloth in a readymade garments manufacturing company; cotton cloth is purchased in truckload shipments, where each truckload contains 2,500 meters of cotton cloth

2-38 Mixed Costs

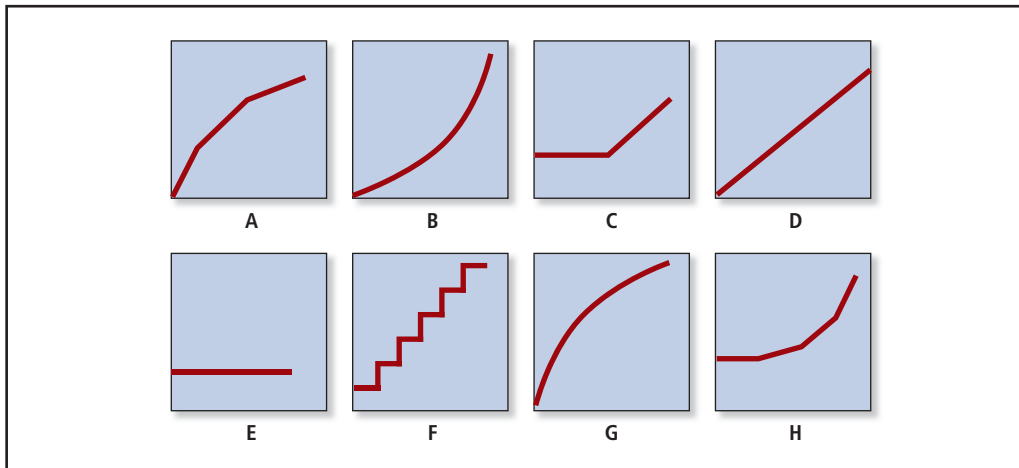
The following cost equation represents the formula for calculating the electricity charges to be levied by Hex Power System, South Korea, an electricity distributor, on its corporate consumers. Explain why the above cost is a mixed cost and not a fixed cost, variable cost, or step cost for a corporate consumer.

$$\text{Total electricity charges payable} = \text{₩}12,000 + \text{₩}103.60 \times \text{units consumed}$$

(Note: The South Korean Won, ₩, is the official currency of the Republic of South Korea.)

2-39 Various Cost-Behavior Patterns

In practice, there is often a tendency to simplify approximations of cost-behavior patterns, even though the “true” underlying behavior is not simple. Choose from the following graphs A–H the one that matches the numbered items. Indicate by letter which graph best fits each of the situations described. Next to each number-letter pair, identify a likely cost driver for that cost.



The vertical axes of the graphs represent total dollars of costs incurred, and the horizontal axes represent levels of cost driver activity during a particular time period. The graphs may be used more than once.

1. Cost of machining labor that tends to decrease as workers gain experience
2. Price of an increasingly scarce raw material as the quantity used increases
3. Guaranteed annual wage plan, whereby workers get paid for 40 hours of work per week even at zero or low levels of production that require working only a few hours weekly
4. Water bill, which entails a flat fee for the first 10,000 gallons used and then an increasing unit cost for every additional 10,000 gallons used
5. Availability of quantity discounts, where the cost per unit falls as each price break is reached
6. Depreciation of office equipment
7. Cost of sheet steel for a manufacturer of farm implements
8. Salaries of supervisors, where one supervisor is added for every 12 phone solicitors
9. Natural gas bill consisting of a fixed component, plus a constant variable cost per thousand cubic feet after a specified number of cubic feet are used

2-40 Hospital Costs and Pricing

Olympia Hospital has overall variable costs of 25% of total revenue and fixed costs of \$45 million per year.

1. Compute the break-even point expressed in total revenue.
2. A patient-day is often used to measure the volume of a hospital. Suppose there are to be 37,500 patient-days next year. Compute the average daily revenue per patient-day necessary to achieve the break-even total revenue computed in item 1.

2-41 Cost-Volume-Profit at a Hospital

Children’s Hospital predicts variable costs of 70% of total revenue and fixed costs of \$42 million per year for the coming year.

1. Compute the break-even point expressed in total revenue.
2. Children's Hospital expects total revenue of \$150 million from 200,000 patient-days. Compute expected profit (a) if costs behave as expected, and (b) if variable costs are 10% greater than predicted

2-42 Nursing Home Revenue

Apollo Hospitals, headquartered in Chennai, India, provides medical services across the country through its private nursing homes. Founded in 1983, it is currently the leading hospital chain in India, with a revenue of ₹97.20 billion and profits of ₹4.70 billion in the 2019–2020 fiscal year.

The Kolkata unit of the hospital has annual fixed costs of ₹29 million for its 120-bed hospital, with average daily bed charges of ₹5,000 and average variable cost of ₹4,200 for each occupied bed. The hospital remains operative 365 days per year.

1. How much net income on beds will the Kolkata unit generate (a) if the hospital is fully occupied throughout the year and (b) if the unit is occupied to 50% of its capacity?
2. Compute the break-even point in number of beds occupied. What percentage occupancy for the year is needed to break even?

(Note: The Indian Rupee, ₹, is the official currency of India.)

2-43 Variable Cost to Break Even

General Mills makes Nature Valley granola bars, Cheerios cereal, Yoplait yogurt, Häagen-Dazs ice cream, and many other food products. Suppose the product manager of a new General Mills cereal has determined that the appropriate wholesale price for a carton of the cereal is \$48. Fixed costs of the production and marketing of the cereal are \$19 million.

1. The product manager estimates that she can sell 800,000 cartons at the \$48 price. What is the largest variable cost per carton that General Mills can pay and still achieve a profit of \$1 million?
2. Suppose the variable cost is \$25 per carton. What profit (or loss) would General Mills expect?

2-44 Sales-Mix Analysis

Study Appendix 2A. Eames Farms produces strawberries and raspberries. Annual fixed costs are \$15,300. The cost driver for variable costs is "pints of fruit produced." The variable cost is \$0.85 per pint of strawberries and \$0.90 per pint of raspberries. Strawberries sell for \$1.05 per pint, raspberries for \$1.30 per pint. Five pints of strawberries are produced for every two pints of raspberries.

1. Compute the number of pints of strawberries and the number of pints of raspberries produced and sold at the break-even point.
2. Suppose only strawberries are produced and sold. Compute the break-even point in pints.
3. Suppose only raspberries are produced and sold. Compute the break-even point in pints.

2-45 Income Taxes

Review the illustration in Appendix 2B. Suppose the income tax rate were 25% instead of 40%. How many units would the company have to sell to achieve a target after-tax net income of (a) \$864 and (b) \$1,440? Show your computations.

2-46 Income Taxes and Cost-Volume-Profit Analysis

Study Appendix 2B. Suppose Wooliscroft Construction Company has a 32% income tax rate, a contribution-margin ratio of 45%, and fixed costs of \$664,000. What sales volume is necessary to achieve an after-tax income of \$136,000?

PROBLEMS

2-47 Andrew's Doughnut Shop, CVP Analysis in a Small Business

Andrew Miller recently opened a new doughnut shop near Cornwall, England. He sells doughnuts in packets of four each. The average price of a doughnut box is \$4.00 and each box costs Andrew an average of \$2.80. He has hired two assistants at a monthly salary of \$2,000 per assistant. His rent, utilities, and other fixed operating costs are \$2,600 per month.

Andrew is considering selling hamburgers along with doughnuts to further diversify his menu and attract more customers. The price of each hamburger will be \$1.50. Andrew will buy buns for \$1.56 per dozen and ground beef for \$1.20 per pound. Each pound of ground beef will make three hamburgers. Other ingredients will cost an average of \$0.21 per hamburger. Andrew will also need to hire a part-time cook at \$1,500 per month. Other additional fixed costs will run about \$400 a month.

1. If Andrew sells only doughnuts, how many boxes does he have to sell every month to earn a profit of \$600?

2. If Andrew sells only doughnuts, how many boxes does he have to sell every month to earn a profit of 10% on sales?
3. Suppose Andrew decides to add hamburgers to his menu. How many hamburgers does he need to sell to break even on the hamburgers? Assume that there is no effect on doughnut sales.
4. The main reason Andrew wanted to add hamburgers to his menu was to attract more customers. Suppose that 2,000 extra customers came to his shop each month because of the availability of hamburgers and that each of them bought one hamburger and two boxes of doughnuts on an average. Compute the added profit (or loss) generated by these extra customers.
5. Andrew was not sure how many new customers would be attracted by the availability of hamburgers. Give Andrew some advice about how many new customers would be needed to just break even on the new business if each new customer bought one hamburger and one box of doughnuts. Include an assessment of the consequences of volume falling below or above this break-even point.
6. Andrew could offer a superior quality hamburger if he spends 50% more on the ingredients. He could then charge \$2.50 for each. Explain how Andrew could determine whether the superior quality hamburgers would be more profitable than the regular hamburgers.

2-48 Suraksha Polyclinic (OPD) Chain, Fixed and Variable Costs

Maintaining a clean, germ-free environment is a key success factor for Suraksha (Safety) Polyclinic, a large outpatient department (OPD) clinic chain in Kolkata, India. Three of the costliest resources needed to clean the OPD clinics are labor, equipment, and cleaning supplies. The cost driver for all these resources is the “number of times cleaned.” Wages for cleaning laborers and rent for cleaning equipment are the same regardless of the number of times the clinic is cleaned. Supplies used for each regular daily cleaning and for each special cleaning are about the same.

A typical clinic has 12,000 square feet. Regular cleaning is performed each day from 8.00 AM until 7:00 PM. Special cleaning of floors and fixtures is performed in the various departments as needed. The frequency of special cleaning varies from 10 to 30 times a month depending on the number of patients in the clinic. The number of times a clinic is cleaned varies from 40 to 60 times a month.

Suppose that in one of the clinics, cleaning was performed 60 times during March 2020. For that month, the cost of labor and rent on equipment was ₹42,000, and the cleaning supplies used cost ₹24,000. The sales budget for the next quarter (April through June) and current COVID-19 pandemic conditions indicated that the store would need to be cleaned 50, 46, and 35 times in April, May, and June, respectively.

1. Prepare a table that shows how labor cost, rent, and cleaning supplies cost, total cost, and total cost per cleaning changes in response to the number of times the clinic is cleaned. Show the cost for 35, 40, 45, 50, 55, and 60 cleanings. What is the predicted total cost of cleaning the clinic for the next quarter?
2. Prepare a single graph that can be used to predict the fixed, variable, and total cleaning cost of the clinic.
3. Suppose the manager of the clinic can hire an outside cleaning company to clean the store as needed. The rate is ₹1,440 per cleaning. If the outside cleaning company is hired, the store can lay off the workers who are now cleaning the store, eliminate the need for equipment rent, and stop purchasing cleaning supplies. Will Suraksha save money with the outside cleaning company over the next quarter? Prepare a schedule that supports your answer.

2-49 Fixed Costs and Relevant Range

Bridger Canyon Systems Group (BCSG) has substantial year-to-year fluctuations in billings to clients. Top management has the following policy regarding the employment of key professional personnel:

If Gross Annual Billings Are	Number of Persons to Be Employed	Key Professional Annual Salaries and Benefits
\$2,000,000 or less	10	\$1,000,000
\$2,000,001–2,400,000	11	\$1,100,000
\$2,400,001–2,800,000	12	\$1,200,000

Top management believes that the group should maintain a minimum of 10 individuals for a year or more even if billings drop drastically below \$2 million.

For the past five years, gross annual billings for BCSG have fluctuated between \$2,020,000 and \$2,380,000. Expectations for next year are that gross billings will be between \$2,100,000 and \$2,300,000. What amount should the group budget for key professional personnel salaries? Graph the relationships on an annual basis, using the two approaches (refined and simplified) illustrated in Exhibit 2-6 on p. 60. Indicate the relevant range on each graph. You need not use graph paper; simply approximate the graphical relationships.

2-50 Comparing Contribution Margin Percentages

Following are actual statements of operating income for **Microsoft** and **Procter & Gamble** (in millions):

Microsoft		Procter & Gamble	
Revenues	\$60,420	Net sales	\$83,503
Cost of revenue	11,598	Cost of products sold	40,695
Research and development	8,164	Selling, general, and administrative expenses	<u>25,725</u>
Sales and Marketing	13,039		
General and administrative	<u>5,127</u>	Operating income	<u>\$17,083</u>
Operating income	<u>\$22,492</u>		

Assume that the only variable cost for Microsoft is “cost of revenue” and for Procter & Gamble the only variable cost is “cost of products sold.”

1. Compute the contribution-margin percentage of Microsoft and that of Procter & Gamble. Why do you suppose the percentages are so different?
2. Suppose each company increases its revenue by \$10 million. Compute the increase in operating income for each company.
3. Explain how the contribution margin percentage helps you predict the effects on operating income of changes in sales volume. What assumptions do you make in forming such a prediction?

2-51 Cost Structure and Risk Sharing

Natsuki is the manager of Kurosawa Traditional Weekend Flicks sponsored by the Kurosawa Film Institute Student Association, Japan. The admission price is ¥300. Every Saturday and Sunday evening a film has one screening and a maximum of 500 tickets can be sold for each screening. The rental of the auditorium is ¥33,000 and labor is ¥43,500, including ¥9,000 payable to the manager, Natsuki. Natsuki must pay the film distributor a guarantee ranging from ¥30,000 to ¥95,000 or 50% of the gross admission receipts, whichever is higher.

Before and during the show, Natsuki sells refreshments; these sales average 14% of the gross admission receipts and yield a contribution margin of 45%.

1. On December 5, Natsuki screened *Avengers: Endgame*. The film grossed ¥225,000. The guarantee to the distributor was ¥75,000 or 50% of gross admission receipts, whichever is higher. What operating income was produced for the Student Association?
2. Recompute the result if the film grossed ¥140,000.
3. The “four-wall” concept is increasingly being adopted by movie producers. In this plan, the movie producer pays a guaranteed fixed rental to the theatre owner for, say, a week’s screening of a movie and the producer receives the ticket receipts less the fixed rental. As a theatre owner, how would you evaluate a “four-wall” offer?

(Note: The Yen, ¥, is the official currency of Japan.)

2-52 CVP for Promotion of a Rock Concert

TJB Productions, Ltd., is promoting a rock concert in London. The bands will receive a flat fee of £7.3 million. The concert will be shown worldwide on closed-circuit television. TJB will collect 100% of the receipts and will return 20% to the individual local closed-circuit theater managers. TJB expects to sell 1.3 million seats at a net average price of £15 each. TJB will also receive £270,000 from the London arena (which has sold out its 19,700 seats, ranging from £175 for box seats to £20 for general admission, for a gross revenue of £1.2 million); TJB will not share the £270,000 with the local promoters.

1. The general manager of TJB Productions is trying to decide what amount to spend for advertising. What is the most TJB could spend and still break even on overall operations, assuming sales of 1.3 million tickets?
2. If TJB desires an operating income of £490,000, how many seats would it have to sell? Assume that the average price is £15 and fixed costs consist of the £7.3 million fee for the bands and £3.7 million for advertising, for total fixed costs of £11 million.

2-53 Cost Drivers at Boeing

Consider a **Boeing** plant. Suppose Boeing has a cost-reduction program for this plant to reduce the costs of activities, such as receiving parts for its airplanes, by 10%.

At a meeting of the receiving department operating managers and the accounting staff, complaints were made that cost-reduction was not completely the responsibility of the receiving department because some factors were beyond the department’s control. Managers pointed out that the total cost of fuel is a function of fuel price per gallon and the gallons used. Furthermore, neither the price

paid for fuel nor the lease cost is controllable by receiving department employees. Managers argue that the factors such as fuel and equipment usage were not explicitly tracked and costed. These operating measures were the ones managers believed to be the ones that should be used as cost drivers.

You have been asked to refine the way variable and fixed costs are calculated by using the more relevant cost drivers for fuel and equipment—“gallons” and “hours operated.” You have collected the following data for the most recent period.

Equipment cost	\$45,000
Fuel cost	\$24,000
Hours equipment operated	1,500
Gallons of fuel used	6,000
Parts received	30,000
Target cost goal after 10% cost reduction ($90\% \times \$69,000$)	\$62,100

1. Draw a diagram similar to Exhibit 2-4 on p. 58 that shows the relationships between the receiving activity and the resources used and that incorporates the new cost drivers recommended by operating managers. On the diagram, show the total level of each cost driver, the fuel consumption rate in gallons used per part received, and the equipment consumption rate in hours per part received.
2. Refer to your answer to requirement 1. If the number of parts received increased from 30,000 to 40,000, which number(s) would most likely change: total gallons used, total hours operated, or gallons per part received? Derive an equation that calculates total fuel cost as a function of fuel cost per gallon and fuel consumption rate. Predict the total cost of the receiving activity if the number of parts received is 40,000.
3. The managers in the receiving department have a plan that will improve fuel efficiency. What is the predicted total cost of receiving 30,000 parts if the fuel consumption rate is reduced by 20% (assume fuel costs per gallon will not change)? Will the receiving department achieve Boeing's 10% cost-reduction goal? Why or why not?
4. Comment on the benefits of the new cost-driver model compared to the one based solely on one cost driver—“number of parts received.”
5. Can you think of other refinements in the cost-driver model based on the data that are given?

2-54 Basic CVP Relationships, Restaurant

Joann Swanson owns and operates a restaurant. Her fixed costs are \$17,000 per month. She serves luncheons and dinners. The average total bill (excluding tax and tip) is \$18 per customer. Swanson's present variable costs average \$9.50 per meal.

1. How many meals must she serve to attain a profit before taxes of \$8,500 per month?
2. What is the break-even point in number of meals served per month?
3. Suppose Swanson's rent and other fixed costs rise to a total of \$25,420 per month and variable costs also rise to \$11.40 per meal. If Swanson increases her average price to \$22, how many meals must she serve to make \$8,500 profit per month?
4. Assume the same situation described in requirement 3. Swanson's accountant tells her she may lose 15% of her customers if she increases her prices. If this should happen, what would be Swanson's profit per month? Assume that the restaurant had been serving 3,000 customers per month.
5. Assume the same situation described in requirement 4. To help offset the anticipated 15% loss of customers, Swanson hires a pianist to perform for 4 hours each night for \$2,300 per month. Assume that this would increase the total monthly meals from 2,550 to 2,800. Would Swanson's total profit change? By how much?

2-55 Break-Even Analysis, Target Income

Digital Innovations is an emerging startup that produces and sells innovative digital products. At the beginning of 2020, the company came up with Digital TV Stick, an innovative product that can transform any normal television into an Android television and help users to access online digital content on various streaming platforms including YouTube, Amazon Prime Video, Netflix, and others. The company charges \$40 for its 4k TV stick; the variable cost of the product is \$20 and the annual fixed cost has been budgeted at \$10,000. The company's after-tax profit objective was \$24,000 and the company is in a 40% tax bracket. An analysis by the company's CEO revealed that during the first five months of the year, only 350 units had been sold at the established price. It seemed that the after-tax profit projection was going to be very hard to achieve unless some actions were taken. The CEO assigned a management committee to analyze the situation and devise several alternative courses of action. The committee has presented the following three alternative courses of action:

- A. Reduce the selling price by \$4. The sales organization forecasts that with the significantly reduced selling price, 2,700 units can be sold during the remainder of the year. The total fixed and unit variable costs will remain unaltered.

- B. Lower the variable cost per unit by \$2.5 through the use of less expensive materials and slightly modified manufacturing techniques. The sales price will also be reduced by \$3, and consequent sale of 2,200 units for the remainder of the year is expected.
- C. Cut the fixed costs by \$1,000 and lower the sales price by 5%. The variable cost per unit will remain the same. Sale of 2,100 units is expected for the remainder of the year.

In view of this, do the following:

1. Determine the target sales (in units) in order to break even assuming no changes are made to the selling price and cost structure.
2. Determine the target sales (in units) in order to achieve the company's after-tax profit objective.
3. Determine which one of the alternatives the company should select to achieve its annual after-tax profit objective. You must support your selection with appropriate calculations.

2-56 CVP and Financial Statements for a Mega-Brand Company

Procter & Gamble Company is a Cincinnati-based company that produces household products under brand names such as Gillette, Bounty, Crest, Folgers, and Tide. The company's 2011 income statement showed the following (in millions):

Net sales	\$82,559
Costs of products sold	40,768
Selling, general, and administrative expense	25,973
Operating income	<u>\$15,818</u>

Suppose that the cost of products sold is the only variable cost; selling, general, and administrative expenses are fixed with respect to sales.

Suppose Procter & Gamble has a 10% decrease in sales next year and there is no change in costs except for decreases associated with the lower volume of sales. Compute the predicted operating income for Procter & Gamble and its percentage decrease. Explain why the percentage decrease in income differs from the percentage decrease in sales.

2-57 Bingo and Operating Leverage

Julian De Klerk, the secretary of Club Horizon, is investigating the feasibility of conducting weekly bingo nights. The club doesn't have a hall of its own. So Julian has approached a local hotel for its hall. The manager of the hotel is willing to commit its hall for a lump-sum rental of €1,900 per night. The rent would include cleaning, setting up and taking down the tables and chairs, and so on.

1. A local printer has shown interest in providing bingo cards in return for free advertising on the cards. Local merchants would donate door prizes. The services of clerks, callers, security force, and others would be donated by the club members. Admission would be €16 per person, entitling the player to one card; extra cards would be available at €1.00 each. It is expected that many people will buy extra cards so there would be an average of five cards played per person. What is the maximum in total cash prizes that the club may award and still break even if 200 persons attend each weekly session?
2. Suppose the total cash prizes are €2,100. What will be the club's operating income if 60 persons attend? If 200 persons attend? If 400 persons attend? Briefly explain the effects of the cost behavior on income.
3. After operating for six months, Julian is thinking of negotiating a different rental arrangement but keeping the prize money unchanged at €2,100. Suppose the rental arrangement is €1,400 per night plus €2 per person. Compute the operating income for attendance of 60, 200, and 400 persons, respectively. Explain why the results differ from those in requirement 2.

2-58 Operating Leverage at eBay

In 2011, **eBay** had \$11.6 billion in revenue and net income over \$3.2 billion. eBay's mission is to "provide a global trading platform where practically anyone can trade practically anything." However, eBay has not always had profits in the billions.

Consider eBay's situation during the early years. In the first quarter of 2001, eBay reported revenue of \$154 million and operating expenses of \$123 million, for an operating profit of \$31 million. In the first quarter of 2002, eBay reported that revenue had increased 59%, to \$245 million. Assume that during both years, eBay's fixed costs were \$37 million and all other costs were variable costs.

1. Compute eBay's operating income for the first quarter of 2002 assuming that variable costs were the same percentage of revenue in 2002 as in 2001. Compute the percentage increase in operating income between 2001 and 2002.
2. Explain how eBay managed to increase its income so much with only a 59% increase in revenue.

2-59 Adding a Product

Ethan's Eatery, located near the University of Newcastle, Australia, serves as a popular gathering place for the university students. Ethan sells a popular Aussie fast-food meat pie usually stuffed with minced meat, gravy, mushrooms, onions, and cheese. The meat pies are sold with a contribution margin of A\$0.60 a pie.

Ethan is considering also selling fish and chips during daytime. He believes it will be an added attraction for foreign students. Moreover, he has to meet competition from other local eateries that provide more extensive menus.

Ethan analyzed the costs of adding fish and chips as follows:

Per Month		Per Plate of Fish and Chips	
Monthly Fixed expenses		Variable Expenses	
Wages of the part-time cook	A\$ 1,450	Chips	A\$ 1.15
Other	<u>350</u>	Fish	2.35
Total	A\$ <u>1,800</u>	Other	<u>0.20</u>
		Total	A\$ <u>3.70</u>

Ethan planned to charge A\$4.50 per plate of fish and chips to lure many customers. For all questions, assume a 30-day month.

1. What are the monthly and daily break-even points in number of plates of fish and chips?
2. What are the monthly and daily break-even points in A\$ sales?
3. At the end of two months, Ethan finds he has sold 3,200 plates of fish and chips. What is the operating profit per month on fish and chips?
4. Ethan thinks that at least 80 extra meat pies are sold per day because he has these fish and chips available. This means that 80 extra people come to the eatery or that 80 buy an extra meat pie because they are attracted by the fish and chips. How does the sale of fish and chips combined with the accompanying effect on meat pie sales affect Ethan's monthly operating income?
5. Refer to requirement 3. How many extra meat pies would have to be sold per day so that the overall effect of the fish and chips sales on monthly income would be zero?

(Note: The Australian Dollar, A\$, is the official currency of Australia.)

2-60 Government Organization

CRY, a well-known social welfare agency that works for orphans in the United Kingdom, gets an annual budget appropriation from the government, which it then allocates to various orphanages throughout the country. In 2020, the agency received £1,800,000. On an average, it distributed £10,000 to each orphanage. The agency's fixed costs are £560,000. There are no other costs.

1. How many orphanages were helped during 2020?
2. For 2021, the agency's budget appropriation has been reduced by 15%. If the agency continues the same level of monetary support per orphanage, how many orphanages will be helped in 2021? Compute the percentage decline in the number of orphanages helped.
3. Assume a budget reduction of 15%, as in requirement 2. The manager of the agency has discretion as to how much monetary support to provide to each orphanage. She does not want to reduce the number of orphanages served. On average, what is the amount of monetary support that can be provided to each orphanage? Compute the percentage decline in the annual monetary support to each orphanage.

2-61 Gross Margin and Contribution Margin

Eastman Kodak Company is a provider of imaging technology products and services to the photographic, graphic communications, and healthcare markets. A condensed 2011 income statement follows (in millions):

Sales	\$6,022
Cost of goods sold	<u>5,135</u>
Gross margin	887
Other operating expenses	<u>1,487</u>
Loss from continuing operations	<u><u>\$ (600)</u></u>

Assume that \$1,400 million of the cost of goods sold is a fixed cost representing depreciation and other production costs that do not change with the volume of production. In addition, \$1,000 million of the other operating expenses is fixed.

1. Compute the total contribution margin for 2011 and the contribution margin percentage. Explain why the contribution margin differs from the gross margin.
2. Suppose that sales for Eastman Kodak are predicted to increase by 10% and that the cost behavior is expected to continue. Compute the predicted operating income (loss).
3. What assumptions were necessary to compute the predicted operating income in requirement 2?

2-62 Choosing Equipment for Different Volumes

IMG Worlds of Adventure is one of the most popular theme parks in Dubai, UAE. It features four zones, including one dedicated entirely to the Jurassic period. The temperature-controlled theme park has more than 20 rides and attractions. Its signature ride, Velociaptor, is the tallest rollercoaster in Dubai, propelling guests to 100 km in 2.5 seconds, from a prehistoric jungle to the desert.

The management of the theme park is considering installing machines that will make candy floss on the premises. These machines would allow the park to sell fresh candy floss in popular Marvel characters' shapes rather than the pre-bagged traditional candy floss that it currently sells. This proposed feature would be properly advertised and is intended to increase its market share.

The machines can be purchased in several different sizes. The annual rental costs and operating costs vary with the size. The machine capacities and costs are as follows:

	Machine Type		
	Standard	Super	Supreme
Annual capacity	100,000 packets	240,000 packets	600,000 packets
Costs			
Annual machine rental	\$15,680	\$22,400	\$40,400
Candy floss cost per packet	0.15	0.15	0.15
Cost of each packet	0.10	0.10	0.10
Other variable cost per packet	0.20	0.12	0.03

1. Calculate the volume level in packets at which the standard and super candy floss makers would earn the same operating profit (or loss).
2. Recommend a suitable decision rule that the park authorities can follow to select the most appropriate model (for its other theme parks in other parts of UAE) based on the number of packets to be sold. That is, at what anticipated range of unit sales should the park use the standard model? The super model? The supreme model?

2-63 Sales Compensation, Variable/Fixed Costs, and Ethics

Companies across the world often compensate their sales forces with a combination of a fixed salary and a commission that is a percentage of sales. Consider two companies—for example, Nestlé and Sicca-Nahrungsmittel—competing for the same customers in the breakfast cereal market. Suppose that Nestlé's compensation policy for the sales force includes a higher fixed salary with a small commission on sales whereas the compensation policy of Sicca involves a smaller fixed salary with a large commission. The total pay on average is the same for both companies.

1. Compare the sales cost structure of Nestlé with that of Sicca. Which has the larger fixed costs? Which has the larger variable cost? How will this affect each company's risk? (Focus on how the company's profits change with change in volume.)
2. What incentives does each pay system provide for the sales force?
3. Might either incentive system create potential ethical dilemmas for the sales personnel? Explain.

2-64 Sales-Mix Analysis

Study Appendix 2A. The Colorado Catering Company specializes in preparing Mexican dinners that it freezes and ships to restaurants in the Denver area. When a diner orders an item, the restaurant heats and serves it. The budget data for 20X5 are as follows:

	Product	
	Chicken Tacos	Beef Enchiladas
Selling price to restaurants	\$4	\$5
Variable expenses	<u>3</u>	<u>3</u>
Contribution margin	<u>\$1</u>	<u>\$2</u>
Number of units	200,000	100,000

The company prepares the items in the same kitchens, delivers them in the same trucks, and so forth. Therefore, decisions about the individual products do not affect the fixed costs of \$680,000.

1. Compute the planned net income for 20X5.
2. Compute the break-even point in units, assuming that the company maintains its planned sales mix.
3. Compute the break-even point in units if the company a) sells only tacos, or b) sells only enchiladas.
4. Suppose the company sells 225,000 units of tacos and 75,000 units of enchiladas, for a total of 300,000 units. Compute the net income. Compute the new break-even point with this new sales mix. What is the major lesson of this problem?

2-65 Hospital Patient Mix

Study Appendix 2A. Hospitals measure their volume in terms of patient-days. We calculate patient-days by multiplying the number of patients by the number of days that the patients are hospitalized. Suppose a large hospital has fixed costs of \$52.8 million per year and variable costs of \$750 per patient-day. Daily revenues vary among classes of patients. For simplicity, assume that there are two classes: (1) self-pay patients (S) who pay an average of \$1,250 per day and (2) non-self-pay patients (G) who are the responsibility of insurance companies and government agencies and who pay an average of \$950 per day. Twenty-five percent of the patients are self-pay.

1. Compute the break-even point in patient-days, assuming that the hospital maintains its planned mix of patients.
2. Suppose that the hospital achieves 172,000 patient-days but that 40% of the patient-days were self-pay (instead of 25%). Compute the net income. Compute the break-even point.

2-66 Income Taxes on Hotels

Study Appendix 2B. The Regal Hotel in downtown Phoenix has annual fixed costs applicable to rooms of \$8.7 million for its 570-room hotel, average daily room rates of \$90, and average variable costs of \$42 daily for each room rented. It operates 365 days per year. The hotel is subject to an income tax rate of 25%.

1. How many rooms must the hotel rent to earn a net income after taxes of \$801,000? Of \$400,500?
2. Compute the break-even point in number of rooms rented. What percentage occupancy for the year is needed to break even?
3. Assume that the volume level of rooms rented is 200,000. The manager is wondering how much income could be generated if 6,000 additional rooms are rented. Compute the additional net income after taxes.

2-67 Tax Effects

Study Appendix 2B. Decca Company is a wholesaler of compact discs. The projected after-tax net income for the current year is \$90,000, based on a sales volume of 170,000 CDs. Decca has been selling the CDs at \$15 each. The variable costs consist of the \$8 unit purchase price and a handling cost of \$4 per unit. Decca's annual fixed costs are \$714,000, and the company is subject to a 40% income tax rate.

Management is planning for the coming year when it expects that the unit purchase price will increase 25%.

1. Compute Decca Company's break-even point for the current year.
2. An increase of 15% in projected unit sales volume for the current year would result in an increased after-tax income for the current year of how much?
3. Compute the volume of sales in dollars that Decca Company must achieve in the coming year to maintain the same after-tax net income as projected for the current year if unit selling price remains at \$15.
4. To cover a 25% increase in the unit purchase price for the coming year and still maintain the current contribution-margin ratio, Decca Company must establish a selling price per unit for the coming year of how much?

CASES

2-68 Hospital Costs

The Institute of Neurosciences, Bangladesh, operates a rehabilitation center. Patients suffering from severe neurological disorders are referred to the rehabilitation center after they are discharged from the Institute so that they can learn to lead a normal life. The rehabilitation center has a capacity of 80 beds. The center levies a charge of BDT425 per bed per day from the patients for using its services. The data relating to charges collected and costs incurred for the year 2020 is as under:

Charges collected from patients	BDT6,991,250
Variable costs of the center	2,714,250
Fixed costs of the center	1,245,000

The general administration charges of the institute apportioned to the center are BDT2,000,000.

The center employed trained nursing staff based on the requirement in terms of annual patient days, paying them a salary of BDT60,000 per annum per nurse.

Annual Patient Days	No. of Nurses Employed
Less than 10,000	3
10,000 to less than 14,000	4
14,000 to less than 18,000	6
18,000 and above	8

While preparing the budget for 2021, the center made the following projections:

- All costs other than the apportioned general administration overheads will go up by 10%.
- The apportioned general administration overheads will increase by BDT500,000 per annum.
- The salary of the nursing staff will increase to BDT72,000 per annum per nurse.

The occupancy of the beds is likely to remain unchanged.

The management of the center is actively considering a proposal to close down the center as the occupancy rate is really low and the revenues may not be enough to meet all expenses.

- Determine the profitability of the center for 2020 and also compute the projected profit for 2021.
- Calculate the break-even bed capacity for the year 2021.
- By how much should the charges per bed per day be increased to justify the continuance of the center?

(Note: The Bangladeshi Taka, BDT, is the official currency of Bangladesh.)

2-69 CVP in a Modern Manufacturing Environment

A division of **Hewlett-Packard Company** changed its production operations from one where a large labor force assembled electronic components to an automated production facility dominated by computer-controlled robots. The change was necessary because of fierce competitive pressures. Improvements in quality, reliability, and flexibility of production schedules were necessary just to match the competition. As a result of the change, variable costs fell and fixed costs increased, as shown in the following assumed budgets:

	Old Production Operation	New Production Operation
Unit variable cost		
Material	\$ 0.88	\$ 0.88
Labor	1.22	0.22
Total per unit	<u>\$2.10</u>	<u>\$1.10</u>
Monthly fixed costs		
Rent and depreciation	\$450,000	\$ 875,000
Supervisory labor	80,000	175,000
Other	50,000	90,000
Total per month	<u>\$580,000</u>	<u>\$1,140,000</u>

Expected volume is 600,000 units per month, with each unit selling for \$3.10. Capacity is 800,000 units.

1. Compute the budgeted profit at the expected volume of 600,000 units under both the old and the new production environments.
2. Compute the budgeted break-even point under both the old and the new production environments.
3. Discuss the effect on profits if volume falls to 500,000 units under both the old and the new production environments.
4. Discuss the effect on profits if volume increases to 700,000 units under both the old and the new production environments.
5. Comment on the riskiness of the new operation versus the old operation.

2-70 Multiproduct Break Even in a Restaurant

Study Appendix 2A. An article in *Washington Business* included an income statement for **La Brasserie**, a French restaurant in Washington, D.C. A simplified version of the statement follows:

Revenues	\$2,098,400
Cost of sales, all variable	<u>1,246,500</u>
Gross profit	851,900
Operating expenses	
Variable	222,380
Fixed	170,940
Administrative expenses, all fixed	<u>451,500</u>
Net income	<u>\$ 7,080</u>

The average dinner tab at La Brasserie is \$40, and the average lunch tab is \$20. Assume that the variable cost of preparing and serving dinner is also twice that of a lunch. The restaurant serves twice as many lunches as dinners. Assume that the restaurant is open 305 days a year.

1. Compute the daily break-even volume in lunches and dinners for La Brasserie. Compare this to the actual volume reflected in the income statement.
2. Suppose that an extra annual advertising expenditure of \$15,000 would increase the average daily volume by three dinners and six lunches, and that there is plenty of capacity to accommodate the extra business. Prepare an analysis for the management of La Brasserie, explaining whether this would be desirable.
3. La Brasserie uses only premium food, and the cost of food makes up 25% of the restaurant's total variable costs. Use of average rather than premium ingredients could cut the food cost by 20%. Assume that La Brasserie uses average-quality ingredients and does not change its prices. How much of a drop-off in volume could it endure and still maintain the same net income? What factors in addition to revenue and costs would influence the decision about the quality of food to use?

2-71 Effects of Changes in Costs, Including Tax Effects

Study Appendix 2B. Pacific Fish Company is a wholesale distributor of salmon. The company services grocery stores in the Chicago area.

Average selling price per pound	\$ 5.00
Average variable costs per pound	
Cost of salmon	\$ 2.50
Shipping expenses	<u>0.50</u>
Total	<u>\$ 3.00</u>
Annual fixed costs	
Selling	\$ 210,000
Administrative	<u>356,250</u>
Total	<u>\$ 566,250</u>
Expected annual sales volume (390,000 pounds)	\$1,950,000
Tax rate	40%

Small but steady growth in sales has been achieved by Pacific Fish over the past few years, while salmon prices have been increasing. The company is formulating its plans for the coming fiscal year. Presented next are the data used to project the current year's after-tax net income of \$128,250.

Fishing companies have announced that they will increase prices of their products by an average of 15% in the coming year, owing mainly to increases in labor costs. Pacific Fish Company expects that all other costs will remain at the same rates or levels as in the current year.

1. What is Pacific Fish Company's break-even point in pounds of salmon for the current year?
2. What selling price per pound must Pacific Fish Company charge to cover the 15% increase in the cost of salmon and still maintain the current contribution-margin ratio?
3. What volume of sales in dollars must the Pacific Fish Company achieve in the coming year to maintain the same net income after taxes as projected for the current year if the selling price of salmon remains at \$5 per pound and the cost of salmon increases 15%?
4. What strategies might Pacific Fish Company use to maintain the same net income after taxes as projected for the current year?

NIKE 10-K PROBLEM

2-72 Operating Leverage

Examine Nike's 10K report in Appendix C.

1. In Item 7 of the 10K, review the section titled Operating Segments. Prepare a table that compares the percent change in "Total revenue" to the change in "Pre-tax income" from 2020 to 2021 for the four major regions (ignore the Global Brand Divisions segment). Note that generally earnings before interest and taxes changes by a larger percentage than revenue. For example, in North America, revenue increased by 19% and earnings increased by 76%. How can operating leverage help explain the greater percent change in earnings than the percent change in total revenues?
2. Would you expect Nike's operating leverage to be high or low? Explain. Which assets do you think contribute to Nike's ability to leverage operating overhead?

EXCEL APPLICATION EXERCISE

2-73 CVP and Break Even

Goal: Create an Excel spreadsheet to perform CVP analysis and show the relationship between price, costs, and break-even points in terms of units and dollars. Use the results to answer questions about your findings.

Scenario: Phonetronix is a small manufacturer of telephone and communications devices. Recently, company management decided to investigate the profitability of cellular phone production. They have three different proposals to evaluate. Under all the proposals, the fixed costs for the new phone would be \$110,000. Under proposal A, the selling price of the new phone would be \$99 and the variable cost per unit would be \$55. Under proposal B, the selling price of the phone would be \$129 and the variable cost would remain the same. Under proposal C, the selling price would be \$99 and the variable cost would be \$49.

When you have completed your spreadsheet, answer the following questions:

1. What are the break-even points in units and dollars under proposal A?
2. How did the increased selling price under proposal B impact the break-even points in units and dollars compared to the break-even points calculated under proposal A?
3. Why did the change in variable cost under proposal C not impact the break-even points in units and dollars as significantly as proposal B did?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 2 Decision Guideline
Row 2: Phonetronix
Row 3: Cost-Volume-Profit (CVP) Analysis
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–D.

4. In row 7, create the following bold-faced, right-justified column headings:

Column B: Proposal A

Column C: Proposal B

Column D: Proposal C

Note: Adjust cell widths when necessary as you work.

5. In column A, create the following row headings:

Row 8: Selling price

Row 9: Variable cost

Row 10: Contribution margin

Row 11: Contribution-margin ratio

Skip a row.

Row 13: Fixed cost

Skip a row.

Row 15: Breakeven in units

Skip a row.

Row 17: Breakeven in dollars

6. Use the scenario data to fill in the selling price, variable cost, and fixed cost amounts for the three proposals.
7. Use the appropriate formulas from this chapter to calculate contribution margin, contribution-margin ratio, breakeven in units, and breakeven in dollars.
8. Format all amounts as follows:

Number tab:	Category:	Currency
	Decimal places:	0
	Symbol:	None
	Negative numbers:	Red with parenthesis

9. Change the format of the selling price, contribution margin, fixed cost, and breakeven in dollars amounts to display a dollar symbol.
10. Change the format of both contribution margin headings to display as indented:

Alignment tab:	Horizontal:	Left (Indent)
	Indent:	1

11. Change the format of the contribution-margin amount cells to display a top border, using the default line style.

Border tab:	Icon:	Top Border

12. Change the format of the contribution-margin ratio amounts to display as a percentage with two decimal places.

Number tab:	Category:	Percentage
	Decimal places:	2

13. Change the format of all break-even headings and amounts to display as bold-faced.
14. Activate the ability to use heading names in formulas under Tools → Options:

Calculation tab:	Check the box:	Accept labels in formulas

15. Replace the cell-based formulas with “word-based” equivalents for each formula used in Proposal A.

Example: Contribution margin for proposal B would be:

= ('Selling price' 'Proposal B') - ('Variable cost' 'Proposal B')

Note: The tic marks used in the example help avoid naming errors caused by data having similar titles (i.e., “contribution margin” and “contribution-margin ratio”). The parentheses help clarify groupings.

Help: Ask the Answer Wizard about “Name cells in a workbook.”

Select “Learn about labels and names in formulas” from the right-hand panel.

16. Save your work, and print a copy for your files.

COLLABORATIVE LEARNING EXERCISE

2-74 CVP for a Small Business

Form into groups of two to six students. Each group should select a very simple business, one with a single product or one with approximately the same contribution-margin percentage for all products. Some possibilities are

- A child's lemonade stand
- A retail DVD rental store
- An espresso cart
- A retail store selling compact discs
- An athletic shoe store
- A cookie stand in a mall

However, you are encouraged to use your imagination rather than just select one of these examples. The following tasks might be split up among the group members:

1. Make a list of all fixed costs associated with running the business you selected. Estimate the amount of each fixed cost per month (or per day or per year, if one of them is more appropriate for your business).
2. Make a list of all variable costs associated with making or obtaining the product or service your company is selling. Estimate the cost per unit for each variable cost.
3. Given the fixed and variable costs you have identified, compute the break-even point for your business in either units or dollar sales.
4. Assess the prospects of your business making a profit.

INTERNET EXERCISE

2-75 Cost Behavior at Southwest Airlines

It is critical that managers understand how costs and revenues behave. One company that is affected by changes in costs and may not have the capability to rapidly change revenues because of competition is **Southwest Airlines**. Let's take a closer look at SWA and its costs and revenues. Log on to SWA's Web site at www.southwest.com. This Web site serves many purposes for the airline, such as providing flight schedules, making reservations and selling tickets, and displaying vacation and airfare specials.

1. Click on “Where We Fly” on the landing page, which provides a map showing the cities served by Southwest. What is the closest city to your current location served by SWA? Click on that city as the departure city and then select any city you like for the arrival city. Now select a date about a month from now for leaving and one for returning. Click to continue to the next screen. What types of fares are available? Why do you think that there are different types of fares offered? Click on one of the fare-type captions to see if Southwest places any restrictions on this fare. If there are any restrictions, what purpose do they serve?
2. Return to the reservations screen and select a departure date that is less than a week away. What types of fare choices are available now? Are the rates the same as those that you found for a trip more than a month away? Why do you think that the choices remaining are for the most part the higher-priced ones? Is there any advantage to the fare(s) still available? Who is the most likely user of a ticket purchased at the last minute?
3. Now that you have looked at the revenue side, let's focus on the expense side. Individuals on the same flight may pay different prices for the ticket. Do you think that the cost of flying a passenger differs because of the price that he or she pays for the ticket? Why or why not?

4. Return to SWA's home page. Take a look at the costs that SWA actually incurs. Find the list of information available "About Southwest" near the bottom of the page and click on "Investor Relations." Click on the most recent "Annual Report" icon, which takes you to Southwest's most recent 10-K report. Open the 10K report and notice the summary information that the company has provided in the "Selected Financial Data" section. Give the most recent year's operating revenues and operating expenses. How much has each changed over the prior year? What does this imply for Southwest's profitability?
5. What kinds of costs do you suppose are included in operating expenses per available seat miles (ASM)? Which of these costs is primarily fixed with respect to ASM? Which is primarily variable? What other cost drivers might be important causes of costs for Southwest?

Measurement of Cost Behavior

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Explain management influences on cost behavior.
2. Measure and mathematically express cost functions and use them to predict costs.
3. Describe the importance of activity analysis for measuring cost functions.
4. Measure cost behavior using the engineering analysis, account analysis, high-low, visual-fit, and least-squares regression methods.

► ACCOR S.A.

In a December 2019 press release, **French** hotel company **Accor S.A.** announced the successful completion of its transition to a fully asset-light business model. Pioneered by Marriott in the 1990s and adopted to varying degrees by other publicly traded hotel firms, the asset-light model involves selling off real estate assets and replacing property ownership with property management services and franchise agreements. The business model has a significant impact on both the balance sheet and income statement.

Managing a hotel property on behalf of a third-party owner generates revenues in the form of management fees, while substantially reducing the fixed operating costs related to owning or leasing the underlying real estate asset. In a similar vein, franchising agreements bestow upon the franchisee the right to operate a hotel under a brand banner in exchange for the payment of franchise fees, thereby allowing the franchisor to pursue an aggressive growth strategy with comparatively low capital requirements. Thus, brands and related intangible assets have replaced property assets on the balance sheet as the primary driver of revenues for asset-light firms.

How does a hotel company protect itself against losses when the economy experiences a downturn? The substantial reduction in fixed costs associated with the asset light business model is key. Revenues in a cyclical industry like the hotel industry fluctuate with the economy, while fixed costs remain unchanged. When fixed costs are high and the economy slows, revenues decline and may not be sufficient to cover these costs. A key benefit of the asset-light model, therefore, is that it significantly decreases operating leverage, a concept introduced in Chapter 2, and, consequently, reduces earnings volatility. This example illustrates that understanding how costs behave, as well as how managers' decisions can influence costs, helped Accor improve its cost control and focus on its chief value-adding activities.

Chapter 2 demonstrated the importance of understanding the cost structure of an organization and the relationships between an organization's activities and its costs, revenues, and profits. This chapter focuses on the **measurement of cost behavior**, which means understanding and quantifying how an organization's activities affect its costs. Recall that activities use resources, and these resources have costs. We measure this relationship between activity and cost using cost drivers. Understanding relationships between costs and their cost drivers allows managers in all types of organizations—profit seeking, nonprofit, and government—to do the following:

- Evaluate strategic plans and operational improvement programs. (Chapter 4)
- Make proper short-run pricing decisions. (Chapter 5)

measurement of cost behavior

Understanding and quantifying how activities of an organization affect its levels of costs.

- Make short-run operating decisions. (Chapter 6)
- Plan or budget the effects of future activities. (Chapters 7 and 8)
- Design effective management control systems. (Chapters 9 and 10)
- Make proper long-run decisions. (Chapter 11)
- Design useful and accurate product costing systems. (Chapters 12–14)

As you can see, understanding cost behavior is fundamental to management accounting. There are numerous real-world cases in which managers have made very poor decisions to drop product lines, close manufacturing plants, or bid too high or too low on jobs because they had erroneous cost-behavior information. This chapter, therefore, deserves careful study. ■

Cost Drivers and Cost Behavior

Accountants and managers often assume that cost behavior is linear over some relevant range of activity or cost-driver levels. We can graph **linear-cost behavior** with a straight line because we assume each cost to be either fixed or variable. Recall that the relevant range specifies the interval of cost-driver activity within which a specific relationship between a cost and its driver will be valid. Managers usually define the relevant range based on their previous experience operating the organization at different levels of activity.

In this chapter, we focus on costs for which the primary cost driver is the volume of a product produced or service provided, as such costs are easy to trace to products or services. Examples of volume-driven costs include the costs of printing labor, paper, ink, and binding to produce all the copies of this textbook. The number of copies printed affects the total printing labor, paper, ink, and binding costs. We can trace the use of these resources to the number of copies of the text printed by using schedules, payroll records, and other documents that show how much of each resource was used to produce the copies of this text.

Activities not directly related to volume also affect costs. Such costs often have multiple cost drivers. For example, members of the apparel design team are responsible for developing a wide range of garments, and it would be very difficult to determine exactly what portion of their wages and salaries went into a specific item of clothing.

Understanding and measuring costs that are difficult to trace to outputs is a challenging exercise. In practice, many organizations use a linear relationship with a single cost driver to describe each cost, even though many costs have multiple causes. This approach is easier and less expensive than using nonlinear relationships or multiple cost drivers. If we use it carefully, this method often provides cost estimates that are sufficiently accurate for most decisions. This scheme may seem at odds with reality and economic theory, but the added benefit of understanding “true” cost behavior may be less than the cost of determining it, which is consistent with the cost-benefit approach to decision making.

Accountants often describe cost behavior in visual or graphical terms. Exhibit 3-1 shows linear-cost behavior, the relevant range, and an activity or resource cost driver. Note the similarity to the cost-volume-profit (CVP) graphs of Chapter 2.

Additionally, many cost graphs display mixed-cost behavior. For example, consider the monthly facilities maintenance department cost of the Providence Medical Center (PMC), shown in Exhibit 3-2. Salaries of the maintenance personnel and costs of equipment are fixed at £10,000 per month. In addition, cleaning supplies and repair materials vary at a rate of £5 per patient-day¹ delivered by the hospital.

The chief administrator at PMC used knowledge of the facilities maintenance department cost behavior to do the following:

1. Plan costs: In May, the hospital expected to service 3,000 patient-days. May’s predicted facilities maintenance department costs are £10,000 fixed costs plus the variable cost of £15,000 (3,000 patient-days times £5 per patient-day) for a total of £25,000.
2. Provide feedback to managers: In May, the actual facilities maintenance costs were £34,000 in a month when PMC serviced 3,000 patient-days as planned. The administrator wanted to know why the hospital overspent by £9,000 (more than the planned £25,000) so that managers could take corrective action.



Kristoffer Tripplaar/Alamy Stock Photo

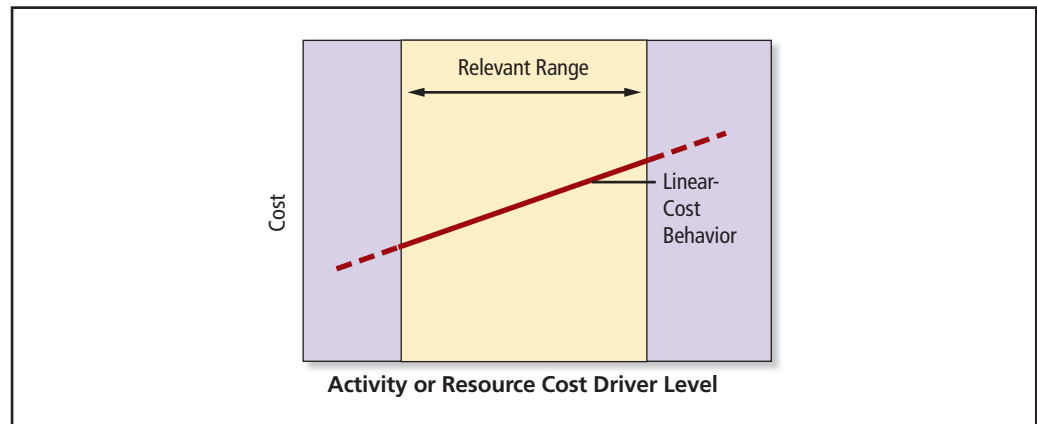
linear-cost behavior

Activity that can be graphed with a straight line because costs are assumed to be either fixed or variable.

¹A patient-day is one patient spending one day in the hospital. One patient spending five days in the hospital is five patient-days of service.

Exhibit 3-1

Linear-Cost Behavior



3. Make decisions about the most efficient use of resources: For example, managers might weigh the long-run trade-offs of increased fixed costs of highly efficient floor cleaning equipment against the variable costs of extra cleaning supplies needed to clean the floors manually.

We can see that managers not only passively measure how costs behave, they also actively influence the cost structure of an organization. Let's explore in more detail how managers influence cost behavior.

Management Influence on Cost Behavior

Objective 1

Explain management influences on cost behavior.

In addition to measuring and evaluating current cost behavior, managers can influence cost behavior through decisions about such factors as product or service attributes, capacity, technology, and policies to create incentives to control costs.

Product and Service Decisions and the Value Chain

Throughout the value chain, managers influence cost behavior. This influence occurs through their choices of process and product design, quality levels, product features, distribution channels, and so on. Each of these decisions contributes to the organization's performance, and managers should consider the costs and benefits of each decision. For example, the Dutch bank **ABN AMRO**, would add a feature to its online banking services and mobile bank app if the cost of the feature—for example, a personal financial management tool—could be more than recovered in profit from increased business and/or extra fees it could charge for the feature.

capacity costs

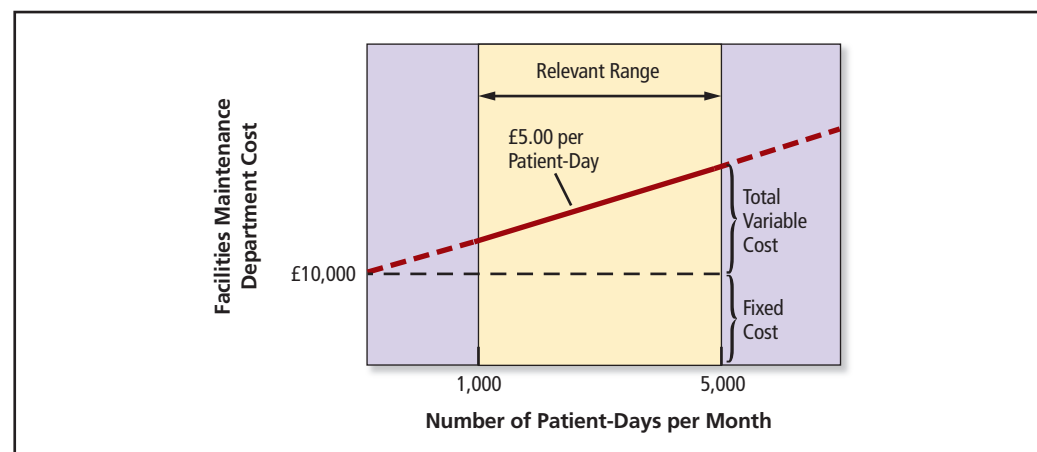
The fixed costs of being able to achieve a desired level of production or to provide a desired level of service while maintaining product or service attributes, such as quality.

Capacity Decisions

Strategic decisions about the scale and scope of an organization's activities generally result in fixed levels of capacity costs. **Capacity costs** are the fixed costs of being able to achieve a desired level of production or service while maintaining product or service attributes, such as quality. Most companies make a capacity decision infrequently. They consider capacity decisions

Exhibit 3-2

Mixed-Cost Behavior



as strategic because large amounts of resources are involved. An incorrect capacity decision can have serious consequences for the competitiveness of a company. However, some companies make capacity decisions so frequently that they almost become routine operating decisions, such as opening a new **Starbucks** or **McDonald's**. In this case, the decision to open a new Starbucks is still strategic, but it becomes highly structured.

Companies in industries with long-term variations in demand must be careful when making capacity decisions. Companies may not be able to fully recover fixed capacity costs when demand falls during an economic downturn. Additionally, capacity decisions can entail an ethical commitment to a company's employees. Most companies try to keep a stable employment policy so that they do not need to fire or lay off employees unless there are huge shifts in demand. In the economic downturn of 2008, news stories about companies "downsizing" and initiating extensive layoffs abounded. But other companies managed the decrease in demand without imposing large financial and emotional costs on their employees. Companies that plan their capacity to allow flexibility in meeting demand generally are better able to survive economic hard times, without the upheaval caused by widespread firings and layoffs.

Committed Fixed Costs

Even if a company has chosen to minimize fixed capacity costs, every organization has some costs to which it is committed, perhaps for quite a few years. A company's **committed fixed costs** usually arise from the possession of facilities, equipment, and a basic organizational structure. They include mortgage or lease payments, interest payments on long-term debt, property taxes, insurance, and salaries of key personnel. Only major changes in the philosophy, scale, or scope of operations could change these committed fixed costs in future periods. Recall the example of the facilities maintenance department for PMC. The capacity of the facilities maintenance department was a management decision, and in this case the decision determined the magnitude of the equipment cost. Suppose PMC were to increase permanently its patient-days per month beyond the relevant range of 5,000 patient-days. Because PMC would need more capacity, the committed equipment cost would rise to a new level per month.

committed fixed costs

Costs arising from the possession of facilities, equipment, and a basic organization.

Discretionary Fixed Costs

Some costs are fixed at certain levels only because management decided to incur these levels of cost to meet the organization's goals. These **discretionary fixed costs** have no obvious relationship to levels of capacity or output activity. Companies determine them as part of the periodic planning process. In each planning period, management will determine how much to spend on discretionary items such as advertising and promotion costs, public relations, research and development costs, charitable donations, employee training programs, and management consulting services. These costs then become fixed until the next planning period.

Managers can alter discretionary fixed costs—up or down—even within a budget period, if they decide that different levels of spending are desirable. Conceivably, managers could eliminate such discretionary costs almost entirely for a given year in dire times, whereas they could not reduce committed costs. Discretionary fixed costs may be essential to the long-run achievement of the organization's goals, but managers can vary spending levels broadly in the short run.

discretionary fixed costs

Costs determined by management as part of the periodic planning process in order to meet the organization's goals. They have no obvious relationship with levels of capacity or output activity.

Consider Apolo Tecnologias Biomédicas S.A., a Brazilian biotech firm that is experiencing financial difficulties. Sales for its major products are down, and Apolo's management is considering cutting back on costs temporarily. Apolo's management must determine which of the following fixed costs it can reduce or eliminate and how much money each would save:

Fixed Costs	Planned Amounts
Advertising and promotion	R\$ 150,000
Depreciation	400,000
Management salaries	800,000
Mortgage payment	250,000
Property taxes	60,000
Research and development	1,500,000
Total	<u>R\$3,160,000</u>

Can Apolo reduce or eliminate any of these fixed costs? The answer depends on Apolo's long-run outlook. Apolo could reduce costs but also greatly reduce its ability to compete in the future if it cuts fixed costs carelessly. Suppose rearranging these costs by categories of committed and discretionary costs yields the following analysis:

Fixed Costs	Planned Amounts
<u>Committed</u>	
Depreciation	R\$ 400,000
Mortgage payment	250,000
Property taxes	<u>60,000</u>
Total committed	<u><u>R\$710,000</u></u>
<u>Discretionary (potential savings)</u>	
Advertising and promotion	R\$ 150,000
Management salaries	800,000
Research and development	<u>1,500,000</u>
Total discretionary	<u>R\$2,450,000</u>
Total committed and discretionary	<u><u>R\$3,160,000</u></u>

Eliminating all discretionary fixed costs would save Apolo R\$2,450,000 per year. However, Apolo might be unwise to cut all discretionary costs completely. This could severely impair the company's long-run prospects and its future competitive position. Nevertheless, distinguishing committed and discretionary fixed costs would be the company's first step in identifying where costs could be reduced.

Technology Decisions

One of the most critical decisions that managers make is choosing the type of technology the organization will use to produce its products or deliver its services. Choice of technology (for example, labor-intensive versus robotic manufacturing, personal banking services versus online banking services or mobile apps) positions the organization to meet its current goals and to respond to changes in the environment (for example, changes in customer needs or actions by competitors). The use of high-technology methods rather than labor usually means a much greater fixed-cost component and higher operating leverage, as discussed in Chapter 2. Higher operating leverage creates greater risks for companies with wide variations in demand.

Cost-Control Incentives

Finally, the incentives that management creates for employees can affect future costs. Managers use their knowledge of cost behavior to set cost expectations, and employees may receive compensation or other rewards that are tied to meeting these expectations. For example, the administrator of PMC could give the supervisor of the facilities maintenance department a favorable evaluation if the supervisor maintained the quality of service and kept department costs below the expected amount for the actual level of patient-days. This feedback motivates the supervisor to watch department costs carefully and to find ways to reduce costs without reducing service quality.

Cost Functions

As a manager, you will use cost functions often as a planning and control tool. A few of the reasons why cost functions are important are listed here:

1. Planning and controlling the activities of an organization require useful and accurate estimates of future fixed and variable costs.
2. Understanding relationships between costs and their cost drivers allows managers in all types of organizations—profit seeking, nonprofit, and government—to make better operating, marketing, and production decisions; to plan and evaluate actions; and to determine appropriate costs for short-run and long-run decisions.

The first step in estimating or predicting costs is **cost measurement**—measuring cost behavior as a function of appropriate cost drivers. The second step is to use these cost measures to estimate future costs at expected levels of cost-driver activity. We begin by looking at the form of cost functions and the criteria for choosing the most appropriate cost drivers.

Form of Cost Functions

To describe the relationship between a cost and its cost driver(s), managers often use an algebraic equation called a cost function. When there is only one cost driver, the **cost function** is similar to the algebraic CVP relationships discussed in Chapter 2. Consider the mixed cost graphed in Exhibit 3-2 on p. 106, the facilities maintenance department cost:

$$\begin{aligned} \text{monthly facilities} \\ \text{maintenance} \\ \text{department costs} &= \text{monthly fixed} \\ &\quad \text{maintenance cost} + \text{monthly variable} \\ &\quad \text{maintenance cost} \\ &= \text{monthly fixed} \\ &\quad \text{maintenance cost} + \left(\text{variable cost per} \right. \\ &\quad \left. \text{patient-day} \times \text{number of patient-days} \right) \\ &\quad \left. \text{in the month} \right) \end{aligned}$$

Let

Y = monthly facilities maintenance department cost

F = monthly fixed maintenance cost

V = variable cost per patient-day

X = cost-driver activity in number of patient-days per month

We can rewrite the mixed-cost function as

$$Y = F + VX \quad (1)$$

or

$$Y = £10,000 + £5.00X$$

This mixed-cost function has the familiar form of a straight line—it is called a linear cost function. When we graph a cost function, F is the intercept—the point on the vertical axis where the cost function begins. In Exhibit 3-2, the intercept is the £10,000 fixed cost per month. V , the variable cost per unit of activity, is the slope of the cost function. In Exhibit 3-2, the cost function slopes upward at the rate of £5 for each additional patient-day.

In our example, we use patient-days as the relevant cost driver. How did we choose this cost driver? Why not use number of patients, or number of operations, or facility square footage? In general, how do we develop cost functions?

Developing Cost Functions

Managers should apply two criteria to obtain useful and accurate cost functions: plausibility and reliability.

1. The cost function must be plausible, that is, believable. Personal observation of costs and activities, when it is possible, provides the best evidence of a plausible relationship between a resource cost and its cost driver. Some cost relationships, by nature, are not directly observable, so the cost analyst must be confident that the proposed relationship is valid. Many costs may move together with a number of cost drivers, but no cause-and-effect relationships may exist. A cause-and-effect relationship (that is, the cost driver causes the organization to incur the resource cost) is desirable for cost functions to be useful and accurate. For example, consider three possible cost drivers for the total cost of a **Eurowings** round-trip flight from Berlin to Palma de Mallorca: miles flown, number of passengers, and passenger-miles (number of passengers times miles flown). Which of these possible cost drivers makes most sense, if only one cost driver were used for total cost? The answer is passenger-miles—the cost driver used by almost all airlines because both distance AND number of passengers flown impact cost incurrence.

cost measurement

Estimating or predicting costs as a function of appropriate cost drivers.

Objective 2

Measure and mathematically express cost functions and use them to predict costs.

cost function

An algebraic equation used by managers to describe the relationship between a cost and its cost driver(s).

2. In addition to being plausible, a cost function's estimates of costs at actual levels of activity must reliably conform to observed costs. We assess reliability in terms of "goodness of fit"—how well the cost function explains past cost behavior. If the fit is good and conditions do not change in the future, the cost function should be a reliable predictor of future costs.

Managers use these criteria together in choosing a cost function. Each is a check on the other. A manager needs to fully understand operations and the way accountants record costs to determine a plausible and reliable cost function that links cause and effect. For example, companies often perform maintenance when output is low because that is the best time to take machines out of service. Therefore, daily or weekly records of maintenance costs and outputs may show that higher maintenance costs occur when output is low. However, lower output does not cause increased maintenance costs, nor does increased output cause lower maintenance costs. A more plausible explanation is that over a longer period, increased output causes higher maintenance costs. Understanding the nature of maintenance costs should lead managers to a plausible and reliable estimate of the long-run cost function.

Making Managerial Decisions

A cost function is a mathematical expression of how cost drivers affect a particular cost. However, an intuitive understanding of cost functions is just as important as being able to write the mathematical formula. Suppose you have been using a cost function to predict total order-processing activity costs. The cost function is $\text{total costs} = \$25,000 + \$89 \times (\text{number of orders processed})$. This formula is based on data that are in the range of 0–700 orders processed. Now, you want to predict the total cost for 680 orders. You have a few fundamental questions to answer before you are comfortable using the cost function in this situation. What does it mean when a cost function is linear? Why do managers want to know whether a cost is linear? What is the importance of the relevant range?

Answer

A linear cost function means that there are two parts to the cost. One part is fixed—that is, it's independent of the cost driver. The other part varies in proportion to the cost driver—that is, if the cost driver increases by X%, this part of the cost also increases by X%. Knowing that a cost is linear allows a manager to separate the cost into fixed and variable components—a simplification that helps you understand how decisions will affect costs. Incidentally, the predicted total cost for 680 orders is $\$25,000 + (\$89 \times 680) = \$85,520$. As long as the operating conditions that existed when the data were collected have not changed significantly, then knowing that the number of orders processed is within the relevant range—0–700, in this case—gives you confidence in the predicted total cost.

Objective 3

Describe the importance of activity analysis for measuring cost functions.

activity analysis

The process of identifying appropriate cost drivers and their effects on the costs of making a product or providing a service.

Choice of Cost Drivers: Activity Analysis

How do managers construct plausible and reliable cost functions? Well, you cannot have a good cost function without knowing the right cost drivers, so constructing a cost function starts with choosing cost drivers—the X in equation (1) on p. 109. Managers use **activity analysis** to identify appropriate cost drivers and their effects on the costs of making a product or providing a service. The final product or service may have several cost drivers because production may involve many separate activities. The greatest benefit of activity analysis is that it helps management accountants identify the appropriate cost drivers for each cost.

Consider the company Living Room Fitness, which makes standard fitness equipment for home use. Two of its most popular products are a cross-trainer (X-Fit) and a spinning bike (Vélo-Fit). These two products consist of material costs, labor costs, and support costs. In the past, most of the work on company's products was done by hand. In such a situation, labor costs were the primary driver of support costs. Support costs were twice as much as labor costs, on average.

Living Room Fitness has just finished upgrading the production process. Now the company uses automated robotic assembly technology, which has increased the cost of support activities, such as engineering and maintenance, and has reduced labor cost. Its cost function has now changed; specifically, labor cost is now only 10% of the total costs at Living Room Fitness. An activity analysis has shown that the number of moving component parts added to products (a measure of product complexity), not labor cost, is the primary cost driver for support costs.

The company estimated support costs to be €35 per component part. The Vélo-Fit has two component parts, while the X-Fit has four.

Suppose Living Room Fitness wants to predict how much support cost it will incur in producing one Vélo-Fit and how much for one X-Fit. Using the old cost driver, labor cost, the prediction of support costs would be as follows:

	Vélo-Fit	X-Fit
Prior labor cost per unit	€30.00	€ 90.00
Predicted support cost 2 × direct labor cost	€60.00	€180.00

Using the more appropriate cost driver based on the new production process, the number of components added to products, the predicted support costs are as follows:

	Vélo-Fit	X-Fit
Predicted support cost at €35 per component		
€35 × 2 components	€70.00	
€35 × 4 components		€140.00
Difference in predicted support cost between the old and new cost function	€10.00 higher	€ 40.00 lower

By using an appropriate cost driver, Living Room Fitness can predict its support costs much more accurately. Managers will make better decisions with this more accurate information. For example, they can relate prices charged for products more closely to the costs of production. To see how an actual organization uses activity analysis, see the Business First box on p. 112.

One major question remains in our discussion of the measurement of cost behavior: How are the estimates of fixed costs and variable cost per cost-driver unit determined? Equation (1) on p. 109 denotes these amounts by F = monthly fixed maintenance cost and V = variable cost per patient-day. In practice, organizations use several methods of measuring cost functions and determining values for F and V . Let's look at each of these methods.

Methods of Measuring Cost Functions

After determining the most plausible drivers behind different costs, managers can choose from a broad selection of methods for approximating cost functions. These methods include (1) engineering analysis, (2) account analysis, (3) high-low analysis, (4) visual-fit analysis, and (5) least-squares regression analysis. These methods are not mutually exclusive; managers frequently use two or more together to confirm conclusions about cost behavior. The first two methods rely primarily on logical analysis of the cost environment, whereas the last three involve explicit analysis of prior cost data.

Engineering Analysis

The first method, **engineering analysis**, measures cost behavior according to what costs should be in an on-going process. It entails a systematic review of materials, supplies, labor, support services, and facilities needed for products and services. Analysts can even use engineering analysis successfully for new products and services, as long as the organization has had experience with similar costs. Why? Because they can base measures on information from personnel who are directly involved with the product or service. In addition to actual experience, analysts learn about new costs from experiments with prototypes, accounting and industrial engineering literature, the experience of competitors, and the advice of management consultants. From this information, cost analysts estimate what future costs should be. If the cost analysts are experienced and understand the activities of the organization, then their engineering cost predictions may be quite useful and reliable for decision making. The disadvantages of engineering cost analysis are that the efforts are costly and may not be timely.

Objective 4

Measure cost behavior using the engineering analysis, account analysis, high-low, visual-fit, and least-squares regression methods.

engineering analysis

The systematic review of materials, supplies, labor, support services, and facilities needed for products and services; measuring cost behavior according to what costs should be, not by what costs have been.

Business First

Activity Analysis in Healthcare Organizations

Manufacturing companies were the first organizations to use activity analysis. However, its use has spread to many service industries and nonprofit organizations. For example, Hosparus (formerly called the Alliance of Community Hospices and Palliative Care Services), a healthcare organization formed by the merger of two hospices in Kentucky and one in Indiana, has used activity analysis to better understand its costs.

Hosparus is a Medicare/Medicaid-certified program providing medical care to the terminally ill. In addition to seeing to the medical needs of its patients, Hosparus has social workers, home health aides, volunteers, and chaplains. It also provides an 18-month bereavement program for families of patients.

Many of Hosparus's costs were related directly to patients, and understanding these costs posed no problems. However, support costs were large, and Hosparus had little information about what caused these costs.

The organization undertook an activity analysis to determine the appropriate cost drivers for support costs. This consisted of two basic tasks: (1) identify the activities being performed and (2) select a cost driver for each activity.

To identify the activities and the costs related to each activity, Hosparus formed a cross-functional team. The team identified 14 activities. The next step was to select a cost driver for each activity. Some of the activities and their related cost drivers were as follows:

Activity	Cost Driver
Referral	Number of referrals
Admission	Number of admissions
Bereavement	Number of deaths
Accounting/finance	Number of patient-days
Billing	Number of billings
Volunteer services	Number of volunteers

Using the cost information from the activity analysis, management was able to learn how much each different activity cost and could recognize that patients requiring use of expensive activities were more expensive to treat.

Another organization, a retirement and assisted-living community with 70 living units, took such an activity analysis one step further. Using an activity analysis similar to that of Hosparus, this organization took the resultant detailed cost information and conducted sensitivity analysis on profitability. Using optimization software called "Solver" from Microsoft Excel the organization was able to construct modified income statements that explicitly displayed how changes in its underlying cost activities would affect its profits. It was subsequently able to maximize its profits by optimizing the levels of these various activities, thus developing an organizational strategy that was best for its cost environment.

Sources: Adapted from Sidney J. Baxendale and Victoria Dornbusch, "Activity-Based Costing for a Hospice," *Strategic Finance*, March 2000, pp. 65–70; Sidney J. Baxendale, Mahesh Gupta, and P. S. Raju, "Profit Enhancement: Using an ABC Model," *Management Accounting Quarterly*, Winter 2005, pp. 11–21; and Hosparus's Web site (<http://www.hosparus.org>).

Nearly any organization can use this approach to measuring cost behavior. For example, **Weyerhaeuser Company**, producer of wood products, used engineering analysis to determine the cost functions for its 14 corporate service departments. These cost functions measure the cost of corporate services used by three main business groups. For example, Weyerhaeuser found that its accounts payable costs for each division are a function of three cost drivers: the number of hours spent on each division, number of documents, and number of invoices.

Now consider PMC, introduced earlier in the chapter. An assistant to the hospital administrator interviewed facilities maintenance personnel and observed their activities on several random days for a month. From these data, she confirmed that the most plausible cost driver for facilities maintenance cost is the number of patient-days. She also estimated from current department salaries and equipment charges that monthly fixed costs approximated £10,000 per month. Using interviews and observing supplies usage during the month, she estimated that variable costs are £5 per patient-day. She gave this information to the hospital administrator but cautioned that the cost measures may be incorrect for the following reasons:

1. The month observed may be abnormal.
2. The facilities maintenance personnel may have altered their normal work habits because the assistant was observing them.

3. The facilities maintenance personnel may not have told the complete truth about their activities because of their concerns about the use of the information they revealed.

However, if we assume the observed and estimated information is correct, we could predict facilities maintenance costs in any month by first forecasting that month's expected patient-days and then entering that figure into the following algebraic, mixed-cost function:

$$Y = \text{£10,000 per month} + (\text{£5} \times \text{patient-days})$$

For example, if the administrator expects 3,000 patient-days next month, the prediction of facilities maintenance costs would be as follows:

$$Y = \text{£10,000} + (\text{£5} \times 3,000 \text{ patient-days}) = \text{£25,000}$$

Account Analysis

In contrast to engineering analysis, users of **account analysis** look to the accounting system for information about cost behavior. The simplest method of account analysis classifies each account as a variable or fixed cost with respect to a selected cost driver. The cost analyst then looks at each cost account balance and estimates either the variable cost per unit of cost-driver activity or the periodic fixed cost.

To illustrate this approach to account analysis, let's return to the facilities maintenance department at PMC and analyze costs for a recent month. The following table shows costs recorded in a month with 3,700 patient-days:

Monthly Cost	January Amount
Supervisor's salary and benefits	£ 3,800
Hourly workers' wages and benefits	14,674
Equipment depreciation and rentals	5,873
Equipment repairs	5,604
Cleaning supplies	<u>7,472</u>
Total facilities maintenance cost	<u><u>£37,423</u></u>

Recall that the most plausible and reliable driver for these costs is the number of patient-days serviced per month. Next, the analyst determines which costs may be fixed and which may be variable. Assume that the analyst has made the following judgments:

Monthly Cost	Amount	Fixed	Variable
Supervisor's salary and benefits	£ 3,800	£3,800	
Hourly workers' wages and benefits	14,674		£14,674
Equipment depreciation and rentals	5,873	5,873	
Equipment repairs	5,604		5,604
Cleaning supplies	<u>7,472</u>	<u> </u>	<u>7,472</u>
Total facilities maintenance costs	<u><u>£37,423</u></u>	<u><u>£9,673</u></u>	<u><u>£27,750</u></u>

Measuring total facilities maintenance cost behavior, then, requires only simple arithmetic. First add up all the fixed costs to get the total fixed cost per month. Then divide the total variable costs by the units of cost-driver activity to get the variable cost per unit of cost driver.

$$\text{Fixed cost per month} = \text{£9,673}$$

$$\begin{aligned} \text{Variable cost per patient-day} &= \text{£27,750} \div 3,700 \text{ patient-days} \\ &= \text{£7.50 per patient-day} \end{aligned}$$

The algebraic, mixed-cost function, measured by account analysis, is

$$Y = \text{£9,673 per month} + (\text{£7.50} \times \text{patient-days})$$

account analysis

Classifying each account as a variable cost or as a fixed cost with respect to a selected cost driver.

Summary Problem for Your Review

PROBLEM

The Dependable Insurance Company processes a variety of insurance claims for losses, accidents, thefts, and so on. Account analysis using one cost driver has estimated the variable cost of processing the claims for each automobile accident at 0.5% (0.005) of the dollar value of all claims related to a particular accident. This estimate seemed reasonable because high-cost claims often involve more analysis before settlement. To control processing costs better, however, Dependable conducted an activity analysis of claims processing. The analysis suggested that there are three main cost drivers for the costs of processing claims for automobile accidents. The drivers and cost behavior are as follows:

- 0.2% of Dependable Insurance policyholders' property claims
- + 0.6% of other parties' property claims
- + 0.8% of total personal injury claims

Data from two recent automobile accident claims follow:

	Automobile Claim No. 607788	Automobile Claim No. 607991
Policyholder claim	\$ 4,500	\$23,600
Other party claim	0	3,400
Personal injury claim	<u>12,400</u>	<u>0</u>
Total claim amount	<u>\$16,900</u>	<u>\$27,000</u>

1. Estimate the cost of processing each claim using data from (a) the single-cost-driver analysis and (b) the three-cost-driver analysis.
2. How would you recommend that Dependable Insurance estimate the cost of processing claims?

SOLUTION

1. Costs are summarized in the table here.

	Automobile Claim No. 607788		Automobile Claim No. 607991	
	Claim Amount	Processing Cost	Claim Amount	Processing Cost
<i>Using single-cost-driver analysis</i>				
Total claim amount	\$16,900		\$27,000	
Estimated processing cost at 0.5%		<u>\$ 84.50</u>		<u>\$135.00</u>
<i>Using three-cost-driver analysis</i>				
Policyholder claim	\$ 4,500		\$23,600	
Estimated processing cost at 0.2%		\$ 9.00		\$ 47.20
Other party claim	0		3,400	
Estimated processing cost at 0.6%		0		20.40
Personal injury claim	12,400		0	
Estimated processing cost at 0.8%		<u>99.20</u>		<u>0</u>
Total estimated processing cost		<u>\$108.20</u>		<u>\$ 67.60</u>

2. The three-cost-driver analysis estimates of processing costs are considerably different from those using a single cost driver. If the activity analyses are reliable, then automobile claims that include personal injury losses are more costly to process than property damage claims. If these estimates are relatively inexpensive to keep current and to use, then it seems reasonable to adopt the three-cost-driver approach. Dependable will have more accurate cost estimates and will be better able to plan its claims processing activities. However, Dependable processes many different types of claims. Extending activity analysis to identify multiple cost drivers for all types of claims would result in a complicated system for predicting costs—much more complex (and costly) than simply using the total dollar value of claims. Whether to undertake an activity analysis for all types of policies depends on cost-benefit considerations. Managers can address such considerations by first adopting activity analysis for one type of claim and assessing the usefulness and cost of the more accurate information.

High-Low, Visual-Fit, and Least-Squares Methods

When enough relevant cost data are available, we can use historical data to estimate the cost function mathematically. Three popular methods are the high-low, visual-fit, and least-squares methods. All three methods are more objective than the engineering-analysis and account-analysis methods. Each is based on hard evidence and uses cost and activity information from multiple periods. In particular, least-squares regression is a powerful statistical tool that yields both accurate estimates of the cost function and precise measures of probable error inherent in the estimation.

While there are situations where one of the three data-based methods is the best way to develop estimates of the cost function, account analysis and engineering analysis will probably remain popular methods of estimating cost behavior because the three mathematical methods require relevant past cost data. Products, services, technologies, and organizations are changing rapidly in response to increased global competition and technological advances. In some cases, by the time enough historical data are collected to support these analyses, the data are obsolete—the organization has changed, the production process has changed, or the product has changed. These methods should only be used when the historical data are from a past environment that still closely resembles the future environment for which a manager wants to predict costs. Another concern is that historical data may hide past inefficiencies that the company could reduce if it could identify them. That being said, the three mathematical methods have their advantages when relevant data exist, in particular the least-squares analysis.

DATA FOR ILLUSTRATION In discussing the high-low, visual-fit, and least-squares regression methods, we will continue to use PMC's facilities maintenance department costs. The following table shows monthly data collected on facilities maintenance department costs and on the number of patient-days serviced over the past year:

Facilities Maintenance Department Data

Month	Facilities Maintenance Department Cost (Y)	Number of Patient-Days (X)
January	£37,000	3,700
February	23,000	1,600
March	37,000	4,100
April	47,000	4,900
May	33,000	3,300
June	39,000	4,400
July	32,000	3,500
August	33,000	4,000
September	17,000	1,200
October	18,000	1,300
November	22,000	1,800
December	20,000	1,600

high-low method

A simple method for measuring a linear-cost function from past cost data, focusing on the highest-activity and lowest-activity points, and fitting a line through these two points.

HIGH-LOW METHOD When sufficient cost data are available, the cost analyst may use historical data to measure the cost function mathematically. The simplest of the three methods to measure a linear-cost function from past cost data is the **high-low method** shown in Exhibit 3-3.

The first step in the high-low method is to plot the historical data points on a graph. This visual display helps the analyst see whether there are obvious errors in the data. Even though many points are plotted, the focus of the high-low method is normally on the highest and lowest activity points. However, if one of these points is an outlier that seems in error or nonrepresentative of normal operations, we should use the next-highest or next-lowest activity point. For example, we should not use a point from a period with abnormally low activity caused by a labor strike or fire. Why? Because that point is not representative of a normal relationship between cost and cost driver.

After selecting the representative high and low points, we can draw a line between them, extending the line to the vertical (Y) axis of the graph. Note that this extension in Exhibit 3-3 is a dashed line, as a reminder that costs may not be linear outside the range of activity for which we have data (the relevant range). Also, managers usually are concerned with how costs behave within the relevant range, not with how they behave either at zero activity or at impossibly high activity levels. Cost measurements within the relevant range may not be reliable measures or predictors of costs outside the relevant range.

The point at which the line intersects the Y-axis is the intercept, F , or estimate of fixed cost. The slope of the line measures the variable cost, V , per patient-day. The clearest way to measure the intercept and slope with the high-low method is to use algebra:

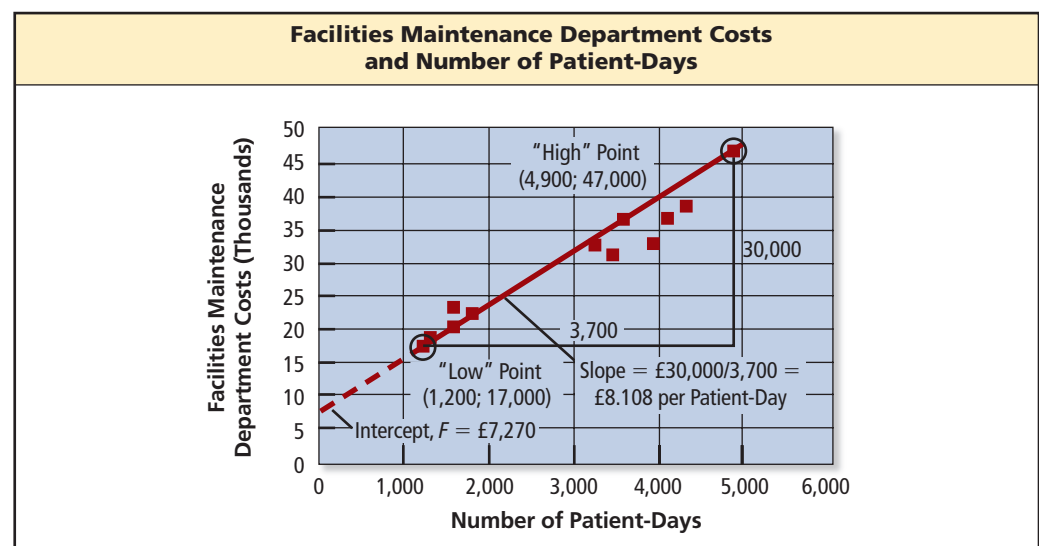
Month	Facilities Maintenance Department Cost (Y)	Number of Patient-Days (X)
High: April	£47,000	4,900
Low: September	17,000	1,200
Difference	£30,000	3,700

Variable cost per patient-day,

$$V = \frac{\text{change in costs}}{\text{change in activity}} = \frac{£47,000 - £17,000}{4,900 - 1,200 \text{ patient-days}}$$

$$V = \frac{£30,000}{3,700} = £8.1081 \text{ per patient-day}$$

Exhibit 3-3
High-Low Method



Fixed cost per month, F = total mixed cost less total variable cost

$$\begin{aligned}\text{At X (high): } F &= £47,000 - (£8.1081 \times 4,900 \text{ patient-days}) \\ &= £47,000 - £39,730 \\ &= £7,270 \text{ per month}\end{aligned}$$

$$\begin{aligned}\text{At X (low): } F &= £17,000 - (£8.1081 \times 1,200 \text{ patient-days}) \\ &= £17,000 - £9,730 \\ &= £7,270 \text{ per month}\end{aligned}$$

Therefore, the facilities maintenance department cost function, measured by the high-low method, is

$$Y = £7,270 \text{ per month} + (£8.1081 \times \text{patient-days})$$

The high-low method is easy to apply and illustrates mathematically how a change in a cost driver can change total cost. The cost function that resulted in this case is plausible. Before the widespread availability of computers, managers often used the high-low method to measure a cost function quickly. Today, however, the high-low method is not used as often because it makes inefficient use of information, basing the cost function on only two periods' cost experience, regardless of how many relevant data points have been collected.

Summary Problem for Your Review

PROBLEM

Ara Coffee Roasters sells its coffees in a variety of formats, including the popular coffee capsule. The costs involved in the process of creating coffee capsules include machinery, machine operators, packaging materials, utilities, and so on. We have the following cost and activity data:

Month	Total Capsule Packaging Cost	Number of Capsules
1	NZ\$25,000	320,000
2	29,000	390,000
3	24,000	300,000
4	23,000	310,000
5	28,000	400,000

1. Use the high-low method to measure the cost behavior of the capsule packaging department in formula form.
2. What are the benefits and disadvantages of using the high-low method for measuring cost behavior?

SOLUTION

1. The lowest and highest activity levels are in months 3 (300,000 capsules) and 5 (400,000 capsules).

$$\begin{aligned}\text{Variable cost per capsule} &= \frac{\text{change in cost}}{\text{change in activity}} = \frac{\text{NZ\$40,493} - \text{NZ\$34,708}}{400,000 - 300,000} \\ &= \frac{\text{NZ\$5,785}}{100,000} = \text{NZ\$0.06}\end{aligned}$$

Fixed cost per month = total cost less variable cost

$$\text{at 400,000 capsules: NZ\$40,493} - (\text{NZ\$0.06} \times 400,000) = \text{NZ\$16,493 per month}$$

$$\text{at 300,000 capsules: NZ\$34,708} - (\text{NZ\$0.06} \times 300,000) = \text{NZ\$16,708 per month}$$

Therefore, the capsule cost function is

$$Y(\text{total cost}) = \text{NZ\$16,493 per month} + (\text{NZ\$0.06} \times \text{number of capsules})$$

2. The benefits of using the high-low method are as follows:

- The method is easy to use.
- Not many data points are needed.

The disadvantages of using the high-low method are as follows:

- The choice of the high and low points is subjective.
- The method does not use all available data.
- The method may not be reliable.

visual-fit method

A method in which the cost analyst visually fits a straight line through a plot of all the available data.

VISUAL-FIT METHOD In the **visual-fit method**, we draw a straight line through a plot of all the available data, using judgment to fit the line as close as possible to all the plotted points. If the cost function for the data is linear, it is possible to draw a straight line through the scattered points that comes reasonably close to most of them and thus captures the general tendency of the data. We can extend that line back until it intersects the vertical axis of the graph.

Exhibit 3-4 shows this method applied to the facilities maintenance department cost data for the past 12 months. By measuring where the line intersects the cost axis, we can visually estimate the monthly fixed cost—in this case, about £10,000 per month. To find the variable cost per patient-day, select any activity level (for example 1,000 patient-days) and visually find the total cost at that activity level (£17,000). Then, divide the variable cost (which is total cost less fixed cost) by the units of activity.

$$\begin{aligned}\text{Variable cost per patient-day} &= (£17,000 - £10,000) / 1,000 \text{ patient-days} \\ &= £7 \text{ per patient-day}\end{aligned}$$

The linear-cost function measured by the visual-fit method is

$$Y = £10,000 \text{ per month} + (£7 \times \text{patient-days})$$

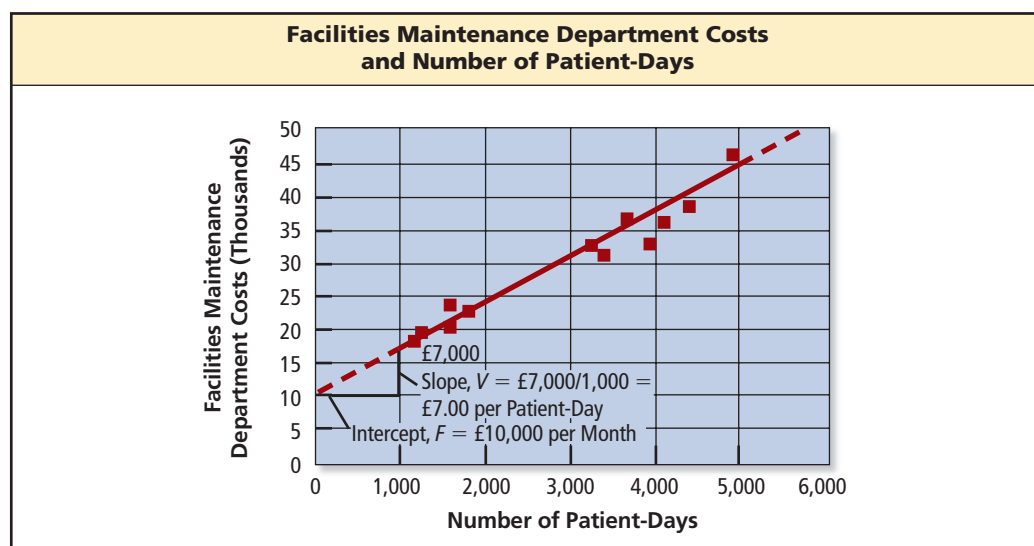
Although the visual-fit method uses all the data, the placement of the line and the measurement of the fixed and variable costs are subjective. This subjectivity is the main reason that many companies with sufficient data prefer to use least-squares regression analysis rather than the visual-fit method.

least-squares regression (regression analysis)

Measuring a cost function objectively by using statistics to fit a cost function to all the data.

LEAST-SQUARES REGRESSION METHOD Least-squares regression (or simply **regression analysis**) measures a cost function more objectively and explicitly than does the visual-fit method. Least-squares regression analysis uses statistics rather than human eyesight to fit a cost function to all the historical data. A simple regression uses one cost driver to measure a cost function, while a multiple regression uses two or more cost drivers. We will discuss only simple regression analysis in this chapter.

Exhibit 3-4
Visual-Fit Method



Appendix 3 presents some statistical properties of regression and shows how to use spreadsheet software to conduct a regression analysis.

Regression analysis measures cost behavior more reliably than other data-based cost measurement methods. It also yields important statistical information about the reliability of its cost estimates. These statistics allow analysts to assess their confidence in the cost measures and thereby select the best cost driver. One such measure of reliability, or goodness of fit, is the **coefficient of determination, R^2** (or R-squared), which measures how much of the fluctuation of a cost is explained by changes in the cost driver. Appendix 3 explains R^2 and discusses how to use it to select the best cost driver.

Exhibit 3-5 shows the linear, mixed-cost function for facilities maintenance costs as measured mathematically by regression analysis. The fixed-cost measure is £9,329 per month. The variable-cost measure is £6.951 per patient-day. The linear-cost function is as follows:

Facilities maintenance department cost = £9,329 per month + (£6.951 × number of patient-days)

or

$$Y = £9,329 + (£6.951 \times \text{patient-day})$$

Compare the cost measures produced by each of the five approaches:

Method	Fixed Cost per Month	Variable Cost per Patient-Day
Engineering analysis	£10,000	£5.000
Account analysis	9,673	7.500
High-low	7,270	8.108
Visual-fit	10,000	7.000
Regression	9,329	6.951

Because the regression-cost measures are grounded in statistical theory, they are more reliable than those obtained from the other data-based methods. Thus, managers have more confidence in cost predictions from the regression-cost function.

coefficient of determination (R^2)

A measurement of how much of the fluctuation of a cost is explained by changes in the cost driver.

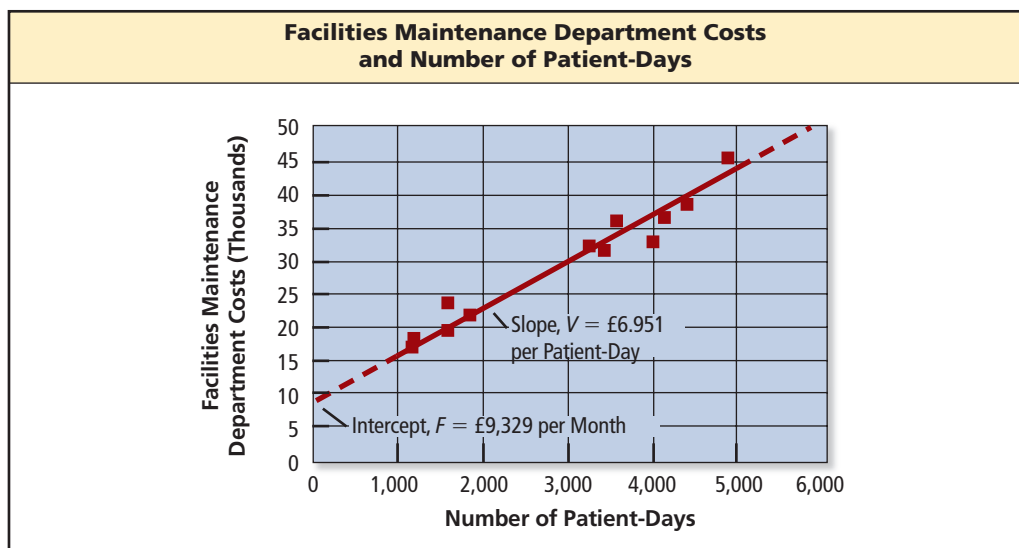


Exhibit 3-5

Least-Squares Regression Method

Highlights to Remember

- 1. Explain management influences on cost behavior.** Managers can affect the costs and cost behavior patterns of their companies through the decisions they make. Decisions on product and service features, capacity, technology, and cost-control incentives, for example, can all affect cost behavior.
- 2. Measure and mathematically express cost functions and use them to predict costs.** The first step in estimating or predicting costs is measuring cost behavior. This is done by finding a cost function. This is an algebraic equation that describes the relationship between a cost and its cost driver(s). To be useful for decision-making purposes, cost functions should be plausible and reliable.
- 3. Describe the importance of activity analysis for measuring cost functions.** Activity analysis is the process of identifying the best cost drivers to use for cost estimation and prediction and determining how they affect the costs of making a product or service. This is an essential step in understanding and predicting costs.
- 4. Measure cost behavior using the engineering analysis, account analysis, high-low, visual-fit, and least-squares regression methods.** Once analysts have identified cost drivers, they can use one of several methods to determine the cost function. Engineering analysis focuses on what costs should be by systematically reviewing the materials, supplies, labor, support services, and facilities needed for a given level of production. Account analysis involves examining all accounts in terms of an appropriate cost driver and classifying each account as either fixed or variable with respect to the driver. The cost function consists of the variable cost per cost-driver unit multiplied by the amount of the cost driver plus the total fixed cost. The high-low, visual-fit, and regression methods all use historical data to determine cost functions. Of these three methods, regression is the most reliable.

Appendix 3: Applying and Interpreting Least-Squares Regression

While we can perform regression analysis of historical cost data by hand, it would be unusual to find cost analysts doing so. Rather, spreadsheets or statistical analysis software are almost always used because they are faster, less prone to error, and produce explicit statistical analyses of the results. Therefore, we focus on interpreting regression results from a spreadsheet analysis.

This appendix is not a substitute for a good statistics class. More properly, think of it as a motivator for studying statistics so that you can better interpret regression cost estimates. Recall that in this textbook we consider only simple regression (a single cost driver) analysis. Incorporating more than one cost driver into a cost function via regression (multiple regression) is beyond the scope of this text, and you should consult a statistics textbook to learn about this more advanced form of regression.

Assume that there are two potential cost drivers for the costs of the facilities maintenance department in PMC: (1) number of patient-days and (2) total value of hospital room charges. Regression analysis can assist in the determination of which activity is the better (more descriptive) cost driver in explaining and predicting costs. Exhibit 3-6 shows the past 12 months' cost and cost-driver data for the facilities maintenance department.

Regression Analysis Procedures

Most spreadsheet software available for PCs offers basic regression analysis in the data analysis or tools commands. We will use these spreadsheet commands to illustrate regression analysis because many readers will already be familiar with spreadsheet software.

Entering Data

First, create a spreadsheet with the historical cost data in rows and columns. Each row should be data from one period. Each column should be a cost category or a cost driver. For ease of analysis, all the potential cost drivers should be in adjacent columns. Each row and column should be complete (no missing data) and without errors.

Month	Facilities Maintenance Cost (Y)	Number of Patient-Days (X ₁)	Value of Room Charges (X ₂)
January	£37,000	3,700	£2,183,000
February	23,000	1,600	2,735,000
March	37,000	4,100	2,966,000
April	47,000	4,900	2,846,000
May	33,000	3,300	2,967,000
June	39,000	4,400	2,980,000
July	32,000	3,500	3,023,000
August	33,000	4,000	2,352,000
September	17,000	1,200	1,825,000
October	18,000	1,300	1,515,000
November	22,000	1,800	1,547,000
December	20,000	1,600	2,117,000

Exhibit 3-6Facilities Maintenance
Department Data**Plotting Data**

There are two main reasons why the first step in regression analysis should be to plot the cost against each of the potential cost drivers. First, plots may show obvious nonlinear trends in the data; if so, linear regression analysis may not be appropriate for the entire range of the data. Second, plots help identify outliers that should be excluded from the analysis—costs that are in error or are otherwise obviously inappropriate. For example, costs may have been abnormally high (or abnormally low) in one month because of an unusual event such as a strike or mechanical breakdown, in which case the abnormal cost for that month should not be used in estimating the normal cost relation.

Plotting with spreadsheets uses graph commands on the columns of cost and cost-driver data. These graph commands typically offer many optional graph types (such as bar charts and pie charts), but the most useful plot for regression analysis usually is called the XY graph. This graph is the type shown earlier in this chapter—the X-axis is the cost driver, and the Y-axis is the cost. The XY graph should be displayed without lines drawn between the data points (called data symbols)—an optional command. (Consult your spreadsheet manual for details because each spreadsheet program is different.)

Regression Output

The format of the regression output is different for each software package. However, every package will identify the cost to be explained (“dependent variable”) and the cost driver (“independent variable”) in the cost function.

Producing regression output with spreadsheets is simple: Just select the regression command, specify (or highlight) the X-dimension(s) (the cost driver[s]), and specify the Y-dimension or “series” (the cost). Next, specify where the output will be displayed on the spreadsheet, and select Ok. The following is a regression analysis of facilities maintenance department costs using one of the two possible cost drivers, number of patient-days, X_1 .

Facilities Maintenance Department Cost Explained by Number of Patient-Days	
Regression Output	
Constant	9,329
R ²	0.955
X coefficient(s)	6.951

Interpretation of Regression Output

The fixed-cost measure, labeled “constant” or “intercept” by most programs, is \$9,329 per month. The variable cost measure, labeled “X coefficient” (or something similar in other spreadsheets), is \$6.951 per patient-day. The linear cost function is

$$Y = \$9,329 \text{ per month} + (\$6.951 \times \text{patient-days})$$

As mentioned in the chapter, it is important to consider plausibility and reliability in evaluating a cost function and its estimates. Plausibility simply refers to whether the estimated cost function makes economic sense. We can assess this by examining the sign of the variable cost estimate. In the preceding cost function, this estimate is +\$6.951. The positive sign in this cost function implies that as patient-days increase, facilities maintenance costs also increase (specifically, by \$6.951 per patient-day). We assess the economic plausibility of this positive relationship by asking ourselves whether it makes economic sense that an increase in patient-days should increase facilities maintenance costs. Based on our economic intuition, a positive relationship appears to make sense (that is, we would expect that increasing patient-days would increase the cost of cleaning supplies and repair materials such that total facilities maintenance costs increase). While plausibility appears to be a simple and straightforward item to assess, it is the most important element to assess in a cost function. We would not want to use a cost function to estimate and predict costs if it did not exhibit plausibility (even if it displayed good reliability) because, without plausibility, we do not fundamentally understand the cost function, which makes cost estimation and prediction suspect.

Regarding reliability, the computer output usually gives a number of statistical measures that indicate how well each cost driver explains the cost and how reliable the cost predictions are likely to be when using the cost function. A full explanation of the output is beyond the scope of this text. However, one of the most important statistics, the coefficient of determination, or R^2 , is an important measure of reliability—how well the cost function fits the actual cost data. In general, the better a cost driver is at explaining a cost, the closer the data points will lie to the line, and the higher will be the R^2 , which varies between 0 and 1. An R^2 of 0 means that the cost driver does not explain variability in the cost data, whereas an R^2 of 1 means that the cost driver explains the variability perfectly. The R^2 of the relationship measured with number of patient-days as the cost driver is 0.955, which is quite high. This value indicates that the number of patient-days explains facilities maintenance department cost extremely well. In fact, the number of patient-days explains 95.5% of the past fluctuations in facilities maintenance department cost. Such a regression is highly reliable.

In contrast, performing a regression analysis on the relationship between facilities maintenance department cost and value of hospital room charges produces the following results:

Facilities Maintenance Department Cost Explained by Value of Hospital Room Charges	
Regression Output	
Constant	£ 924
R^2	0.511
X coefficient(s)	0.012

While the positive sign of the variable cost estimate (+0.012) appears to satisfy plausibility (that is, as hospital room charges increase, we would expect facilities maintenance costs to also increase), the R^2 value, 0.511, indicates that the cost function using value of hospital room charges fits the facilities maintenance department cost worse than does the cost function using number of patient-days.

To use the information generated by regression analysis fully, an analyst must understand the meaning of the statistics and must be able to determine whether the statistical assumptions of regression are satisfied by the cost data. Indeed, one of the major reasons why cost analysts study statistics is to understand the assumptions of regression analysis better. With this understanding, analysts can provide their organizations with the best estimates of cost behavior.

Summary Problem for Your Review

PROBLEM

ND Labs Inc. makes 3D printers, producing a variety of models ranging from those suitable for household use to those suited to industrial purposes. Until recently, managers predicted production scheduling and control (PSC) costs to vary in proportion to labor costs according to the following cost function:

$$\text{PSC costs} = 200\% \text{ of labor cost}$$

or

$$Y = 2 \times \text{labor cost}$$

Because PSC costs have been growing at the same time that labor cost has been shrinking, The company is concerned that its cost estimates are neither plausible nor reliable. *nD Labs'* controller has just completed regression analysis to determine the most appropriate drivers of PSC costs. She obtained two cost functions using different cost drivers:

$$Y = 2 \times \text{labor cost}$$

$$R^2 = 0.233$$

and

$$Y = \text{€10,000 per month} + (11 \times \text{number of components used})$$

$$R^2 = 0.782$$

1. How should the controller determine which cost function better predicts PSC costs?
2. During a subsequent month, *nD Labs'* labor costs were €12,000, and it used 2,000 product components. Actual PSC costs were €31,460. Using each of the preceding cost functions, prepare reports that show predicted and actual PSC costs and the difference or variance between the two.
3. What is the meaning and importance of each cost variance?

SOLUTION

1. The controller should examine both the plausibility and the reliability of each cost function. Both costs seem plausible with positive signs on their respective variable cost estimates as we would expect. Regarding reliability, a statistical test of which function better explains past PSC costs compares the R^2 of each function. The second function, based on the number of components used, has a considerably higher R^2 , so it better explains the past PSC costs. If the environment is essentially unchanged in the future, the second function probably will predict future PSC costs better than the first. A useful predictive test would be to compare the cost predictions of each cost function with actual costs for several months that were not used to measure the cost functions. The function that more closely predicted actual costs is probably the more reliable function.
2. Note that more actual cost data would be desirable for a better test, but the procedure would be the same. PSC cost predicted on a labor-cost basis follows:

Predicted Cost	Actual Cost	Variance
$2 \times \text{€12,000} = \text{€24,000}$	€31,460	€7,460 underestimate

PSC cost predicted on a component basis follows:

Predicted Cost	Actual Cost	Variance
$\text{€10,000} + (\text{€11} \times 2,000) = \text{€32,000}$	€31,460	€540 overestimate

3. The cost function that relies on labor cost underestimated PSC cost by €7,460. The cost function that uses the number of components closely predicted actual PSC costs (off by €540). Planning and control decisions would have been based on more accurate information using this prediction than using the labor-cost-based prediction. An issue is whether the benefits of collecting data on the number of components used exceeded the added cost of the data collection.

Accounting Vocabulary

account analysis, p. 113	cost function, p. 109	least-squares regression, p. 118
activity analysis, p. 110	cost measurement, p. 109	linear-cost behavior, p. 105
capacity costs, p. 106	discretionary fixed costs, p. 107	measurement of cost behavior, p. 104
coefficient of determination (R^2), p. 119	engineering analysis, p. 111	visual-fit method, p. 118
committed fixed costs, p. 107	high-low method, p. 116	

MyLab Accounting

Fundamental Assignment Material

3-A1 Activity Analysis

Dogwood Signs makes customized wooden signs for businesses and residences. These signs are made of wood, which the owner glues and carves by hand or with power tools. After carving the signs, she paints them or applies a natural finish. She has a good sense of her labor and materials cost behavior, but she is concerned that she does not have good measures of other support costs. Currently, she predicts support costs to be 75% of the cost of materials. Close investigation of the business reveals that \$70 times the number of power tool operations is a more plausible and reliable support cost relationship.

Consider estimated support costs of the following two signs that Dogwood Signs is making:

	Sign A	Sign B
Materials cost	\$300	\$800
Number of power tool operations	10	2
Support cost	?	?

1. Prepare a report showing the support costs of both signs using each cost driver and showing the differences between the two.
2. What advice would you give Dogwood Signs about predicting support costs?

3-A2 Division of Mixed Costs into Variable and Fixed Components

Molly Flutie, president of First Tool, Co., has asked for information about the cost behavior of manufacturing support costs. Specifically, she wants to know how much support cost is fixed and how much is variable. The following data are the only records available:

Month	Machine Hours	Support Costs
May	1,700	\$ 22,000
June	1,600	21,000
July	1,500	19,500
August	1,400	18,500
September	1,300	18,000

1. Find monthly fixed support cost and the variable support cost per machine hour by the high-low method.
2. Explain how your analysis for requirement 1 would change if new October data were received and machine hours were 1,650 and support costs were \$24,000.
3. A least-squares regression analysis gave the following output:

$$\text{Regression equation: } Y = \$4,050 + \$10.50X$$

What recommendations would you give the president based on these analyses?

3-B1 Activity Analysis

DeHart Technology, an Idaho manufacturer of printed circuit boards, has always estimated the support cost of its circuit boards with a 100% “markup” over its material costs. An activity analysis suggests that support costs are driven primarily by the number of manual operations performed on each board,

estimated at \$6 per manual operation. Compute the estimated support costs of the following two typical circuit boards using the traditional markup and the activity analysis results:

	Board Z15	Board Q52
Material cost	\$46.00	\$65.00
Manual operations	19	8

Why are the cost estimates different?

3-B2 Division of Mixed Costs into Variable and Fixed Components

The president and the controller of Toluca Transformer Company (Mexico) have agreed that refinement of the company's cost measurements will aid planning and control decisions. They have asked you to measure the function for mixed-cost behavior of repairs and maintenance from the following sparse data. Currency is the Mexican peso (P).

Monthly Activity in Machine Hours	Monthly Repair and Maintenance Cost
7,900	P202,000,000
11,900	P272,000,000

Additional Assignment Material

MyLab Accounting

QUESTIONS

3-1 What is a cost driver? Give three examples of costs and their possible cost drivers.

3-2 Explain linear-cost behavior.

3-3 "Step costs can be fixed or variable, depending on your perspective." Explain.

3-4 Explain how mixed costs are related to both fixed and variable costs.

3-5 How do management's product and service choices affect cost behavior?

3-6 Why are fixed costs also called capacity costs?

3-7 How do committed fixed costs differ from discretionary fixed costs?

3-8 Why are committed fixed costs the most difficult of the fixed costs to change?

3-9 What are the primary determinants of the level of committed costs? Discretionary costs?

3-10 "Discretionary fixed costs are part of a company's periodic planning process and hence considered fixed only for the relevant period." Do you agree? Explain.

3-11 How can a company's choice of technology affect its costs?

3-12 Explain the use of incentives to control cost.

3-13 Why is it important for managers and accountants to measure cost functions?

3-14 Explain plausibility and reliability of cost functions. Which is preferred? Explain.

3-15 What is activity analysis?

3-16 What is engineering analysis? Account analysis?

3-17 Describe the methods for measuring cost functions using past cost data.

3-18 How could account analysis be combined with engineering analysis?

3-19 Explain the strengths and weaknesses of the high-low and visual-fit methods.

3-20 "High-low method makes inefficient use of information." Do you agree? Explain.

3-21 Why is regression analysis usually preferred to the high-low method?

3-22 "You never know how good your fixed- and variable-cost measures are if you use account analysis or if you visually fit a line on a data plot. That's why I like least-squares regression analysis." Explain.

3-23 (Study Appendix 3) Why should an analyst always plot cost data in addition to applying least-squares regression analysis?

3-24 (Study Appendix 3) What can we learn from R^2 , the coefficient of determination?

3-25 At a conference, a consultant stated, "Before you can control, you must measure." An executive complained, "Why bother to measure when work rules and guaranteed employment provisions in labor contracts prevent discharging workers, using part-time employees, and using overtime?" Evaluate these comments.

CRITICAL THINKING EXERCISES

3-26 Committed and Discretionary Fixed Costs in Manufacturing

Among the fixed costs of Howarth Company are depreciation and research and development (R&D). Using these two costs as examples, explain the difference between committed and discretionary fixed costs.

3-27 Cost Functions and Decision Making

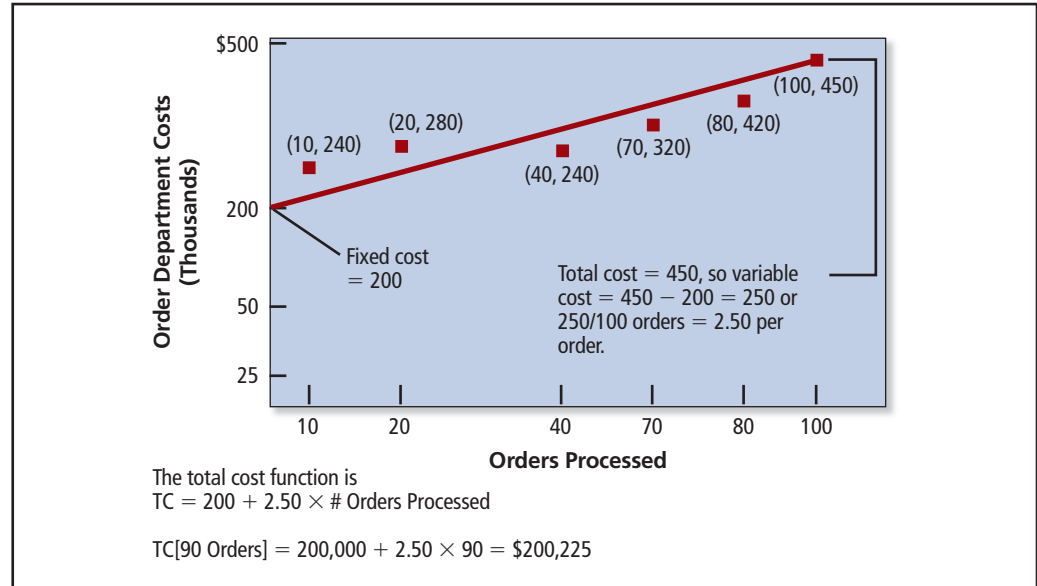
Why is it important that decision makers in a corporation know the cost function for producing the company's products?

3-28 Statistical Analysis and Cost Functions

What advantages does using regression analysis have over the visual-fit method for determining cost functions?

3-29 Plotting Data

The following graph was constructed and data plotted to apply the visual-fit method. Then, the predicted total order-department costs for processing 90 orders was computed. Comment on the accuracy of the analysis. Do your own analysis and explain any differences. Assume the data in parentheses are accurate in thousands of dollars and number of orders.

**EXERCISES****3-30 Cost Function for an Airline Company**

Airgo Inc. is an international airline company headquartered in New Delhi, India. The company was incurring losses for several quarters until the first quarter of 2021. During the first quarter of 2020, it incurred an operating loss of ₹22 million with a revenue of ₹148 million. In the first quarter of 2021, however, it earned ₹308 million revenue with an operating income of ₹122 million. The level of fixed costs remained the same throughout.

(Note: The Indian rupee, ₹, is the official currency of India.)

1. Calculate the operating expenses for Airgo Inc. for the first quarter of 2020 as well as 2021.
2. Determine the cost function of Airgo Inc., that is, the fixed cost and the variable cost, as a percentage of the sales revenue.
3. Explain how the company could increase its operating income by ₹158 million with an increase in revenue of ₹160 million within just one year.

3-31 Predicting Costs

Predict total cost based on the cost behavior and expected cost driver activity in each of the following cases:

1. Lease rental fees for hydraulic cranes in a construction company, €5,000 per month per crane for two cranes over four months.
2. Sales department cost, €8,000 per month plus €4.5 per order delivered at 5,000 orders in one month.
3. Telephone charges, rental at €500 per month plus €0.20 per call for 10,000 calls during a month.
4. Private security personnel cost for an Indian Premier League cricket match, €1,250 for each 500 spectators; the authority is expecting 20,000 spectators for the match.

3-32 Identifying Discretionary and Committed Fixed Costs

Identify and compute total discretionary fixed costs and total committed fixed costs from the following list prepared by the accounting supervisor for Kasay Building Supply:

Advertising	\$21,000
Depreciation	48,000
Health insurance for the company's employees	24,000
Management salaries	87,500
Payment on long-term debt	48,500
Property tax	30,000
Grounds maintenance	7,000
Office remodeling	24,000
Research and development	45,500

3-33 Cost Effects of Technology

Manifestation, a leading fashion boutique in Singapore, is planning to use the services of a digital marketing solution provider to increase its online sales. It has shortlisted two digital marketing solution providers, the details of which are given below:

	Solution A	Solution B
Annual fixed cost	SGD 150,000	SGD 310,000
Variable cost per order	SGD 8.00	SGD 6.00
Estimated number of orders	40,000	40,000

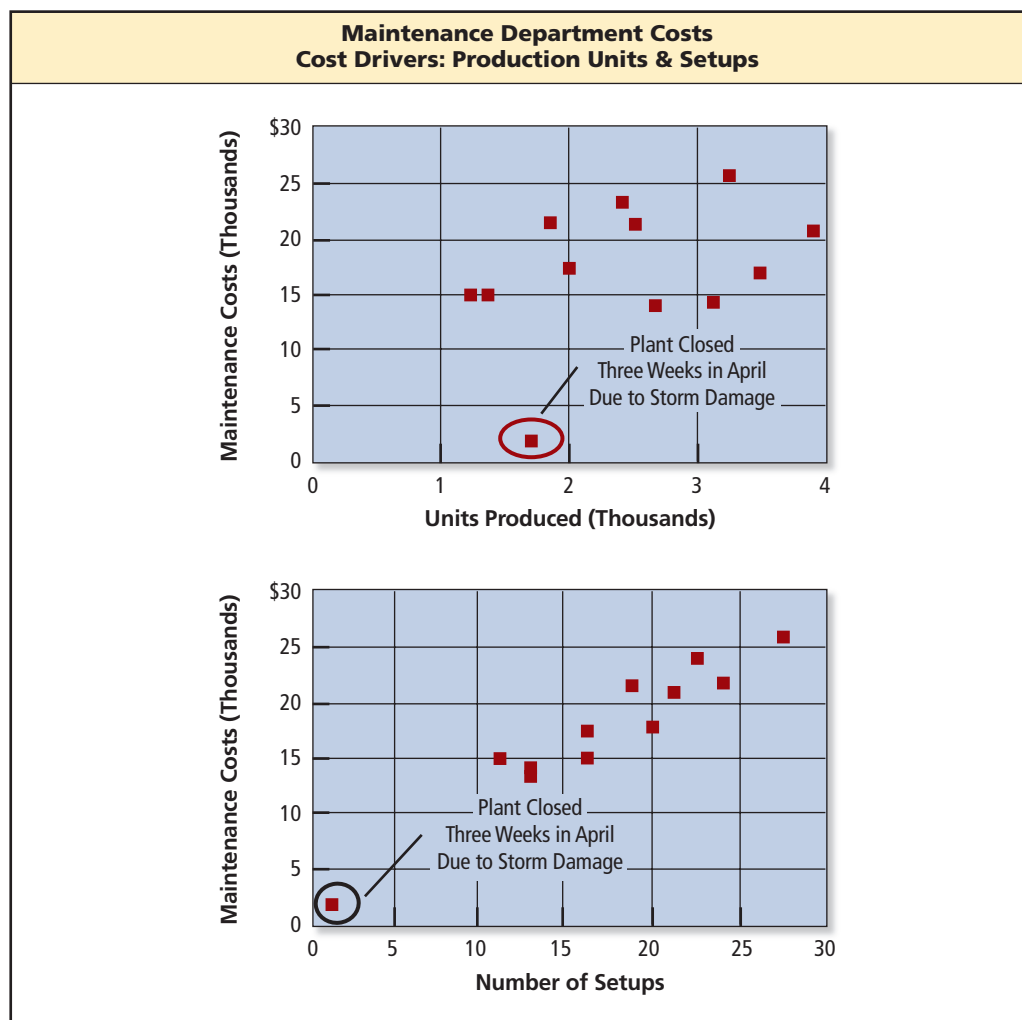
At the expected number of orders, which solution has the lower cost? What is the indifference level of orders or break-even level of orders? What is the meaning of this level of orders?

(Note: The Singapore Dollar, SGD, is the official currency of Singapore.)

3-34 Mixed Cost, Choosing Cost Drivers, and High-Low and Visual-Fit Methods

Cedar Rapids Implements Company produces farm implements. Cedar Rapids is in the process of measuring its manufacturing costs and is particularly interested in the costs of the manufacturing maintenance activity, since maintenance is a significant mixed cost. Activity analysis indicates that maintenance activity consists primarily of maintenance labor setting up machines using certain supplies. A setup consists of preparing the necessary machines for a particular production run of a product. During setup, machines must still be running, which consumes energy. Thus, the costs associated with maintenance include labor, supplies, and energy. Unfortunately, Cedar Rapids' cost accounting system does not trace these costs to maintenance activity separately. Cedar Rapids employs two full-time maintenance mechanics to perform maintenance. The annual salary of a maintenance mechanic is \$42,000 and is considered a fixed cost. Two plausible cost drivers have been suggested: "units produced" and "number of setups."

Data had been collected for the past 12 months and a plot was made for the cost driver—units of production. The maintenance cost figures collected include estimates for labor, supplies, and energy. Cory Fielder, controller at Cedar Rapids, noted that some types of activities are performed each time a batch of goods is processed rather than each time a unit is produced. Based on this concept, he has gathered data on the number of setups performed over the past 12 months. The plots of monthly maintenance costs versus the two potential cost drivers follow:



1. Find monthly fixed maintenance cost and the variable maintenance cost per driver unit using the visual-fit method based on each potential cost driver. Explain how you treated the April data.
2. Find monthly fixed maintenance cost and the variable maintenance cost per driver unit using the high-low method based on each potential cost driver.
3. Which cost driver best meets the criteria for choosing cost functions? Explain.

3-35 Account Analysis

Heavenly Computers is a company started by two engineering students to assemble and market personal computers to faculty and students. The company operates out of the garage of one of the students' homes. From the following costs of a recent month, compute the total cost function and total cost for the month:

Telephone	\$ 60, fixed
Utilities	250, fixed: 30% attributable to the garage, 70% to the house
Advertising	85, fixed
Insurance	110, fixed
Materials	5,500, variable, for five computers
Labor	2,150: \$1,400 fixed plus \$750 for hourly help for assembling five computers

3-36 Linear Cost Functions

Let Y = total costs, X_1 = production volume, and X_2 = number of setups. Which of the following are linear cost functions? Which are mixed cost functions?

- $Y = \$8X_1$
- $Y = \$1,500$
- $Y = \$8,500 + \$1.50X_1$
- $Y = \$3,000 + \$6X_1 + \$30X_2$
- $Y = \$9,000 + \$3(X_1 \times X_2)$
- $Y = \$5,000 + \$4.00X_1$

3-37 High-Low Method

In March 2020, PureBreath, an air purifier manufacturer based in the United Kingdom, produced 5,500 purifiers at a cost of £115,000. In April 2020, the company produced 3,500 purifiers at a cost of £95,000. Using only these two data points, determine the cost function for PureBreath.

3-38 Economic Plausibility of Regression Analysis Results

The head of the warehousing division of Lachton, Co., was concerned about some cost behavior information given to him by the new assistant controller, who was hired because of his recent training in cost analysis. His first assignment was to apply regression analysis to various costs in the department. One of the results was presented as follows:

A regression on monthly data was run to explain building maintenance cost as a function of direct labor hours as the cost driver. The results are

$$Y = \$7,810 - \$0.47X$$

I suggest that we use the building as intensively as possible to keep the maintenance costs down.

The department head was puzzled. How could increased use cause decreased maintenance cost? Explain this counterintuitive result to the department head. What step(s) did the assistant controller probably omit in applying and interpreting the regression analysis?

PROBLEMS

3-39 Controlling Risk, Capacity Decisions, Technology Decisions

Consider the following hypothetical situation in the computer industry. **HP** had been outsourcing production to **Acer** and using overtime for as much as 20% of production—HP's plants and assembly lines were running at 100% of capacity and demand was sufficient for an additional 20%. HP had considered increasing its capacity by building new, highly automated assembly lines and plants. However, the investment in high technology and capacity expansion was rejected.

Assume that all material and labor costs are variable with respect to the level of production and that all other costs are fixed. Consider one of HP's plants that makes the Pavillion model. The increase in annual fixed costs to convert the plant to use fully automated assembly lines is \$20 million. The resulting labor costs would be significantly reduced and there would be no need for overtime or outsourced production. The annual costs, in millions of dollars, of the build option and the existing costs that include outsourcing and overtime are given in the following tables:

	Build Option		
Percent of current capacity	<u>60</u>	<u>100</u>	<u>120</u>
Material costs	\$18	\$30	\$36
Labor costs	6	10	12
Other costs	<u>40</u>	<u>40</u>	<u>40</u>
Total costs	<u>\$64</u>	<u>\$80</u>	<u>\$88</u>

	HP's Existing Costs Using Outsourcing/Overtime		
Percent of current capacity	<u>60</u>	<u>100</u>	<u>120</u>
Material costs	\$18	\$30	\$ 36
Labor costs	18	30	44
Other costs	<u>20</u>	<u>20</u>	<u>20</u>
Total costs	<u>\$56</u>	<u>\$80</u>	<u>\$100</u>

1. Prepare a line graph showing total costs for the two options: (a) build new assembly lines, and (b) continue to use overtime and outsource production of Pavillions. Give an explanation of the cost behavior of the two options.
2. Which option enables HP's management to control risk better? Explain. Assess the cost-benefit trade-offs associated with each option.
3. A solid understanding of cost behavior is an important prerequisite to effective managerial control of costs. Suppose you are an executive at HP. Currently the production (and sales) level is approaching the 100% level of capacity, and the economy is expected to remain strong for at least one year. While sales and profits are good now, you are aware of the variability inherent in the computer business. Would you recommend committing HP to building automated assembly lines in order to service potential near-term increases in demand? Or would you recommend against building, looking to the possible future downturn in business? Discuss your reasoning.

3-40 Step Costs

St. Lawrence National Park in Europe requires a staff of at least one guard for every 20 visitors. The park allows a maximum of 240 visitors. The park attracts many tourists and transients in the spring and summer seasons. However, the number of visitors falls rapidly in the autumn and winter. The park's autumn–winter population is generally between 60 to 80 visitors. The numbers of visitors in the spring and summer fluctuate between 60 and 240, depending on the weather among many other factors.

St. Lawrence National Park has four permanent guards, hired on an annual basis for an annual salary of €24,000 each. Additional guards are hired, when needed, from the same agency on a weekly basis at a rate of €400 per week. (Assume each month has exactly four weeks.)

1. Prepare a graph with the weekly planned cost of guards on the vertical axis and the number of visitors on the horizontal axis.
2. What would be the budgeted amount for the guards for January? Would this be a fixed or a variable cost?
3. Suppose the number of visitors of each of the four weeks in July was 125, 190, 130, and 215, respectively. The actual amount paid for the guards in July was €13,200. Prepare a report comparing the actual amount paid for guards with the amount that would be expected with efficient scheduling and hiring.
4. Suppose the Park treated the salaries for non-permanent guards as a variable expense of €20 per week per visitor. This variable cost was applied to the number of visitors in excess of 80. Therefore, the weekly cost function was as follows:

$$\text{Weekly guard cost} = \text{€}2,000 + \text{€}20 \times (\text{total visitors} - 80)$$

Explain how this cost function was determined.

5. Prepare a report similar to that in requirement 3 except that the cost function in requirement 4 should be used to calculate the expected amount of guard salaries. Which report, this one or the one in requirement 3, is more accurate? Is accuracy the only concern?

3-41 Government Service Cost Analysis

Auditors for the Internal Revenue Service (IRS) scrutinize income tax returns after they have been prescreened with the help of computer tests for normal ranges of deductions claimed by taxpayers. The IRS uses an expected cost of \$5 per tax return, based on measurement studies that allow 15 minutes per return. Each agent has a workweek of five days of 8 hours per day. Eighteen auditors are employed at a salary of \$790 each per week.

The audit supervisor has the following data regarding performance for the most recent 4-week period, when 8,300 returns were processed:

Actual Cost of Auditors	Expected Cost for Processing Returns	Difference or Variance
\$56,880	?	?

1. Compute the expected cost and the variance.
2. The supervisor believes that audit work should be conducted more productively and that superfluous personnel should be transferred to field audits. If the foregoing data are representative, how many auditors should be transferred?
3. List some possible reasons for the variance.
4. Describe some alternative cost drivers for processing income tax returns.

3-42 Cost Analysis of a Hotel Chain in the United Kingdom

Regalia is a U.K.-based hotel chain with four 5-star hotels in different parts of the United Kingdom. The following are some of the costs incurred by Regalia. For each cost, select an appropriate cost driver and indicate whether the cost is likely to be fixed, variable, or mixed in relation to your cost driver.

- Yearly maintenance contract fees (AMC) for all equipment
- Advertising costs
- Payroll
- Food, beverages, and house-keeping cleaning supplies
- Laundry operations
- Guest supplies and amenities
- Electricity and water supply

3-43 Separation of Mixed Costs into Variable and Fixed Components

A staff meeting has been called at SportsLab, a drug-testing facility retained by several professional and college sports leagues and associations. The chief of testing, Dr. Hyde, has demanded an across-the-board increase in prices for a particular test because of the increased testing and precision that are now required.

The administrator of the laboratory has asked you to measure the mixed-cost behavior of this particular testing department and to prepare a short report she can present to Dr. Hyde. Consider the following limited data:

	Average Test Procedures per Month	Average Monthly Cost of Test Procedures
Monthly averages, 20X7	400	\$ 60,000
Monthly averages, 20X8	500	80,000
Monthly averages, 20X9	600	140,000

3-44 University Cost Behavior

Imperial Law College, a private university in Bangladesh, is preparing a planned income statement for the academic year ending on July 31, 2021. The course fees for the past two years ending July 31 were BDT 460,000 in 2020 and BDT 420,000 in 2019. Total expenses for 2020 and 2019 were BDT 425,000 and BDT 411,000, respectively. There was no change in the course fee in 2019 and 2020 and it is likely to remain unchanged in 2021 as well. The university expects the revenue from course fee of 2021 to be BDT 480,000. What net income should be planned for 2021, assuming that the implied cost behavior remains unchanged in 2021? What will be the break-even course fee revenue?

(Note: The Bangladeshi taka, BDT, is the official currency of Bangladesh.)

3-45 Activity Analysis

Washta Software develops and markets computer software for the agriculture industry. Because support costs are a large portion of the cost of software development, the director of cost operations of Washta, Vera Soren, is especially concerned with understanding the effects of support cost behavior. Soren has completed a preliminary activity analysis of one of Washta's primary software products: FertiMix (software to manage fertilizer mixing). This product is a software template that is customized for specific customers, who are charged for the basic product plus customizing costs. The activity analysis is based on the number of customized lines of FertiMix code. Currently, support cost estimates are based on a fixed rate of 65% of the basic cost. Data are shown for two recent customers:

	Customer	
	Mystical Plants	Todal Blooms
Basic cost of FertiMix	\$8,000	\$8,000
Lines of customized code	520	160
Estimated cost per line of customized code	\$ 20	\$ 20

- Compute the support cost of customizing FertiMix for each customer using each cost-estimating approach.
- If the activity analysis is reliable, what are the pros and cons of adopting it for all Washta's software products?

3-46 High-Low, Regression Analysis

On January 24, 2020, Mr. Clark, the newly appointed cost analyst at BestPrice, a discount store operating in Sydney, Australia, was asked to predict the receiving cost, an overhead cost associated with purchase orders, for the company's operation in the April–June quarter, 2021, when 530 units are expected to be purchased. Mr. Clark collected information regarding company's receiving cost and purchase orders (the corresponding cost driver) for the past 15 quarters.

Quarter	Purchase Orders	Receiving Cost (A\$)
1/2017	365	3,575
2/2017	380	3,545
3/2017	340	3,200
4/2017	665	5,620
1/2018	610	4,975
2/2018	625	5,525
3/2018	610	5,565
4/2018	650	5,180
1/2019	605	4,910
2/2019	630	5,300
3/2019	560	4,950
4/2019	405	4,755
1/2020	405	4,145
2/2020	595	5,220
3/2020	435	4,925

- Using the high-low method to estimate costs, prepare a prediction of receiving cost for the April–June quarter, 2021.
- Mr. Clark ran a regression analysis using the data he collected. The result was

$$Y = \text{A\$ } 1.733 + \text{A\$ } 5.76X$$

Using this cost function, predict receiving cost for the April–June quarter, 2021.

- Which prediction do you prefer? Why?

3-47 Interpretation of Regression Analysis

Study Appendix 3. The tent division of New York Outdoor Equipment Company has had difficulty controlling its use of supplies. The company has traditionally regarded supplies as a purely variable cost. Nearly every time production was above average, however, the division spent less than predicted for supplies; when production was below average, the division spent more than predicted. This pattern suggested to Winnie Tsang, the new controller, that part of the supplies cost was probably not related to production volume, or was fixed.

She decided to use regression analysis to explore this issue. After consulting with production personnel, she considered two cost drivers for supplies cost: (1) number of tents produced, and (2) square feet of material used. She obtained the following results based on monthly data.

	Cost Driver	
	Number of Tents	Square Feet of Material Used
Constant	2,500	2,000
Variable coefficient	0.071	0.073
R ²	0.803	0.485

- Which is the preferred cost function? Explain.
- What percentage of the fluctuation of supplies cost depends on square feet of materials? Do fluctuations in supplies cost depend on anything other than square feet of materials? What proportion of the fluctuations is not explained by square feet of materials?

3-48 Regression Analysis

Study Appendix 3. Mr. Liao, CEO of a manufacturer of fine china and stoneware, is troubled by fluctuations in productivity and wants to compute how manufacturing support costs are related to the various sizes of batches of output. The following data show the results of a random sample of 10 batches of one pattern of stoneware:

Sample	Batch Size, X	Support Costs, Y
1	15	\$180
2	12	140
3	20	230
4	17	190
5	12	160
6	25	300
7	22	270
8	9	110
9	18	240
10	30	320

1. Plot support costs, Y , versus batch size, X .
2. Using regression analysis, measure the cost function of support costs and batch size.
3. Predict the support costs for a batch size of 25.
4. Using the high-low method, repeat requirements 2 and 3. Should the manager use the high-low or regression method? Explain.

3-49 Choice of Cost Driver

Study Appendix 3. Richard Ellis, the director of cost operations of American Micro Devices, wishes to develop an accurate cost function to explain and predict support costs in the company's printed circuit board assembly operation. Mr. Ellis is concerned that the cost function that he currently uses—based on direct labor costs—is not accurate enough for proper planning and control of support costs. Mr. Ellis directed one of his financial analysts to obtain a random sample of 25 weeks of support costs and three possible cost drivers in the circuit-board assembly department: direct labor hours, number of boards assembled, and average cycle time of boards assembled. (Average cycle time is the average time between start and certified completion—after quality testing—of boards assembled during a week.) Much of the effort in this assembly operation is devoted to testing for quality and reworking defective boards, all of which increase the average cycle time in any period. Therefore, Mr. Ellis believes that average cycle time will be the best support-cost driver. Mr. Ellis wants his analyst to use regression analysis to demonstrate which cost driver best explains support costs.

Week	Circuit Board Assembly Support Costs, Y	Direct Labor Hours, X_1	Number of Boards Completed, X_2	Average Cycle Time (Hours), X_3
1	\$66,402	7,619	2,983	186.44
2	56,943	7,678	2,830	139.14
3	60,337	7,816	2,413	151.13
4	50,096	7,659	2,221	138.30
5	64,241	7,646	2,701	158.63
6	60,846	7,765	2,656	148.71
7	43,119	7,685	2,495	105.85
8	63,412	7,962	2,128	174.02
9	59,283	7,793	2,127	155.30
10	60,070	7,732	2,127	162.20
11	53,345	7,771	2,338	142.97
12	65,027	7,842	2,685	176.08
13	58,220	7,940	2,602	150.19
14	65,406	7,750	2,029	194.06
15	35,268	7,954	2,136	100.51
16	46,394	7,768	2,046	137.47
17	71,877	7,764	2,786	197.44
18	61,903	7,635	2,822	164.69
19	50,009	7,849	2,178	141.95
20	49,327	7,869	2,244	123.37
21	44,703	7,576	2,195	128.25
22	45,582	7,557	2,370	106.16
23	43,818	7,569	2,016	131.41
24	62,122	7,672	2,515	154.88
25	52,403	7,653	2,942	140.07

1. Plot support costs, Y , versus each of the possible cost drivers, X_1 , X_2 , and X_3 .
2. Use regression analysis to measure cost functions using each of the cost drivers.
3. According to the criteria of plausibility and reliability, which is the best cost driver for support costs in the circuit board assembly department?
4. Interpret the economic meaning of the best cost function.

3-50 Use of Cost Functions for Pricing

Study Appendix 3. Read the previous problem. If you worked that problem, use your measured cost functions. If you did not work the previous problem, assume the following measured cost functions:

$$Y = \$9,000/\text{week} + (\$6 \times \text{direct labor hours}); R^2 = 0.10$$

$$Y = \$20,000/\text{week} + (\$14 \times \text{number of boards completed}); R^2 = 0.40$$

$$Y = \$5,000/\text{week} + (\$350 \times \text{average cycle time}); R^2 = 0.80$$

1. Which of the support cost functions would you expect to be the most reliable for explaining and predicting support costs? Why?
2. Assume that American Micro Devices prices its products by adding a percentage markup to its product costs. Product costs include assembly labor, components, and support costs. Using each of the cost functions, compute the circuit board portion of the support cost of an order that used the following resources:
 - a. Effectively used the capacity of the assembly department for three weeks
 - b. Assembly labor hours: 20,000
 - c. Number of boards: 6,000
 - d. Average cycle time: 180 hours
3. Which cost driver would you recommend that American Micro Devices use? Why?
4. Assume that the market for this product is extremely cost competitive. What do you think of American Micro Devices' pricing method?

3-51 Review of Chapters 2 and 3

Curtis Institute of Music (CIM) provides instrumental music education to children of all ages. Payment for services comes from two sources: (1) a contract with Imagine That School to provide private music lessons for up to 140 band students a year (where a year is nine months of education) for a fixed fee of \$150,000, and (2) payment from individuals at a rate of \$120 per month for nine months of education each year. In the 2012–2013 school year, CIM made a profit of \$1,000 on revenues of \$270,000:

Revenues:		
Imagine That School contract	\$150,000	
Private students	<u>120,000</u>	
Total revenues		\$270,000
Expenses:		
Administrative staff	\$ 64,000	
Teaching staff	100,000	
Facilities	51,000	
Supplies	<u>54,000</u>	
Total expenses		<u>269,000</u>
Profit		<u>\$ 1,000</u>

CIM conducted an activity analysis and found that teaching staff wages and supplies costs are variable with respect to student-months. (A student-month is one student educated for one month.) Administrative staff and facilities costs are fixed within the range of 1,800–2,300 student-months. At volumes between 2,300 and 2,800 student-months, an additional facilities charge of \$2,800 would be incurred. During the last year, a total of 2,200 student-months of education were provided, 1,000 of which were for private students and 1,200 of which were offered under the contract with Imagine That School.

1. Compute the following using cost information from year 2012–2013 operations:
 - Fixed cost per year
 - Variable cost per student-month

- Suppose that in 2013–2014 Imagine That School decreased its use of CIM to 90 students (that is, 810 student-months). The fixed contract price of \$150,000 was still paid. If everything else stayed as it was in 2012–2013, what profit or loss would be made in 2013–2014?
- Suppose that at the beginning of 2013–2014 Imagine That School decided not to renew its contract with CIM, and the management of CIM decided to try to maintain business as usual with only private students. How many students (each signing up for nine months) would CIM require to continue to make a profit of \$1,000 per year?

CASES

3-52 Community Health Center Cost Behavior

Dr. Sristi Mukherjee has recently been promoted to the post of Chief Administrator of a community health center at New Delhi, India. Though the program has been quite a successful one in the recent past, the government is thinking about rationalizing the costs incurred on such centers as a recent round of auditing has raised questions about the rationality of certain activities and associated costs. Accordingly, a notification has been issued to all Chief Administrators to prepare the budget for the next financial year keeping in view of the observations of the auditor. Dr. Mukherjee, thus, needs to first identify where costs can be reduced and keep the center function at its best. The following is some data about fixed costs from the past year:

Program Area	Costs (₹)
Administrative salaries	
Administrator	960,000
Assistant	480,000
Two secretaries	360,000
Supplies	420,000
Advertising and promotion	210,000
Professional meetings, dues, and literature	250,000
Services outsourced	
Accounting and billing	120,000
Custodial and maintenance	80,000
Security	240,000
Consulting	140,000
Community health services	
Salaries of two social workers	360,000
Travelling	150,000
Outpatient health treatment	
Salaries	
Two general physician	1,560,000
Two social workers	360,000

- Identify which costs you think are likely to be discretionary and which are committed costs.
- One possibility is to eliminate all discretionary costs. How much would be saved? What is your opinion regarding this recommendation?
- How would you advise Dr. Mukherjee to prepare for reduced budgets?

3-53 Activity Analysis

The costs of the systems support (SS) department (and other service departments) of Southeast Pulp and Paper have always been charged to the three business divisions (forest management, lumber products, and paper products) based on the number of employees in each division. This measure is easy to obtain and update, and until recently none of the divisions had complained about the charges. The paper products division has recently automated many of its operations and has reduced the number of its employees. At the same time, however, to monitor its new process, paper products has increased its requests for various reports provided by the SS department. The other divisions have begun to complain that they are being charged more than their fair share of SS department costs. Based on activity analysis of possible cost drivers, cost analysts have suggested using the number of reports prepared as a means of charging for SS costs and have gathered the following information:

	Forest Management	Lumber Products	Paper Products
2011 number of employees	762	457	502
2011 number of reports	410	445	377
2011 SS costs: \$300,000			
2012 number of employees	751	413	131
2012 number of reports	412	432	712
2012 SS costs: \$385,000			

1. Discuss the plausibility and probable reliability of each of the cost drivers—number of employees or number of reports.
2. What are the 2011 and 2012 SS costs per unit of cost driver for each division using each cost driver? Do the forest management and lumber products divisions have legitimate complaints? Explain.
3. What are the incentives that are implied by each cost driver?
4. Which cost driver should Southeast Pulp and Paper use to charge its divisions for SS services? For other services? Why?

3-54 Identifying Relevant Data

eComp.com manufactures personal digital assistants (PDAs). Because these very small computers compete with laptops that have more functions and flexibility, understanding and using cost behavior is very critical to eComp.com's profitability. eComp.com's controller, Kelly Hudson, has kept meticulous files on various cost categories and possible cost drivers for most of the important functions and activities of eComp.com. Because most of the manufacturing at eComp.com is automated, labor cost is relatively fixed. Other support costs comprise most of eComp.com's costs. Partial data that Hudson has collected over the past 25 weeks on one of these support costs, logistics operations (materials purchasing, receiving, warehousing, and shipping), follow:

Week	Logistics Costs, Y	Number of Orders, X
1	\$23,907	1,357
2	18,265	1,077
3	24,208	1,383
4	23,578	1,486
5	22,211	1,292
6	22,862	1,425
7	23,303	1,306
8	24,507	1,373
9	17,878	1,031
10	18,306	1,020
11	20,807	1,097
12	19,707	1,069
13	23,020	1,444
14	20,407	733
15	20,370	413
16	20,678	633
17	21,145	711
18	20,775	228
19	20,532	488
20	20,659	655
21	20,430	722
22	20,713	373
23	20,256	391
24	21,196	734
25	20,406	256

1. Plot logistics costs, Y , versus number of orders, X . What cost behavior is evident? What do you think happened in week 14?
2. What is your recommendation to Kelly Hudson regarding the relevance of the past 25 weeks of logistics costs and number of orders for measuring logistics cost behavior?
3. Hudson remarks that one of the improvements that eComp.com has made in the past several months was to negotiate JIT deliveries from its suppliers. This was made possible by substituting an automated ordering system for the previous manual (labor-intensive) system. Although fixed costs increased, the variable cost of placing an order was expected to drop greatly. Do the data support this expectation? Do you believe that the change to the automated ordering system was justified? Why or why not?

NIKE 10-K PROBLEM

3-55 Step and Mixed Costs and Cost Drivers

Refer to Nike's 10-K report in Appendix C and "Item 1. Business." Nike's contract manufacturers make the vast majority of Nike's footwear. Assume these costs are variable to Nike. Nike's largest fixed costs are associated with its distribution system. Consider one of Nike's seven distribution and customer service facilities in the United States. List several examples of step-fixed costs and mixed costs at these centers. For each of the following activities at a distribution center, list one plausible cost driver:

1. Receiving activity
2. Unpacking incoming cases of footwear
3. Picking and packing cases of footwear for shipment to retail accounts
4. Processing orders from retail accounts
5. Providing customer service to retail accounts
6. Processing order changes from retail accounts

EXCEL APPLICATION EXERCISE

3-56 Fixed and Variable Cost Data

Goal: Create an Excel spreadsheet to calculate fixed and variable cost data for evaluating alternative approaches. Use the results to answer questions about your findings.

Scenario: American Sports has asked you to evaluate two alternative cost approaches for its new Web site. It would like you to calculate fixed and variable costs at different numbers of orders. The background data for your analysis appear in Exercise 3-33, on p. 127.

When you have completed your spreadsheet, answer the following questions:

1. At what number of orders are the total costs for the two approaches the same? What does this mean?
2. Which alternative should be selected if the expected number of orders is less than the break-even level of orders? If the expected number of orders is greater than the break-even level of orders?
3. What conclusion regarding cost predictions can be drawn from your analysis?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 3 Decision Guideline
Row 2: American Sports
Row 3: Analysis of Alternative Cost Approaches
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–K.
4. In row 7, create the following bold-faced, right-justified column headings:
Column A: Number of Orders
Column B: Alternative 1
Column C: Alternative 2

Note: Adjust column widths as necessary.

5. In column A, rows 8–12, enter order levels from 40,000 to 80,000 in 10,000-unit increments.
6. Use the scenario data to create formulas in columns B and C for calculating the total costs (fixed plus variable costs) for each alternative at the order level in column A.
7. Format all amounts as follows:

Number tab:	Category:	Number
	Decimal places:	0
	Use 1000 Separator (,):	Checked

8. Modify the Page Setup by selecting File, Page Setup.

Page tab:	Orientation:	Landscape
Margins tab:	Top:	0.5
	Bottom:	0.5

9. Select the data in columns A–C, rows 7–12, and start the Chart Wizard either by inserting a chart (Insert, Chart) or by clicking the Chart Wizard icon on the toolbar.

Step 1 of 4—Chart Type

- a. **Custom Types tab:**
- b. Chart Type: Smooth Lines
- c. Click “Next >” button

Note: List is alphabetical.

Step 2 of 4—Chart Source Data

- d. **Data Range tab:**
- e. Modify Data range to: = *SheetName*!\$B\$7:\$C\$12
- f. Series in: Columns
- g. **Series tab:**
- h. Category (X) axis labels: = *SheetName*!\$A\$8:\$A\$12
- i. Click “Next >” button

Step 3 of 4—Chart Options

- j. **Titles tab:**
- k. Chart Title: Analysis of Alternative Cost Approaches
- l. Category (X) axis: Number of Orders
- m. Value (Y) axis: Total Costs
- n. **Gridlines tab:**
- o. Category (X) axis: Major Gridlines (checked)
- p. Value (Y) axis: Major Gridlines (checked)
- q. Click “Next >” button

Step 4 of 4—Chart Location

- r. As object in *SheetName* Checked
- s. Click “Finish” button
10. Move the chart so the upper-left corner is on the left margin, row 14.
Left-click the upper-left handle and drag it to the designated location.
11. Resize the chart so the lower-right corner fills cell K37.
Left-click the lower-right handle and drag it to the designated location.
12. Format the Y-axis amounts (Total Costs) to display a dollar symbol by doing the following:
Double-click any cost amount on the Y-axis to open the “Format Axis” dialog box.

Scale tab:	Minimum:	300,000
Number tab:	Category:	Currency
	Decimal Places:	0
	Symbol:	\$

13. Save your work, and print a copy for your files.

Note: Select cell A8 before printing if you want both the data and the chart to print. If you want only the chart to print, ignore the “Select cell A8” instruction.

Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

3-57 Cost-Behavior Examples

Select about 10 students to participate in a “cost-behavior bee.” The game proceeds like a spelling bee—when a participant is unable to come up with a correct answer, he or she is eliminated from the game. The last one in the game is the winner.

The object of the game is to identify a type of cost that fits a particular cost-behavior pattern. The first player rolls a die.² If a 1 or a 6 comes up, the die passes to the next player (and the roller makes it to the next round). If a 2, 3, 4, or 5 comes up, the player has to identify one of the following types of costs:

- If a 2 is rolled, identify a variable cost.
- If a 3 is rolled, identify a fixed cost.
- If a 4 is rolled, identify a mixed cost.
- If a 5 is rolled, identify a step cost.

A scribe should label four columns on the board, one for each type of cost, and list the costs that are mentioned for each category. Once a particular cost has been used, it cannot be used again.

Each player has a time limit of 10 seconds to produce an example. (For a tougher game, make the time limit 5 seconds.) The instructor is the referee, judging if a particular example is acceptable. It is legitimate for the referee to ask a player to explain why he or she thinks the cost mentioned fits the category before making a judgment.

After each player has had a turn, a second round begins with the remaining players taking a turn in the same order as in the first round. The game continues through additional rounds until all but one player has failed to give an acceptable answer within the time limit. The remaining player is the winner.

INTERNET EXERCISE

3-58 Cost Behavior at Southwest Airlines

In this exercise, we will look at some costs and see if we can determine the type of behavior associated with those costs. While firms are concerned about trying to label costs as either variable or fixed to help in planning, very few costs are completely variable or fixed. The information provided by firms to external users also often precludes a user from determining specifics about the cost behaviors—they don’t want to give the competitors too much information!

Log on to the **Southwest Airlines** Web site at www.southwest.com. Click on the information icon “About Southwest,” and then click on “Investor Relations.” This will take you to the site where you can then access the financial information.

1. Click on the most recent “Southwest Airlines One Report” tab. Then click on the “performance” tab, then “past performance,” and find the page where the 10-year summary starts. Go to this section of the report. What type of information do you find there?
2. When you look at the operating revenue information, what do you see? Look at the information provided concerning operating expenses. Is it categorized in the same manner as the revenues? If the information is not in the same categories, why do you think Southwest did not match it up in the same manner?
3. Now look at the section on consolidated operating statistics. Southwest measures activity in revenue passenger miles (RPMs) and capacity in available seat miles (ASMs). Which of these is larger? How are the RPM and ASM determined? Is it possible for the two numbers to be the same? What information is provided for each of these items in the consolidated operating statistics section?
4. Using data from 2008 through 2011 and employing the high-low method, compute the fixed operating expense per year and the variable operating expense per RPM. Assume that half of the increase in operating expenses between 2008 and 2011 represents increases in fuel prices, which should be omitted from the analysis. Compare the total operating expense after omitting the increase caused by higher fuel prices and the variable expense for 2011. Is this relationship what you expected? Why or why not?
5. Airlines are often considered to be high-fixed-cost companies. Is this consistent with your findings in requirement 4? Explain why the high-low method this time might overestimate the amount of variable costs.

²Instead of rolling a die, players could draw one of the four cost categories out of a hat (or similar container) or from a deck of four 3 × 5 cards. This eliminates the chance element that can let some players proceed to a later round without having to give an example of a particular cost behavior. However, the chance element can add to the enjoyment of the game.

Cost Management Systems and Activity-Based Costing

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Describe the purposes of cost management systems.
2. Explain the relationship among cost, cost object, cost accumulation, and cost assignment.
3. Distinguish between direct and indirect costs.
4. Explain the major reasons for allocating costs.
5. Identify the main types of manufacturing costs: direct materials, direct labor, and indirect production costs.
6. Explain how the financial statements of merchandisers and manufacturers differ because of the types of goods they sell.
7. Understand the main differences between traditional and activity-based costing (ABC) systems and why ABC systems provide value to managers.
8. Use activity-based management (ABM) to make strategic and operational control decisions.
9. Describe the steps in designing an activity-based costing system (Appendix 4).

► DELL

Michael Dell founded **Dell Inc.** in 1984 while still a student at the University of Texas. He originally called the company PC's Limited but changed the name to Dell Computer Corporation in 1988, the same year the company issued its first shares to the public, and to Dell Inc. in 2003. Dell pioneered the selling of personal computers directly to end users by selling computers over the Internet. By waiting to produce a computer until it received an order and applying just-in-time manufacturing, Dell achieved a cost structure that gave it an advantage over its competitors.

In the 10 years leading up to 2011, revenues increased from \$32 billion to \$62 billion, but toward the end of the decade market share declined. In 2001 Dell was the world's largest seller of personal computers. In 2002, Dell temporarily slipped to second place after the merger of two major competitors, **Hewlett-Packard** and **Compaq**. However, Dell regained the lead the next year and held it through 2006. Dell lost the market-share lead to Hewlett-Packard in 2007 as global market share fell from 16% to 14%, and by 2011 Dell's market share had declined further to 12%.

In 2004 Michael Dell had stepped down as CEO. Shortly thereafter, Dell began experiencing difficulties—quality problems and declining sales. Michael Dell stepped back in as CEO in early 2007 and summarized Dell's problems: "As we evolved we lost focus and allowed our cost structure to become non-competitive."

How could Dell regain its competitive cost structure? By better understanding and controlling its costs. Michael Dell described the company's renewed focus on cost control:

Our strategy is focused on competitiveness and growth. To achieve the former, we comprehensively reviewed costs across all processes and organizations, which resulted in actions to reduce:

- *product and procurement costs by more closely matching our product design to customer segments and eliminating embedded costs associated with features not valued by our customers;*
- *operating expenses, including a reduction of global employee headcount; and,*
- *manufacturing and logistics costs by optimizing our global manufacturing network.*

To accomplish these objectives, Dell had to develop systems to better measure and report the costs of producing products and providing services for customers. This chapter focuses on many of the issues Dell faced. Managers need information about costs to make good decisions in any organization, ranging from large corporations such as Dell or Hewlett-Packard to small businesses such as the local bakery or auto repair shop to nonprofit organizations such as hospitals or food banks. Managers need to know how decisions will affect their organization's costs. ■



Kristoffer Tripplaar/Alamy Stock Photo

Dell has focused on cost control and shifted its product mix toward services and solutions.

Cost Management Systems

To support managers' decisions, accountants develop **cost management systems (CMS)**—collections of tools and techniques that identify how decisions affect costs. A cost management system provides

1. cost information for strategic management decisions;
2. cost information for operational control; and
3. measures of inventory value and cost of goods sold for financial reporting to investors, creditors, and other external stakeholders.

External users need *aggregate* measures of inventory value and the cost of goods sold. Internal managers need more detailed cost information on individual products or services.

The need for sophisticated cost management systems is driven by the strategic and operational decisions faced by managers. Managers need accurate and timely cost information for strategic decisions, such as deciding on the optimal product and customer mix or investment decisions. For these decisions, managers want to know the costs of individual products, services, customers, and processes. For example, **Dell** supports a wide range of products that in the majority of cases are customized to individual customer requirements, whether they are businesses or consumers. Dell has shifted its product mix away from consumer sales and toward services and enterprise solutions where expected margins are higher. In a recent 2019 interview in the *Allister & Paine Magazine*, Michael Dell described this strategy: "Today, roughly 80 percent of our business is with businesses and public-sector organizations. Ninety-five percent of all Fortune 500 companies and 100 percent of G20 governments are Dell customers. While we have a strong consumer presence and will continue to compete in that space, it's important to focus and commercial is where we expect most of our growth will come from. Ours is a \$3 trillion industry and only about \$250 billion of it is consumer. We're laser-focused on the \$2.75 trillion opportunity that is commercial." This strategic decision relied on cost information about both production costs and distribution costs.

Managers also strive for efficiency by controlling costs. For example, in 2011, CFO Brian Gladden listed a number of cost improvements at Dell, including:

- Reduced number of configurations resulting in materials reduction and faster time to market
- Better products with reduced warranty expense and less obsolete inventory
- Lower manufacturing and freight costs
- Reduced overhead
- Building and shipping in bulk based on better forecasts and enabling ocean shipment

To implement sustainable cost control programs, managers need accurate and timely feedback on costs.

Objective 1

Describe the purposes of cost management systems.

cost management system (CMS)

A collection of tools and techniques that identify how management's decisions affect costs.

cost accounting

That part of the cost management system that measures costs for the purposes of management decision making and financial reporting.

Objective 2

Explain the relationship among cost, cost object, cost accumulation, and cost assignment.

cost

A sacrifice or giving up of resources for a particular purpose.

cost object (cost objective)

Anything for which decision makers desire a separate measurement of costs. Examples include departments, products, activities, and territories.

cost accounting system

The techniques used to determine the cost of a product, service, customer, or other cost object.

Throughout this text, we describe many CMS tools and techniques that help managers make decisions. Examples include the contribution margin technique and cost-volume-profit analysis you read about in Chapter 2. All of these tools and techniques have one thing in common—the need for accurate information about costs. This chapter focuses on **cost accounting**, the part of a cost management system that measures costs for the purposes of management decision making and financial reporting.

Cost Accounting Systems

We define **cost** as a sacrifice or giving up of resources for a particular purpose. Consider the cost of labor resources. An organization pays (gives up) cash or its equivalent to employees in exchange for their work. We measure the cost of labor resources by monetary units such as yen, dollars, or euros paid to obtain the labor resources. However, managers generally want more from their accountants than simply the cost of the resources used. They often want to know the cost of something in particular, such as a product or a service. Anything for which decision makers desire a separate measurement of costs is a **cost object** (or **cost objective**). Although managers most often want to know the cost of a product or service, there are many other possible cost objects. Examples include customers, departments, territories, and activities such as processing orders or moving materials. For example, **Brussels South Charleroi Airport**, Belgium's second largest airport, introduced the Environmental and Movement Monitoring for Airports (EMMA) operations management platform to help it increase the predictability of operations, reduce delays, conserve fuel, and decrease operational costs. This platform enables the airport to improve its operational efficiency and optimize the use of resources. The new management system, which helps reduce costs, is in line with the airport's market position as a low-cost alternative for low-cost carriers. The airport is competing with others that are handling between 5 and 16.5 million passengers per year. At its peak in 2019, this technology helped Belgium's airport handle 8.2 million passengers.

The cost data that managers use for decision making come from the **cost accounting system**—the techniques used to determine the cost of a product, service, customer, or other cost objects. The cost accounting system is the most fundamental component of a cost management system. It supports all other cost management system tools and techniques.

Cost accounting systems need to provide accurate and timely cost information to help managers make decisions. Without accurate and timely cost information, many decisions can be downright harmful. For example, several years ago a large U.S. grocery chain, **A&P**, ran into profit difficulties and began retrenching by closing many stores. Management's lack of adequate cost information about individual store operations made the closing program a hit-or-miss affair. A 2015 news story reported the following:

Because of the absence of detailed profit-and-loss statements, and a [cost accounting] system that did not reflect true costs, A&P's strategists could not be sure whether an individual store was really unprofitable. For example, distribution costs were shared equally among all the stores in a marketing area without regard to such factors as a store's distance from the warehouse. Says one close observer of the company: "When they wanted to close a store, they had to wing it. They could not make rational decisions, because they did not have a fact basis."

All kinds of organizations—manufacturing firms, service companies, and nonprofit organizations—need some form of cost accounting. Consider the following commentaries on the modern role of management accountants and cost accounting systems:

We [management accountants] have to understand what the numbers mean, relate the numbers to business activity, and recommend alternative courses of action. Finally, we have to evaluate alternatives and make decisions to maximize business efficiency.

—**South Central Bell**

Because the [cost accounting] system now mirrors the manufacturing process, the engineers and production staff believe the cost data produced by the cost accounting system. Engineering and production regularly ask accounting to help find the product design combination that will optimize costs.... The accountants now participate in product

*design decisions. They help engineering and production understand how costs behave...
The system makes the professional lives of the accountants more rewarding.*

—Hewlett-Packard Company

A cost accounting system typically includes two processes:

1. **Cost accumulation:** Collecting costs by some “natural” classification, such as materials or labor, or by activities performed such as order processing or machine processing.
2. **Cost assignment:** Attaching costs to one or more cost objects, such as activities, processes, departments, customers, or products.

Exhibit 4-1 is a simple illustration of these two basic processes for materials costs. First, the system collects the costs of all materials. Then, it assigns these costs to the departments that use the materials and further to the specific activities performed in these departments. Last, the system assigns the accumulated costs to the products made—cabinets, tables, and desks. The total materials cost of a particular product is the sum of the materials costs assigned to it in the various departments. For example, the cost of a finished desk would include the following materials costs:

- Metal top, sides, and legs produced by the various activities in the machining department
- Bolts, brackets, screws, drawers, handles, and knobs pieced together by finishing department activities

Managers rely on the accuracy of the cost accounting system. In today’s business environment, characterized by highly-competitive global markets and complex production processes, designing cost accounting systems that provide accurate and useful information is a key success factor for all types of organizations. The financial vice president of a major manufacturing firm recently told one of the authors that the company’s main competitive advantage was its financial information system, not its manufacturing or distribution capabilities.

cost accumulation

Collecting costs by some natural classification, such as activities performed, labor, or materials.

cost assignment

Attaching costs to one or more cost objects, such as activities, departments, customers, or products.

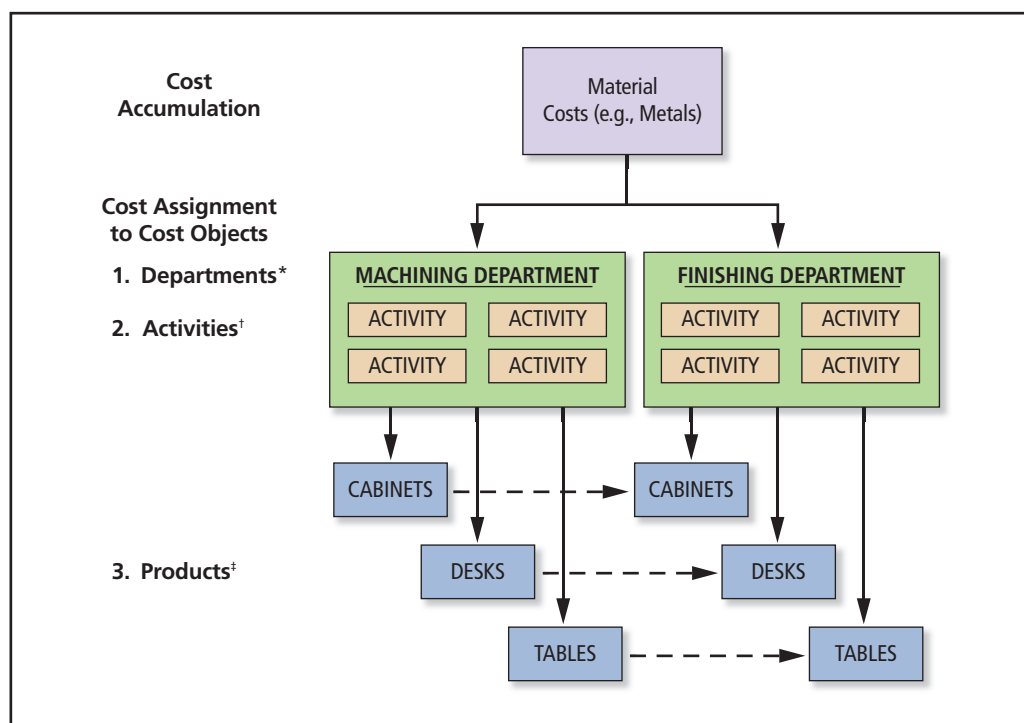


Exhibit 4-1

Cost Accumulation and Assignment

*Purpose: to evaluate performance of manufacturing departments

†Purpose: to measure and evaluate the efficiency of various activities

‡Purpose: to obtain costs of various products for valuing inventory, determining income, and judging product profitability

This chapter describes some major types of cost accounting systems. However, before describing the systems, we need to develop an understanding of the various cost terms that managers and accountants commonly use.

Cost Terms Used for Strategic Decision Making and Operational Control Purposes

Objective 3

Distinguish between direct and indirect costs.

direct costs

Costs that accountants can identify specifically and exclusively with a given cost object in an economically feasible way.

tracing

Physically identifying the amount of a direct cost that relates exclusively to a particular cost object.

indirect costs

Costs that accountants cannot identify specifically and exclusively with a given cost object in an economically feasible way.

cost allocation

Assigning indirect costs to cost objects in proportion to the cost object's use of a particular cost-allocation base.

cost-allocation base

A measure of input or output that determines the amount of cost to be allocated to a particular cost object. An ideal cost-allocation base measures how much of the particular cost is generated by the cost object.

Accountants have their own language laced with jargon. As a manager, you will need to understand the basics of this language. This section focuses on three key terms: direct costs, indirect costs, and cost allocation.

Direct Costs, Indirect Costs, and Cost Allocation

Costs may be direct or indirect with respect to a particular cost object. Accountants can identify **direct costs** specifically and exclusively with a given cost object in an economically feasible way. Parts and materials included in a product are the most common types of direct cost. For example, to determine the cost of parts assembled into a **Dell** laptop computer, Dell's accountants can determine the cost of the specific parts used. A key characteristic of direct costs is that accountants can physically identify the amount of the cost that relates exclusively to a particular cost object. We call this **tracing** the direct cost to the cost object. In contrast, accountants cannot specifically and exclusively identify the amount of **indirect costs** related to a given cost object in an economically feasible way. Examples of indirect costs include facilities rental costs, depreciation on equipment, and many staff salaries.

To further illustrate the distinction between direct and indirect cost, consider the cost of labor. Some employees work specifically on particular products. These labor costs are direct to those products because the costs can be traced to the products. Other employees, such as supervisors, general managers, accountants, and legal staff, do not work on individual products. Because these costs cannot be traced to the products, they are indirect costs.

Over time, the mix is shifting toward more indirect costs. A century ago, a large proportion of labor costs were direct. Most companies had a labor-intensive production process where a majority of the workers had hands-on involvement with producing their company's products. To produce 10% more units of a particular product, a company typically needed about 10% more workers. Today the situation is different. Automated production processes have eliminated many hands-on jobs, and more employees just oversee automated processes that make many different products. Increases or decreases in production, or changes in the product mix do not directly affect this labor cost.

Just because a cost is indirect does not mean it is unimportant. Companies cannot continue to make products without indirect costs. Further, in many companies today, indirect costs exceed 50% of total costs, so accurate assignment of indirect costs is crucial. Decision makers who ignore indirect costs or receive inaccurate measures of indirect costs often make poor decisions. One of the most challenging tasks of a cost accounting system is to assign indirect costs to cost objects.

To assign indirect costs to cost objects, we use **cost allocation**, which assigns indirect costs to cost objects in proportion to the cost object's use of a particular cost-allocation base. A **cost-allocation base** is some measure of input or output that determines the amount of cost to be allocated to a particular cost object. An ideal cost-allocation base measures how much of the particular cost is *generated* by the cost object. Note the similarity of this definition to that of a cost driver—a factor that *generates* costs. Therefore, *most cost-allocation bases are cost drivers*.

Consider how Dell's accountants assign assembly-equipment depreciation to a particular model of laptop. They might allocate this indirect cost based on the allocation base "machine hours," a measure of the amount of assembly equipment time used to make a particular computer. If making a Latitude laptop uses two machine hours while making an Ultrabook laptop uses only one, then Dell would allocate twice as much machine depreciation cost to the Latitude. An *allocated* cost is an indirect cost assigned to a cost object using a cost-allocation base.

Decision makers should be cautious in using allocated indirect costs. When the allocation base measures how much cost is *generated* by the cost objects, allocated costs will be relevant for many decisions. When the allocation is not related to the cause of the costs, managers have reason to suspect the resulting costs are inaccurate.

Because cost allocations are so important to cost measurement in today's companies, let's look more deeply into why and how companies allocate their indirect costs.

Purposes of Cost Allocation

What logic should we use for allocating costs? The answer depends on the purpose(s) of the cost allocation. In short, there are no firm rules that we can rely on—there is no universally best cost-allocation system. Instead of cost allocation rules, we focus on general concepts that provide guidance when managers design these systems. You will be a better decision maker if you use these concepts to evaluate the system generating the information you are using in your decisions.

Recall that cost allocations support a company's CMS—the system providing cost measurements for strategic decision making, operational control, and external reporting. Following are four purposes of cost allocation. The first two support strategic decision making and operational control, the third supports external reporting, and the fourth supports the previous three.

1. **To predict the economic effects of strategic and operational control decisions:** Major strategic decisions include setting the optimal product and customer mix, establishing pricing policy, and setting policy about which value-chain functions to develop as core competencies. Managers also need to predict the economic effects—both benefits and costs—of process improvement efforts. Managers within an organizational unit should be aware of all the consequences of their decisions, even consequences outside of their unit. Examples are the addition of a new course in a university that causes additional work in the registrar's office, the addition of a new flight or an additional passenger on an airline that requires reservation and booking services, and the addition of a new specialty in a medical clinic that produces more work for the medical records department.
2. **To provide desired motivation and to give feedback for performance evaluation:** Companies often hold managers responsible for total costs that include allocated costs. Therefore, cost allocations influence management behavior and can help motivate managers to make decisions that are in the company's best interests. For example, some organizations allocate the costs of legal services or internal management consulting services to spur managers to make sure the benefits of the services exceed the costs. Other organizations do not allocate such costs because top management wants to encourage their use.
3. **To compute income and asset valuations for financial reporting:** Companies allocate costs to products to measure inventory costs for their balance sheets and cost of goods sold for their income statements.
4. **To justify costs or obtain reimbursement:** Sometimes organizations base prices directly on costs. For example, government contracts often specify a price that includes reimbursement for costs plus some profit margin. In these instances, cost allocations directly determine the revenue received from a product or service.

Ideally, a single cost allocation would serve all four purposes simultaneously. But thousands of managers and accountants will agree that most systems fail to achieve this ideal. Instead, cost allocations are often a major source of discontent and confusion. Allocating fixed costs usually causes the greatest problems. Why? Because fixed costs by definition do not change with the level of activity or production, yet the allocated fixed costs are often misinterpreted as a measure of how costs change with the level of activity. At the same time, fixed costs are often necessary to run a business and systems that do not allocate these fixed costs can also be misinterpreted, creating the misimpression that all products or services that sell for more than their direct, variable costs are profitable. Because both systems that allocate costs and systems that do not allocate costs can lead to misinterpretation, managers and accountants need to decide which approach is preferable in a particular situation.

Often external reporting rules for measuring inventory and cost of goods sold dominate by default because they are externally imposed. For example, generally accepted accounting principles (GAAP) require a company to assign all production-related costs and only production-related costs to its products. On the other hand, managers may prefer not to allocate all production-related indirect fixed costs for some decision-making purposes. If a particular management decision does not affect such fixed costs, it can be misleading to include them as part of the cost of the product. In addition, managers may want to allocate major costs from nonproduction parts of the value chain,

Objective 4

Explain the major reasons for allocating costs.

such as R&D, marketing, or administrative expenses. Thus, the product or customer costs managers need for decision making and performance evaluation often are different from the costs allocated under GAAP. The decision should be made to create a system of allocations that differ from those used for inventory-costing purposes when the benefits of the system exceed the added cost of the system.

Methods of Cost Allocation

Now let’s turn to the question of how companies allocate costs. Because final products or services are important cost objects to nearly all organizations, we focus on how companies trace direct costs and allocate indirect costs to these cost objects. Examine Exhibit 4-2 to see the difference between tracing direct costs and allocating indirect costs to final products.

Physically tracing the direct costs is usually straightforward. For example, the cost accounting system can measure the amount and cost of each material added to a product. Workers can record the time spent on each product and the system can value each hour at the worker’s appropriate wage rate. Systems to accurately measure direct costs have been available for decades, even centuries.

Allocating indirect costs is more complex. Because indirect costs are substantial for most companies, allocation choices are especially important. Allocation is a four-step process:

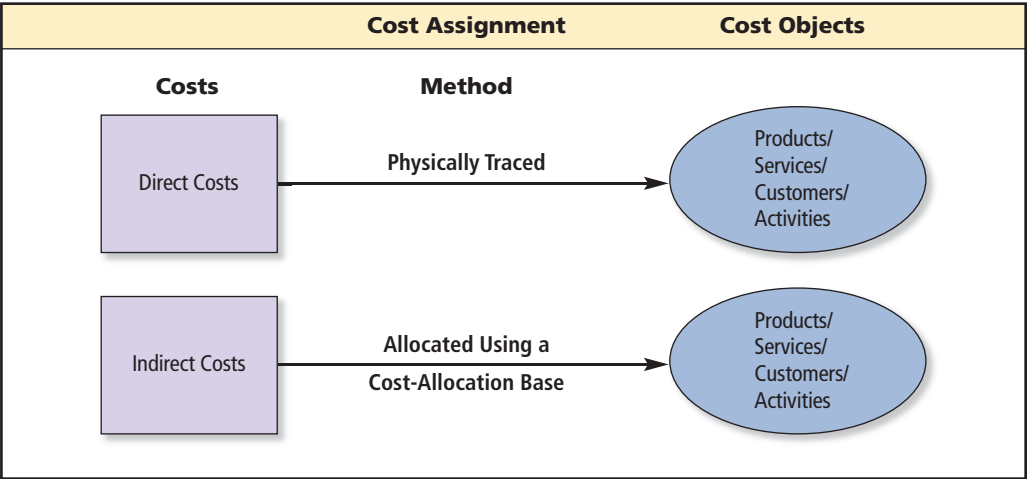
cost pool
A group of individual costs that a company allocates to cost objects using a single cost-allocation base.

1. Accumulate indirect costs into one or more cost pools. A **cost pool** is a group of individual costs that a company allocates to cost objects using a single cost-allocation base. Many simple cost accounting systems place all indirect production costs in a single cost pool.
2. Select an allocation base for each cost pool. If possible, the allocation base should be a cost driver—a measure that generates the costs in the cost pool. However, in many cases it is not possible to find a clear cost driver, and therefore companies resort to using an allocation base that has little to do with the cause of costs in the cost pool. For example, companies that have a single cost pool for indirect costs often use direct-labor hours or direct-labor cost as the cost-allocation base.
3. Measure the units of the cost-allocation base used for each cost object (for example, the number of direct-labor hours used on a particular product) and compute the total units used for all cost objects.
4. Multiply the percentage of total cost-allocation base units used for each cost object by the total costs in the cost pool to determine the cost allocated to each cost object.

Consider the depreciation on Dell’s assembly equipment. How would Dell’s accountants allocate \$400,000 of depreciation for July to Ultrabook and Latitude laptop computers? Let’s apply the four steps:

1. In July accountants measured the depreciation cost, the only cost in this cost pool, at \$400,000.
2. The cost-allocation base selected is machine hours.

Exhibit 4-2
Assignment of Direct and Indirect Costs to Products, Services, Customers, or Activities



3. Dell used 2,000 machine hours in July to make Ultrabook laptops and 3,000 machine hours to make Latitude laptops, for a total of 5,000 machine hours.
4. This means that Dell used $2,000 \div 5,000 = 40\%$ of the machine hours for Ultrabook and $3,000 \div 5,000 = 60\%$ of the machine hours for Latitude, so the depreciation cost allocated to Ultrabook is $40\% \times \$400,000 = \$160,000$, and the cost allocated to Latitude is $60\% \times \$400,000 = \$240,000$.

An alternative way to describe this allocation is to compute the depreciation cost per machine hour or $\$400,000 \div (3,000 + 2,000) = \$80$. The allocation to Ultrabook is $\$80 \times 2,000 = \$160,000$ and the allocation to Latitude is $\$80 \times 3,000 = \$240,000$.

Companies also use cost allocation to assign indirect costs to cost objects other than products or services. For example, suppose we are allocating costs to departments. A logical cost-allocation base for allocating rent costs to departments is the number of square feet that each department occupies. Other logical cost-allocation bases include cubic feet for allocating depreciation of heating and air conditioning equipment and total direct cost for allocating general administrative expense.

You will see varying terminology used to describe cost allocation. You may encounter terms such as *allocate*, *apply*, *absorb*, *attribute*, *reallocate*, *assign*, *distribute*, *redistribute*, *load*, *burden*, *apportion*, and *reapportion* being used interchangeably to describe the allocation of indirect costs to cost objects.

Unallocated Costs

Some costs lack an identifiable relationship to a cost object. Often it is best to leave such costs unallocated. **Unallocated costs** are costs that an accounting system records but does not allocate to any cost object. They might include research and development (R&D), process design, legal expenses, accounting, information services, and executive salaries. Keep in mind, though, that an unallocated cost for one company may be an allocated cost or even a direct cost for another. Why? Because businesses vary considerably in their value chains and operating processes. For example, product design is a critical success factor for some businesses, and therefore, managers in such companies are willing to spend the time and effort to deploy sophisticated accounting systems to allocate or even directly trace product design costs. For other companies, this cost is not important enough to warrant special treatment.

Consider the statement of operating income for Li Company in Panel A of Exhibit 4-3. Li Company makes cabinets, tables, and chairs. Each item in Panel A represents accumulated totals for all products sold for an entire reporting period. To help make a strategic decision regarding which of the three products to emphasize, it would be useful to “unbundle” these totals to find the profitability of each product. How can we do this?

Consider cost of goods sold, which includes all manufacturing costs. Like most companies, Li Company finds that it is easy to trace direct-material costs to individual products. However, other manufacturing costs are difficult to trace directly, so Li Company treats them as indirect and allocates them to products.

Let's assume that Li Company uses machine hours to allocate all indirect manufacturing costs. Last year Li Company used 9,000, 6,000, and 7,000 machine hours to make cabinets, tables, and chairs, respectively—a total of 22,000 machine hours. Therefore, the allocation of the \$110,000 indirect manufacturing costs to cabinets is $\$110,000 \times (9,000 \div 22,000) = \$45,000$, to tables is $\$110,000 \times (6,000 \div 22,000) = \$30,000$, and to chairs is $\$110,000 \times (7,000 \div 22,000) = \$35,000$, as shown in Panel B of Exhibit 4-3. If managers responsible for each of the products believe the use of machine hours is closely related to the amount of indirect costs incurred, they would be satisfied that the cost of goods sold and gross profit amounts in Panel B are accurately measured.

Li Company also has both direct and indirect selling expenses. It can directly trace sales salaries to individual products because the company pays its sales force commissions based on individual sales and no fixed salaries. In addition, it allocates the expenses for the distribution of products to warehouses in a fair manner based on weight. Last year, shipments of cabinets, tables, and chairs weighed 6,000, 4,000, and 5,000 pounds, respectively, for a total of 15,000 pounds. Consequently, the allocation of the \$30,000 total distribution costs to cabinets is $\$30,000 \times (6,000 \div 15,000) = \$12,000$, to tables is $\$30,000 \times (4,000 \div 15,000) = \$8,000$, and to chairs is $\$30,000 \times (5,000 \div 15,000) = \$10,000$.

unallocated costs

Costs that an accounting system records but does not allocate to any cost object.

Panel A Statement of Operating Income [External Reporting Purpose]		Panel B Contribution to Corporate Costs and Profit [Internal Strategic Decision-Making Purpose]			
		Cabinets	Tables	Chairs	Cost Type, Assignment Method
Sales revenues	\$470,000	\$ 280,000	\$100,000	\$90,000	
Cost of goods sold:					
Direct material	120,000	50,000	30,000	40,000	Direct, direct trace
Indirect manufacturing	110,000	45,000	30,000	35,000	Indirect, allocation based on machine hours
Total cost of goods sold	230,000	95,000	60,000	75,000	
Gross profit	240,000	185,000	40,000	15,000	
Selling expenses:					
Sales salaries	47,000	28,000	10,000	9,000	Direct, direct trace
Distribution	30,000	12,000	8,000	10,000	Indirect, allocation based on weight
Total selling expenses	77,000	40,000	18,000	19,000	
Contribution to corporate expenses and profit	163,000	\$145,000	\$ 22,000	\$(4,000)	
Corporate expenses (unallocated):					
Administrative salaries	40,000				
Other administrative expenses	60,000				
Total unallocated expenses	100,000				
Operating income	\$ 63,000				

Exhibit 4-3

Direct, Indirect, and Unallocated Costs for Li Company

Because Li Company's allocation bases are good measures of what generates the indirect costs, managers are likely to view the allocated costs as fair. While the managers in charge of chairs may not be happy with the reported loss of \$4,000, they would feel that it is a reasonable measure of profitability.

Li Company could find no reasonable means to allocate administrative salaries or other administrative expenses. Therefore, these corporate-level expenses remain unallocated. Why not allocate the administrative salaries and other administrative expenses to the products by using some simple measure, such as "percent of total revenue generated" or "number of units sold"? Because managers generally want allocations to be a fair measure of the costs incurred on their behalf. If administrative salaries and expenses are not closely related to the allocation base such as "percent of revenue" or "number of units sold," the allocations are arbitrary. Managers will not trust allocations that are arbitrary and may make decisions based on other less relevant information. Therefore, companies that cannot find cost drivers that are directly related to costs often choose not to allocate the costs.

Assigning a cost as direct, indirect, or unallocated requires judgment. Such judgments are based on the type of cost, its magnitude, and how expensive it is to implement a system to trace or allocate the cost. For direct costs, judgments required are generally fairly easy to make with the main issue being whether the cost of a system for tracing costs to cost objects is greater than its expected benefits. For example, a system for tracing the exact cost of products sold by [Amazon.com](https://www.amazon.com) to individual orders is likely to be worth its cost. However, it may be too expensive to trace the exact cost of packing and preparing each order for shipment, even though such a tracing is technically possible. For indirect costs, the judgments required are more difficult. Much of the remainder of this book deals with judgments about allocating indirect costs.

Frequently, managers want to know the costs of more than one cost object, such as departments, products, services, activities, or resources. In these cases, companies allocate costs to multiple cost objects. For example, suppose the manager of a local telephone company is faced with two decisions: 1) what price to charge for installing new phone service and 2) what costs to include in the installation department's budget. Among the various costs relevant to both decisions is the salary of a supervisor in the installation department who oversees both phone installations and routine service calls. For the pricing decision, the supervisor's salary is an indirect cost. Why? Because accountants cannot physically trace this cost to the phone

installations or service calls and therefore must allocate the cost. However, for the department budget, the supervisor's salary is a direct cost. Why? Because accountants can physically identify 100% of the cost as belonging to the department. This is an example of a cost that is both direct (to the department) and indirect (to the product or service). In general, many more costs are direct when the cost object is a department than when it is a product or service.

Cost Terms Used for External Reporting Purposes

While this text focuses mostly on costs used by managers, it is important to recognize that cost accounting systems also support the financial reporting process. One of the four purposes of cost management systems is to provide aggregate measures of inventory value and cost of goods manufactured for external reporting to investors, creditors, and other external stakeholders. We will discuss four attributes of these costs: manufacturing costs, product versus period costs, costs on the balance sheet, and costs on the income statement.

Categories of Manufacturing Costs

Manufacturing companies accumulate and report the cost of inventories in a different way than merchandising companies. Manufacturing operations transform **raw materials**—the basic materials from which a product is made—into other goods through the use of labor and factory facilities. In manufacturing companies, products are frequently the cost object. Manufacturing companies classify production costs as either (1) direct-material costs, (2) direct-labor costs, or (3) indirect production costs:

1. **Direct-material costs** include the acquisition costs of raw materials that a company can trace to the products in an economically feasible way. Examples of materials that are typically considered direct-material costs are iron castings, lumber, aluminum sheets, and subassemblies. Examples where it is typically not economically feasible to trace materials cost to products are costs of solder, glue, or tape.
2. **Direct-labor costs** include the wages (and, in some companies, related benefits) paid to employees that a company can trace specifically and exclusively to the manufactured goods. Examples are the wages of machine operators and assemblers. In highly automated factories with a flexible workforce, there may not be any direct-labor costs. Why? Because all workers may spend time overseeing numerous products, making it economically infeasible to physically trace any labor cost directly to specific products.
3. **Indirect production costs** (also called **indirect manufacturing costs**, **factory overhead**, **factory burden**, or **manufacturing overhead**) include all costs associated with the production process that a company cannot trace to products or services in an economically feasible way. Examples of indirect production costs are power, supplies, supervisory salaries, property taxes, rent, insurance, and depreciation. Supplies or indirect materials are also part of indirect production costs. Supplies are materials used in the manufacturing process that do not become part of the product, such as sandpaper or cleaning materials. Minor items, such as tacks or glue, are also often treated as indirect materials even though they become part of the manufactured product because the cost of tracing these items is greater than the benefit of having more precise product costs. Similarly, accountants consider many labor costs, such as costs of janitors, forklift truck operators, plant guards, and storeroom clerks, to be indirect labor because it is impossible or economically infeasible to trace such activities to specific products.

Product Costs and Period Costs

When preparing income statements and balance sheets, accountants frequently distinguish between product costs and period costs. **Product costs** are costs identified with products manufactured or purchased for resale. In a manufacturing company, product costs include direct-materials costs, direct-labor, and indirect production costs. These costs first become part of the inventory; thus, we call them **inventoriable costs**. These inventoriable costs become expenses in the form of cost of goods sold when the company sells the inventory.

In contrast, **period costs** become expenses during the current period without becoming part of inventory. Period costs are associated with nonproduction value-chain functions (research and development, design, marketing, distribution, and customer service). Most firms' financial

Objective 5

Identify the main types of manufacturing costs: direct materials, direct labor, and indirect production costs.

raw material

The basic material from which a product is made.

direct-material costs

The acquisition costs of raw materials that a company traces to the manufactured goods.

direct-labor costs

The wages of all labor that a company can trace specifically and exclusively to the manufactured goods.

indirect production costs (indirect manufacturing costs, factory burden, factory overhead, manufacturing overhead)

All costs associated with the production process that a company cannot trace to the goods or services produced in an economically feasible way; usually all production costs except direct materials and direct labor.

product costs

(inventoriable costs) Costs identified with goods produced or purchased for resale.

period costs

Costs that become expenses during the current period without becoming part of inventory.

statements report these costs as selling and administrative expenses. In short, these costs do not become a part of the reported inventory cost of the manufactured products for financial reporting purposes.

Exhibit 4-4 illustrates product and period costs. The top half shows a merchandising company, such as a retailer or wholesaler, that acquires goods for resale without changing their basic form. The only product cost is the purchase cost of the merchandise. The company holds unsold goods as merchandise inventory and shows their costs as an asset on a balance sheet. As the company sells the goods, their costs become expenses in the form of “cost of goods sold.” A merchandising company also has a variety of selling and administrative expenses. These costs are period costs because the company deducts them from revenue as expenses without ever being regarded as a part of inventory.

The bottom half of Exhibit 4-4 shows product and period costs in a manufacturing company. Note that the company incurs direct-labor costs and indirect production costs to transform direct materials into salable items. You can see that the balance sheets of manufacturers and merchandisers differ with respect to inventories. Instead of one inventory account, a manufacturing concern has three inventory accounts that help managers trace all product costs through the production process to the time of sales. These accounts are as follows:

raw-material inventory

Raw material on hand and awaiting use in the production process.

work-in-process inventory

Goods undergoing the production process but not yet fully completed.

finished-goods inventory

Goods fully completed but not yet sold.

- **Raw-material (direct-material) inventory:** Raw material on hand and awaiting use in the production process.
- **Work-in-process inventory:** Goods undergoing the production process but not yet fully completed. Costs include appropriate amounts of the three major manufacturing costs: direct-material costs, direct-labor costs, and indirect production costs.
- **Finished-goods inventory:** Goods fully completed but not yet sold.

The only accounting difference between manufacturing and merchandising companies is in the composition of product costs. A merchandising company includes in product cost only the cost to acquire the merchandise it sells. In contrast, a manufacturing company includes in product cost such items as insurance, depreciation, and wages that are incurred in the production process in addition to the cost of materials. Although merchandising and manufacturing companies differ in how they account for product costs, they account for period costs the same. Regardless of the type of company, period costs never become part of inventory.

Balance Sheet and Income Statement Presentation of Costs

How do published financial statements of merchandising and manufacturing companies differ in presenting costs? Let’s first examine balance sheets and notice the extra detail provided by a manufacturer:

Current Asset Sections of Balance Sheets

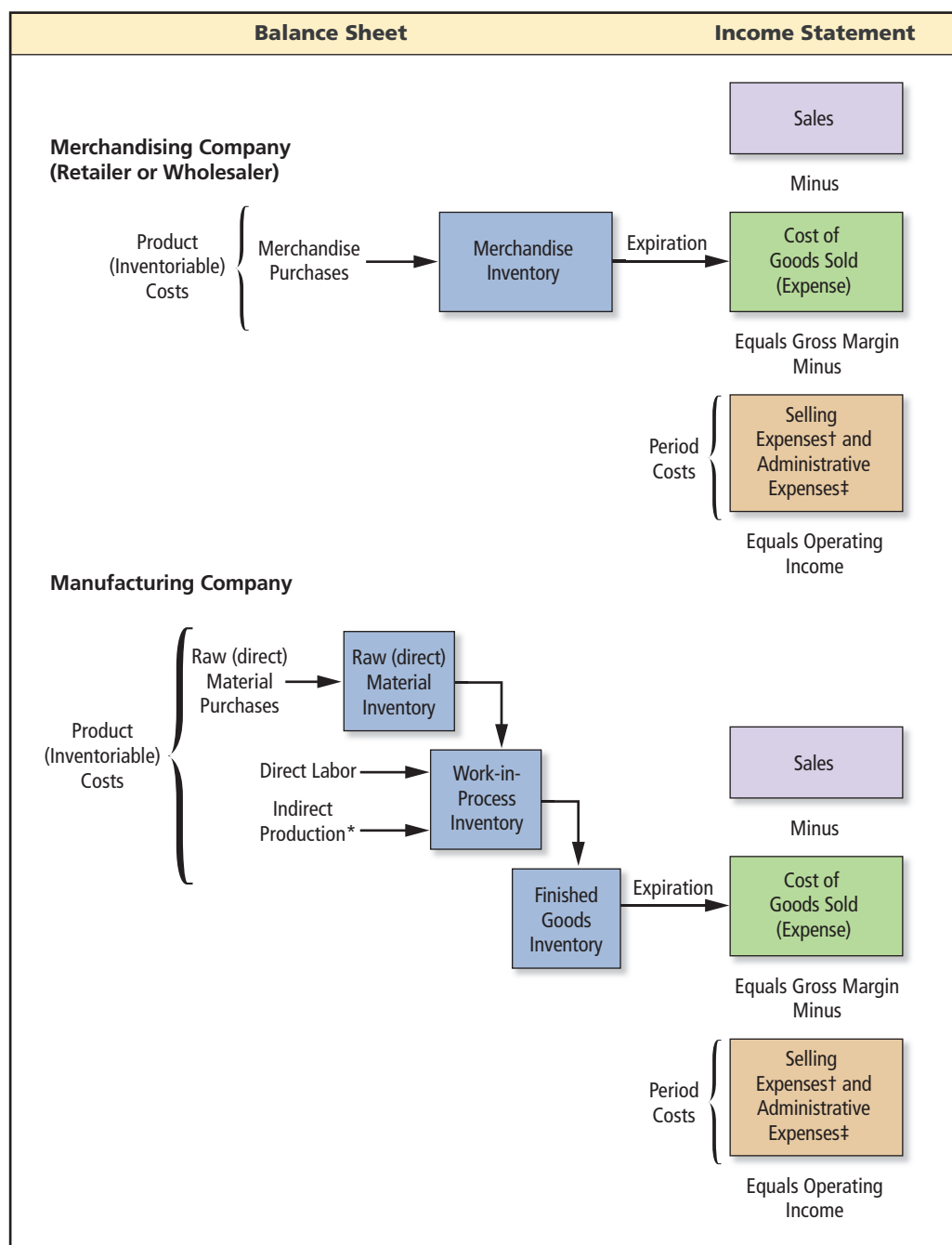
Manufacturer		Retailer or Wholesaler	
Cash	\$ 4,000	Cash	\$ 4,000
Receivables	25,000	Receivables	25,000
Finished goods	\$32,000		
Work in process	22,000		
Raw material	<u>23,000</u>		
Total inventories	77,000	Merchandise inventories	<u>77,000</u>
Other current assets	<u>1,000</u>	Other current assets	<u>1,000</u>
Total current assets	<u>\$107,000</u>	Total current assets	<u>\$107,000</u>

The difference between the balance sheet of a manufacturer and that of a merchandiser (retailer or wholesaler) is apparent from the inventory accounts from the 2021 annual reports of **Cisco Systems** (a manufacturer) and **Costco Wholesale** (a merchandiser), amounts in millions:

Cisco Systems, Inc.		Costco Wholesale Corporation	
Raw materials	\$ 456	Merchandise inventories	<u>\$12,242</u>
Work in process	25		
Finished goods	<u>601</u>		
Total inventories	<u>\$1,082</u>		

Objective 6

Explain how the financial statements of merchandisers and manufacturers differ because of the types of goods they sell.

**Exhibit 4-4**

Relationships of Product Costs and Period Costs

*Examples: indirect labor, factory supplies, insurance on inventories, and depreciation on plant

†Examples: insurance on salespersons' cars, depreciation on salespersons' cars, salespersons' salaries

‡Examples: insurance on corporate headquarters building, depreciation on office equipment, clerical salaries

Note particularly that when insurance and depreciation relate to the manufacturing function, they are inventoriable, but when they relate to selling and administration, they are not inventoriable.

Now consider income statements. We have already mentioned that the reporting of selling and administrative expenses is typically the same for manufacturing and merchandising organizations. What about the cost of goods sold? In published financial statements you will

generally see one line for cost of goods sold regardless of the type of company. Only the way the companies calculate the cost of goods sold differs, as follows:

Manufacturer	Retailer or Wholesaler
Manufacturing cost of goods produced and then sold, usually composed of the three major categories of cost: direct-material costs, direct-labor costs, and indirect production costs	Merchandise cost of goods sold, usually composed of the purchase cost of items that are acquired and then resold

The following shows how manufacturers and retailers or wholesalers calculate their cost of goods sold (numbers assumed):

Cost of Goods Sold Section of the Income Statement			
Manufacturer		Retailer or Wholesaler	
Beginning finished goods inventory	\$ 4,000	Beginning merchandise inventory	\$ 4,000
Cost of goods manufactured:		Purchases	<u>40,000</u>
Direct materials used	\$20,000		
Direct labor	12,000		
Indirect production	<u>8,000</u>		
Cost of goods available for sale	44,000	Cost of goods available for sale	44,000
Ending finished goods inventory	<u>8,000</u>	Ending merchandise inventory	<u>8,000</u>
Cost of goods sold	<u>\$36,000</u>	Cost of goods sold	<u>\$36,000</u>

Sometimes confusion arises because accountants and managers use the terms *costs* and *expenses* loosely. *Cost* is a broad term that describes the amount paid for an activity, product, or service. *Expenses* specifically denote the costs deducted from revenue on an income statement in a given period. All costs eventually become expenses, but they are not expenses until accountants deduct them from revenue in the income statement. Thus, product manufacturing costs become an expense on an income statement (called cost of goods sold) via the multistep inventory procedure shown earlier in Exhibit 4-4. In contrast, selling and administrative costs become expenses immediately in all types of companies.

Traditional and Activity-Based Cost Accounting Systems

Objective 7

Understand the main differences between traditional and activity-based costing (ABC) systems and why ABC systems provide value to managers.

There are many different types of cost accounting systems, but most of the important features of these systems can be described in terms of two general types—traditional and activity-based cost accounting systems.

Until the late 1990s, most global businesses used the **traditional costing system**, but the changing business environment and greater global competition forced them to move to the activity-based costing (ABC) system. Traditional costing systems often use a single cost pool for all indirect production costs. Traditional systems allocate this pool of costs to products using a single cost-allocation base, such as labor cost or labor hours.

Traditional systems work well with simple production processes. Consider a company that makes only a few products for which indirect production costs are a small percentage of total costs so the system combines them into a single cost pool and allocates them to products using

only one cost-allocation base, direct-labor hours. Such a company can achieve a reasonable level of accuracy of product costs with a traditional costing system because direct-material and direct-labor costs are a high percentage of total costs.

As companies grow, as they face increasing global competition, and as their operations become more complex, indirect costs become increasingly important. Companies often refine their traditional costing systems to increase the accuracy of product or service costs. They do this by accumulating indirect costs into multiple cost pools. For example, consider a company that has two operating departments, assembly and finishing. The resources in the assembly department are mainly large, expensive machines. The finishing department has only a few machines but many employees. Because operations within each department are relatively simple, the company might choose a traditional costing system that allocates manufacturing overhead using machine hours as an allocation base in the assembly department and labor hours as an allocation base in the finishing department.

But what about a still more complex situation where a company makes hundreds or thousands of different products and indirect production costs are a large percentage of total costs? What if the many different products consume resources at widely varying rates? Achieving a high level of cost accuracy in such an operating environment requires a more elaborate cost accounting system such as an **activity-based costing (ABC) system**—a system that first accumulates indirect resource costs for each of the *activities* of a particular plant, department, value-chain function, or organization and then assigns the cost of each activity to the products, services, or other cost objects that require that activity. Most ABC systems provide highly accurate product or customer costs that a company can use for strategic decisions. Further, information about the costs of activities helps managers to understand the cause and effect relationships between day-to-day activities and product or customer costs and thereby aids the operational control purpose of cost management systems. Many managers believe that ABC systems help them better manage their organizations. The Business First box on p. 154 explains why some companies use ABC.

Companies adopt cost accounting systems that are consistent with their management philosophies and their production and operating technologies. Changes in philosophies or technologies often prompt corresponding changes in cost accounting systems. For example, in 2019 when **BorgWarner's** automotive chain systems operation transformed its manufacturing operation to a just-in-time manufacturing system with work cells, it also changed its cost accounting system. The transformation in the way BorgWarner operated made the existing cost accounting system obsolete. According to management, the new cost accounting system, coupled with the new production systems, “improved the overall reporting, controls, and efficiency dramatically.”

Comparing Activity-Based and Traditional Costing

Let's take a closer look at how ABC differs from traditional costing. Traditional systems generally focus on allocating only production costs—and not the costs of other value-chain functions—to the products. Why? Because traditional systems often focus on simply measuring inventory values for financial reporting purposes, and GAAP does not allow companies to include nonproduction costs in the inventory value of a product. ABC systems, in contrast, consider a broader range of costs that are important to decision makers. They often allocate the costs of value-chain functions such as design, marketing, order processing, and customer service in addition to production costs. As a result, ABC systems are more complex but provide more accurate costs to aid managerial decision making.

Activity-based costing also causes managers to look closely at the relationships among resources, activities, and cost objects—essentially analyzing the unit's production process. Many ABC teams find it useful to develop a **process map**—a schematic diagram that captures the interrelationships among cost objects, activities, and resources. These maps can help accountants and managers to better understand the company's operations.

traditional costing systems

Accounting systems that do not accumulate or report costs of individual activities or processes. They often use a single cost pool for all indirect production costs with a labor-based cost-allocation base.

activity-based costing (ABC) system

A system that first accumulates indirect resource costs for each of the activities of the area being costed, and then assigns the costs of each activity to the products, services, or other cost objects that require that activity.

process map

A schematic diagram capturing interrelationships between cost objects, activities, and resources.

Use of Activity-Based Costing

Why do managers use ABC? The most frequent applications are for product and service costing, process and activity analysis, and performance measurement. These are the primary purposes of strategic decision making and operational control that we discussed at the beginning of this chapter. A recent survey asked companies that use ABC to indicate how many managers routinely used the ABC system. The vast majority, 62%, indicated that from 10 to 24 managers used ABC; 23% of the companies reported that between 25 and 99 managers used ABC information.

BlueCross BlueShield of Florida (BCBSF) is an example of one company that uses ABC. BCBSF's major customers include local groups (persons in companies with headquarters in Florida), direct pay (individuals), national and corporate accounts (persons in companies with headquarters outside Florida), and government programs (persons 65 years or older with Medicare benefits). During the early 1990s, BCBSF faced increased competition for its healthcare products and services. But its cost management system did not adequately meet the needs of managers.

The primary goal of BCBSF's management was to develop a new cost management system that would help identify opportunities for increased operating control and cost reduction in administrative expenses. Administrative expenses—all the costs of doing business other than claims payments—were

\$588 million, or 20% of total revenue. The company goal was to reduce administrative costs from 20% of revenue to less than 10%. The cost-management-system technique BCBSF used was an ABC system. This new cost accounting system provided more accurate and timely measurements of

1. customer and product profitability—a strategic purpose,
2. activities that provided the most value to managers and customers—an operational control purpose, and
3. costs of non-value-added activities—an operational control purpose.

Another healthcare organization using ABC is **Froedtert Memorial Lutheran Hospital** in Milwaukee. For example, the hospital uses ABC strategically to determine the costs of various levels of anesthesia care so that prices can be set based on solid cost data. It also uses ABC for control purposes. An example is determining the cost of various activities used in knee replacement surgery. The hospital used ABC information to reengineer the process to reduce operating room time by 37 minutes and resource costs by \$828 per procedure.

Sources: Mohan Nair, "Activity-Based Costing: Who's Using It and Why?" *Management Accounting Quarterly*, Spring 2000, pp. 29–33; K. Thurston, D. Keleman, and J. MacArthur, "Cost for Pricing at BlueCross BlueShield of Florida," *Management Accounting Quarterly*, Spring 2000, pp. 4–13; and Cherly Grandlich, "Using Activity-Based Costing in Surgery," *AORN Journal*, January 2004, pp. 189–192.

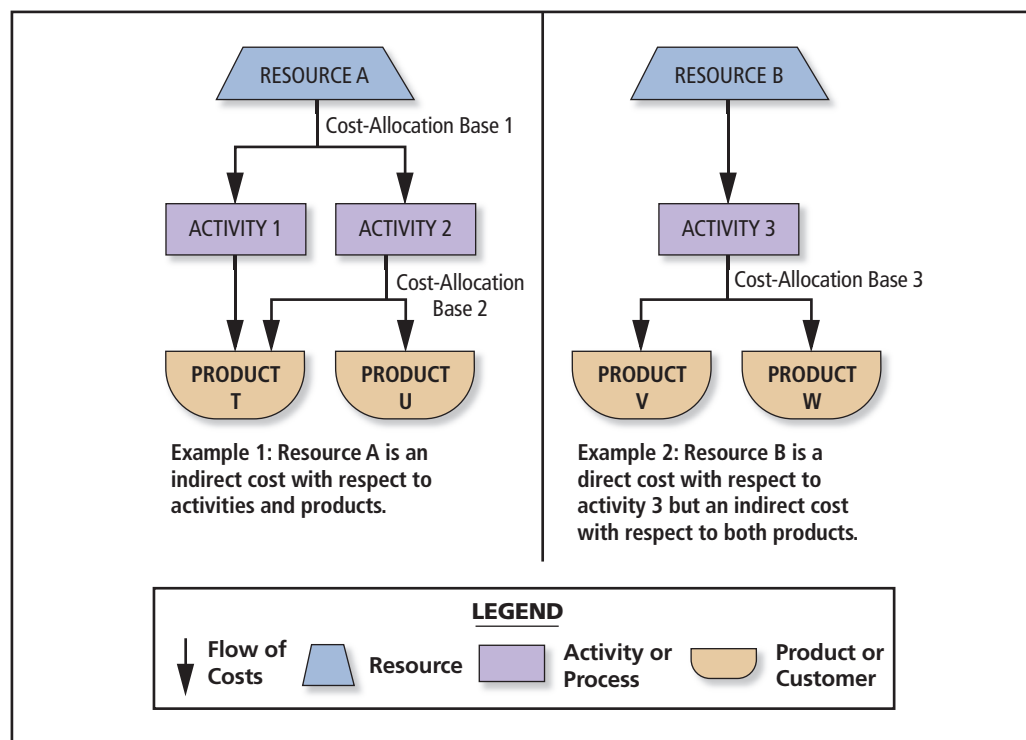
The two examples in Exhibit 4-5 illustrate how to draw process maps. We depict resources by the  symbol. When a product, service, or customer is the cost object, we use the  symbol for the cost object. When the cost object is an activity we use a .

When a resource supports only one activity or an activity applies to only one product, the entire cost of the resource or activity flows to the activity or product. In Exhibit 4-5, the costs of resource B and activity 1 flow entirely to activity 3 and product T, respectively. When a resource supports two or more activities or an activity applies to two or more products, we must divide the cost among the activities or products. In some cases we can physically trace the costs, but in many cases the costs must be allocated. In Exhibit 4-5 we assume that the costs of resource A, activity 2, and activity 3 are each allocated to two cost objects. The process map identifies the cost-allocation base on the arrow between the resource or activity cost and the cost object.

An Illustration of Traditional and ABC Systems

Now let's look at a simple example that demonstrates the main differences between traditional and ABC systems and shows the reasons why many managers prefer ABC systems. Lopez Plastics Company makes just two product lines, plastic casings for pens and plastic casings for cell phones. Last quarter, the company had an operating loss of \$64,500. Management needs to take immediate actions to improve profitability.

You are the vice president of operations. You have to decide which of the two product lines to emphasize to improve profitability. You also wish to reduce costs—especially in the production function of the value chain. Lopez Plastics currently uses a traditional cost accounting system, but you are considering deploying an ABC system to support strategic decision making and operational control.

**Exhibit 4-5**

Basic Concepts for Process Maps

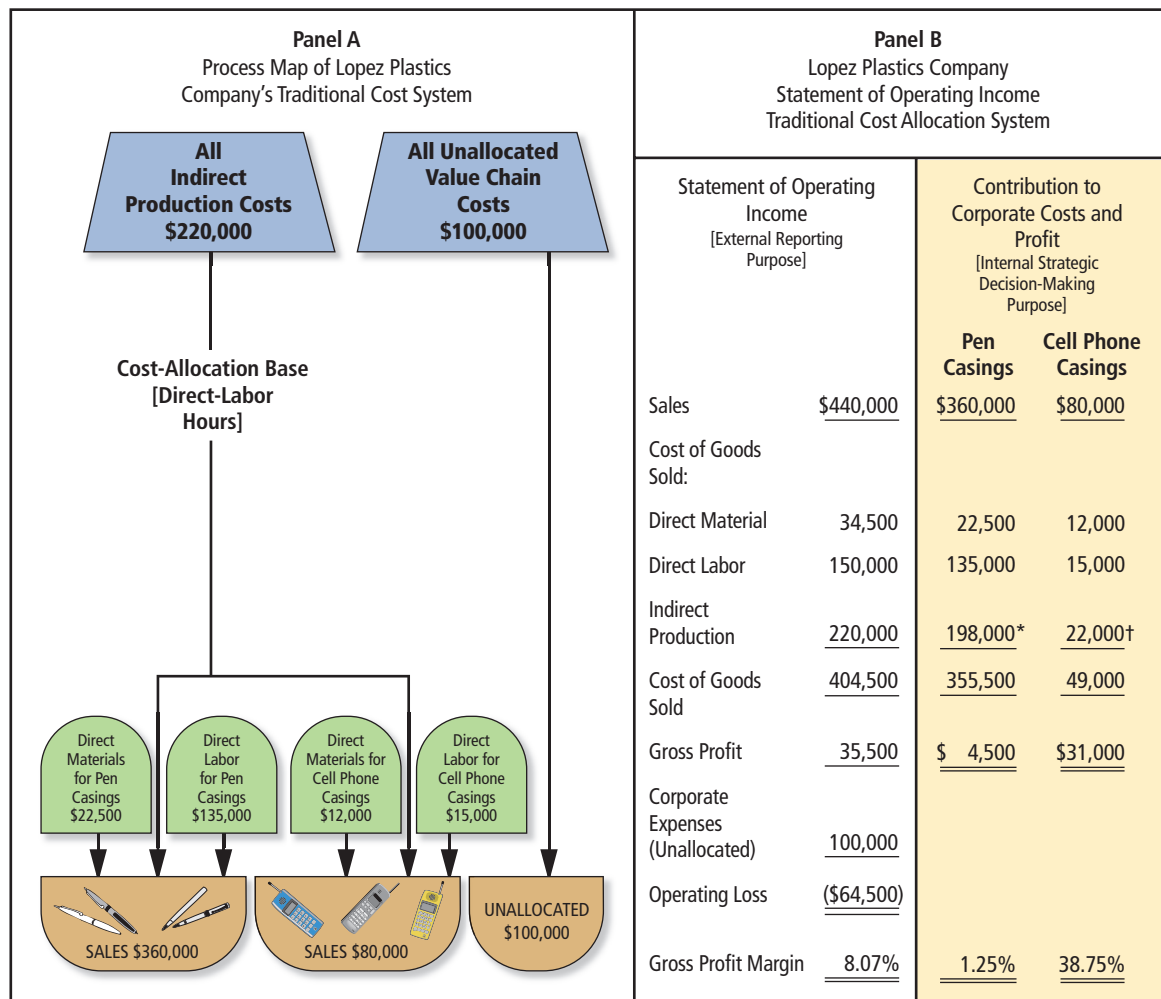
Exhibit 4-6 shows the company's traditional cost accounting system in panel A and two financial reports based on the traditional system in panel B. Notice the three types of costs: direct, indirect, and unallocated. Direct-materials costs and direct-labor costs are shown with a  symbol. The traditional costing system traces direct-materials costs and direct-labor costs to the products. It allocates the indirect production costs (\$220,000) to each product in proportion to a single allocation base, the direct-labor hours consumed in making the product. Last period, the company used 4,500 and 500 direct-labor hours to make pen casings and cell phone casings, respectively, for a total of 5,000 hours. So the traditional system allocated $(4,500 \div 5,000) = 90\%$ of the indirect costs to pen casings and $(500 \div 5,000) = 10\%$ to cell phone casings. Finally, the system does not assign the unallocated value-chain costs (\$100,000) to either product. The gross profit and gross profit margin lines for both products, shown at the bottom of the two right-hand columns of panel B, indicate that cell phone casings is the more profitable product line.

When does a traditional costing system that uses only one cost driver as a basis for allocating indirect production costs, like that of Lopez Plastics, provide accurate product costs? When there is a plausible and reliable relationship between the single cost driver and all the indirect resource costs being allocated. In today's complex business environments, this is rare.

Let's take a careful look at Lopez Plastics' production process to see if the traditional cost accounting system is providing the costing accuracy required for strategic decision making and operational control. Pen casings have a simple design and a simple production process. The company produces them in high volumes, using 90% of its direct-labor time. Pen casings rarely require special customer support or engineering work. This means that indirect production-support costs, such as design engineering of the pen casings, are small.

In contrast, cell phone casings have a more complex design, and the company produces them in small volumes, accounting for only 10% of its direct-labor time. Customers who buy cell phone casings have specific design requirements that cause much production engineering work. Most of the engineering work performed at Lopez Plastics supports the production of cell phones. How significant is the cost of engineering-related work? Of the \$220,000 total indirect cost, engineering-related costs are \$40,000.

Lopez Plastics' traditional cost system does not separately identify or report the indirect costs of the engineering activity. Instead, the \$40,000 of resources used for engineering activity—such as engineer salaries and depreciation of computer-aided design (CAD) equipment—is part of the single indirect resource cost pool. The company allocates all \$40,000 of these indirect costs using the cost driver direct-labor time as the cost-allocation base. Thus, it allocates only 10% of



* $\$220,000 \times (4,500 \div 5,000) = \$198,000$

† $\$220,000 \times (500 \div 5,000) = \$22,000$

Exhibit 4-6

Lopez Plastics Company's Traditional Costing System and Statement of Operating Income

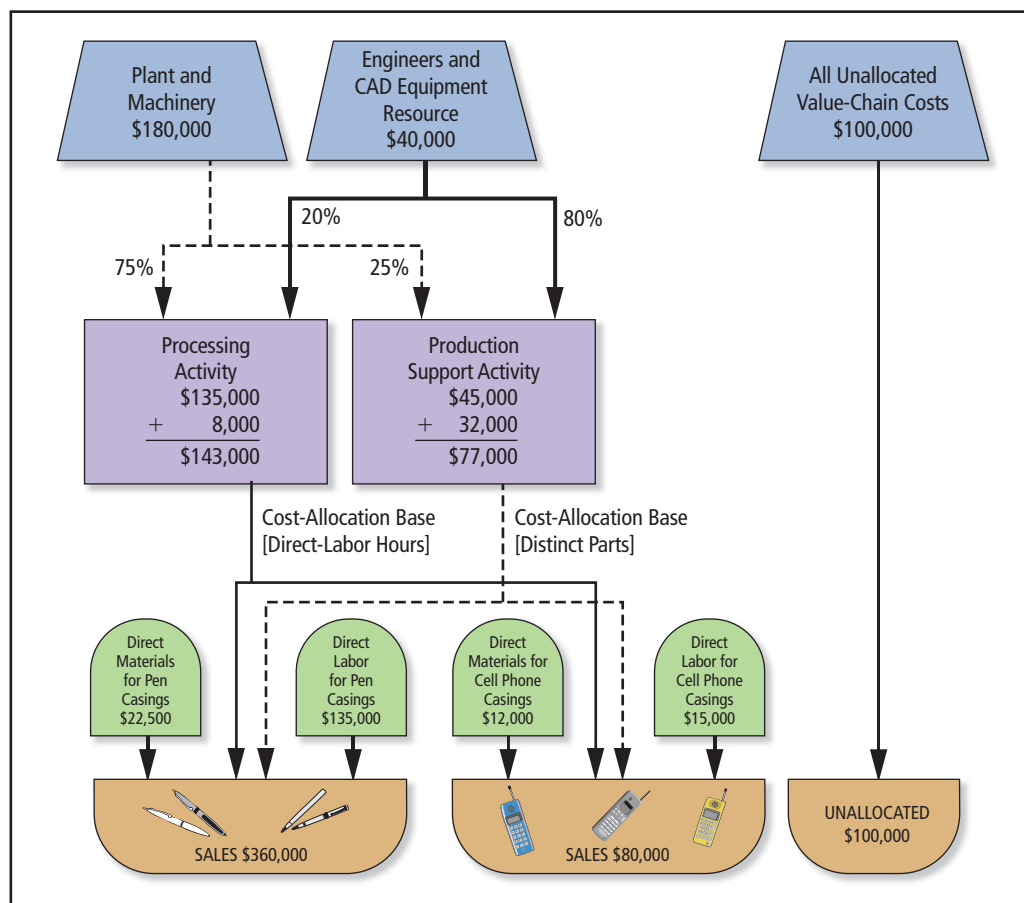
the engineering costs to the cell phone casings. However, the fact that most of the engineering work supports production of cell phones tells us that most of the costs of engineering should be allocated to the cell phone casings. We conclude that the traditional system probably does not provide the level of costing accuracy needed. How can we improve Lopez Plastics' costing accuracy? How can we design the company's cost accounting system to better support strategic decision making and operational control?

We could use an ABC system to 1) identify a cost pool for each significant production activity, including engineering activity as one cost pool; 2) assign each indirect resource cost to the appropriate cost pool; and 3) allocate the costs in each activity-cost pool to products using plausible and reliable cost drivers as allocation bases. Exhibit 4-7 depicts a **two-stage ABC system**, which uses two stages of allocation to get from the original indirect resource cost to the final product or service cost. (At this point, Lopez Plastics uses the ABC system only for production costs, so the \$100,000 of nonproduction value-chain costs remains unallocated.) The first stage allocates indirect resource costs to two activity-cost pools, processing activity costs and production-support activity costs. The second stage allocates activity costs to the products or services. In essence, the cost objects in the first stage are the activities, and the cost objects in the second stage are the products. You will find a more detailed example of a two-stage ABC system in Appendix 4 on pp. 163–164.

In the first stage, Lopez Plastics allocates the cost of two resources, (1) plant and machinery and (2) engineers and CAD equipment to two activities, (1) processing and (2) production support, as shown in Exhibit 4-7. The cost allocated to processing is $(\$135,000 + \$8,000) = \$143,000$ and the cost allocated to production support is $(\$45,000 + \$32,000) = \$77,000$, as explained in the next two paragraphs.

two-stage ABC system

A costing system with two stages of allocation to get from the original indirect resource cost to the final product or service cost. The first stage allocates indirect resource costs to activity-cost pools. The second stage allocates activity costs to products or services.

**Exhibit 4-7**

Lopez Plastics Company's ABC System

The cost of plant and machinery depends mostly on the square feet of space used. Processing uses 75% of the space and production support uses 25%. Therefore, we allocate 75% of the plant and machinery cost or \$135,000 to the processing activity. Similarly, we allocate 25% or \$45,000 to production support.

The cost of engineers and CAD equipment depends mainly on the amount of time engineers spend on a product. Engineers spend, on average, about 48 minutes each hour performing production-support activities, such as designing casings. They spend the other 12 minutes supervising the processing activity. Thus, we allocate $(48 \div 60) = 80\%$ of the cost of engineers and CAD equipment to the production-support activity and $(12 \div 60) = 20\%$ to processing. The resulting allocations are $80\% \times 40,000 = \$32,000$ to production support and $20\% \times 40,000 = \$8,000$ to processing.

The second stage allocates the costs of the two activities, processing and production support, to the two products, pen casings and cell-phone casings. There are several possible cost-allocation bases for the production-support activity costs, including “number of customer-generated engineering changes” and “number of distinct parts.” The cost-allocation base should be a measure of the consumption of production-support activity. Let’s assume this is “number of distinct parts.” Suppose pen casings have only 5 distinct parts compared to 20 for cell phone casings. We would allocate $[20 \div (20 + 5)] \times \$77,000 = \$61,600$ of the production-support activity costs to cell phone casings and the remaining $[5 \div (20 + 5)] \times \$77,000 = \$15,400$ to pen casings. The ABC allocation better represents the use of engineering services than does the allocation based on the traditional system. Why? Because cell phone casings generate $(20 \div 25) = 80\%$ of the production-support activity costs, but the traditional system allocates only 10% of such costs to cell phone casings. In contrast, the ABC system allocates the appropriate 80% of the production-support activity costs to cell phone casings.

We will continue this example in the Summary Problem for Your Review, but first let’s consider one more advantage of ABC systems. In many companies, managers try to gain cost savings by efficiently managing activities. If Lopez Plastics wants its managers to reduce the cost of producing cell phone casings, the managers will probably focus on possible cost savings in either processing or production support. They may also redesign the product to reduce direct materials costs or reengineer the production process to reduce direct-labor costs. But often the largest

potential savings are in the indirect costs. By carrying out activities more efficiently, managers reduce the costs of the products that use those activities.

What information do managers need to examine the efficiency of activities? At a minimum, they need to know the cost of each activity. Traditional systems do not generate this cost information but ABC systems do. Therefore, in addition to providing better information about the cost of products, ABC systems can also promote better operating efficiency.

Making Managerial Decisions

Suppose you have been asked to attend a meeting of top management of your company. When the meeting begins, you are asked to explain in general terms the main differences and similarities in traditional and ABC systems and why managers might prefer ABC costs for decision-making purposes. You have only Exhibits 4-6 and 4-7 as a guide, so you quickly display these side-by-side on a PowerPoint slide, and, after taking a deep breath, you begin to talk. What similarities and differences would you point out? What advantages do ABC costs have?

Answer

1. Traditional costing systems are much simpler than ABC systems and are usually less costly to maintain.
2. Traditional systems and ABC systems both have all three types of costs: direct, indirect, and unallocated.
3. Traditional systems use only one cost pool that includes all indirect resource costs. ABC systems identify multiple cost pools, each representing a particular production activity. This allows ABC systems to better match costs with the causes of those costs.
4. ABC systems require many more cost-allocation bases than do traditional systems. When these cost-allocation bases are both plausible and reliable cost drivers, the overall accuracy of product, service, or customer cost is improved.
5. ABC systems assign indirect resource costs to cost objects in two stages of allocation, where the first stage allocates costs to activities and the second stage allocates activity costs to final cost objects such as products, services, or customers. Thus, ABC systems provide information about the costs of activities, which managers can use to reduce costs by improving operating efficiencies for activities.

We now are in a position to complete our ABC analysis and answer our strategic issue regarding our product mix strategy. We do this in the following Summary Problem for Your Review. It is important for you to carefully work this problem to gain a clear understanding of the basic concepts and value of an ABC system.

Summary Problem for Your Review

PROBLEM

Refer to the Lopez Plastics illustration, starting with the financial reports based on the traditional cost accounting system in panel B of Exhibit 4-6, p. 156. Based on these reports, a marketing manager has proposed a plan that emphasizes cell phone casings due to their large gross profit margin (38.75%) compared to that of pen casings (1.25%).

Now, management implements the ABC system shown in Exhibit 4-7, p. 157. The first stage of the two-stage ABC system has been completed, and the results are the activity-cost-pool figures given in Exhibit 4-7—processing activity costs of \$143,000 and production-support activity costs of \$77,000. You need to perform the second-stage allocations to determine the profitability of each product line. The cost-allocation base for processing activity is direct-labor hours and the cost-allocation base for production-support activity is number of distinct parts. Data on the use of these cost-allocation bases for the last quarter are as follows:

	Pen Casings	Cell Phone Casings
Direct-labor hours	4,500	500
Distinct parts	5	20

1. Calculate the gross profit and gross profit margin for each product based on ABC.
2. Explain why your results differ significantly from those based on the traditional cost accounting system in Exhibit 4-6, p. 156.
3. Evaluate marketing's plan.
4. Propose a product-mix strategy for the company.

SOLUTION

1. The table that follows shows the gross profit for each product using ABC costs.

Financial Reports for Lopez Plastics Company's Activity-Based Cost Allocation System

Panel A Statement of Operating Income [External Reporting Purpose]		Panel B Contribution to Corporate Costs and Profit [Internal Strategic Decision-Making and Operational-Control Purposes]	
		<i>Pen Casings</i>	<i>Cell Phone Casings</i>
Sales	<u>\$440,000</u>	<u>\$360,000</u>	<u>\$ 80,000</u>
Cost of goods sold:			
Direct material	34,500	22,500	12,000
Direct labor	150,000	135,000	15,000
Processing activity	143,000	128,700*	14,300
Production-support activity	<u>77,000</u>	<u>15,400[†]</u>	<u>61,600</u>
Cost of goods sold	<u>404,500</u>	<u>301,600</u>	<u>102,900</u>
Gross profit	<u>35,500</u>	<u>\$ 58,400</u>	<u>\$(22,900)</u>
Corporate expenses			
(Unallocated):	<u>100,000</u>		
Operating loss	<u>\$(64,500)</u>		
Gross profit margin	<u>8.07%</u>	<u>16.22%</u>	<u>(28.63%)</u>

* The cost driver is direct-labor hours. The company used $4,500 \div (4,500 + 500) = 90\%$ of direct-labor hours to produce pen casings. Thus, the allocation is $\$143,000 \times 0.90 = \$128,700$.

[†] The cost driver is distinct parts. The company used $5 \div (20 + 5) = 20\%$ of distinct parts to make pen casings. Thus, the allocation is $\$77,000 \times 0.20 = \$15,400$.

2. The ABC system gives results that are dramatically different from those of the traditional cost allocation system. Pen casings are generating substantial profits for the company, while cell phone casings are losing money. Why is there such a dramatic difference between the two cost accounting systems? It's because the traditional cost accounting system doesn't recognize differences in the production process for each of the two products. The ABC system separates the processing-related costs from the production-support costs and allocates each activity cost to the products based on the proportion of the activity used by each product. Only the cell phone casings require large amounts of the production-support activity. The ABC system correctly allocates most of this cost to the cell phone casings, while the traditional system allocates most of it to the pen casings.
3. Marketing's plan most likely will result in significantly lower profitability. The company's top management should make the strategic decision to emphasize pen casings because of its large gross profit margin when accurately measured.
4. The cell phone casings are losing money, so management should carefully evaluate that product line. Possible actions include raising prices, changing the design by reducing the number of distinct parts, working with suppliers to reduce the cost of direct materials, improving the efficiency of direct labor, or dropping the product line.

Objective 8

Use activity-based management (ABM) to make strategic and operational control decisions.

activity-based management (ABM)

Using the output of an activity-based cost accounting system to aid strategic decision making and to improve operational control of an organization.

value-added cost

The necessary cost of an activity that cannot be eliminated without affecting a product's value to the customer.

non-value-added costs

Costs that a company can eliminate without affecting a product's value to the customer.

benchmarking

The continuous process of comparing products, services, and activities against the best industry standards.

Activity-Based Management: A Cost Management System Tool

Because ABC systems focus on costs of activities (as well as costs of products), they are a very useful tool in cost management systems. **Activity-based management (ABM)** uses the output of an activity-based cost accounting system to aid strategic decision making and to improve operational control of an organization. The strategic decision to emphasize pen casings at Lopez Plastics is an example of ABM. In the broadest terms, ABM aims to improve the value received by customers and to improve profits by identifying opportunities for improvements in strategy and operations.

One of the most useful applications of ABM is distinguishing between value-added and non-value-added costs. A **value-added cost** is the cost of an activity that a company cannot eliminate without affecting a product's value to the customer. Value-added costs are necessary (though there may be ways to lower value-added costs by performing activities more efficiently). In contrast, companies try to eliminate (or at least minimize) **non-value-added costs**, costs that a company can eliminate without affecting a product's value to the customer. Activities such as handling and storing inventories, transporting partly finished products from one part of the plant to another, and changing the setup of production-line operations to produce a different model of the product are all non-value-adding activities. A company can often reduce, if not eliminate, some of these costs by careful redesign of the plant layout and the production process.

Another useful management technique is **benchmarking**, the continuous process of comparing products, services, and activities to the best industry standards. Benchmarking is a tool to help an organization measure its competitive posture. Benchmarks can come from within the organization, from competing organizations, or from other organizations having similar processes.

Consider the production of laptops at **Dell**. Unit costs for key activities provide the basis for benchmarking the work groups in one production facility with those at others and possibly with industry standards. In addition, Dell can use the cost-allocation bases for key activities—for example, the time to assemble a motherboard—as operational benchmarks. The most efficient work groups and centers can share their ideas for process improvements with other groups and centers.

Companies must exercise caution when benchmarking, especially when using financial benchmarks. For example, consider comparison of branches in Chico and San Francisco for a California bank. The bank's benchmarking system uses the financial benchmark *cost per deposit* to measure deposit-processing efficiency. The San Francisco branch managers pointed out at least two problems that put them at a disadvantage. First, costs, especially labor costs, differ between Chico and San Francisco. Employees in metropolitan areas generally receive higher salaries because of their higher cost of living. Therefore, higher teller salaries in San Francisco increase the cost per deposit. Second, different branches can implement an ABC system in different ways. In this case, Chico's ABC system does not allocate equipment depreciation to the deposit-processing activity; these costs remain unallocated. In contrast, the San Francisco branch allocates this cost to the processing activity. This causes the cost per deposit to be higher at the San Francisco branches. As a result, even if the tellers process deposits faster and more accurately at the San Francisco branch, their performance will not appear to be as good as that of the tellers at the Chico branch. A better measure of the deposit process might be the *time to process a deposit*, a nonfinancial benchmark that is more directly controllable by the respective branch managers.

Benefits of Activity-Based Costing and Activity-Based Management

Activity-based costing systems are more complex and costly than traditional systems. Thus, companies that have relatively simple operations may not realize sufficient benefits to warrant the additional cost of an ABC system. But more organizations in both manufacturing and non-manufacturing industries are adopting activity-based costing systems for a variety of reasons:

- Fierce competitive pressure has resulted in shrinking profit margins. Companies may know their overall margin, but they often do not have confidence in the accuracy of the margins for individual products or services. Some are winners and some are losers—but which ones are which? Accurate costs are essential for answering this question. Consider **Taylor Corporation**, one of the largest specialty printers in the United States with annual sales of more than \$1.3 billion. One of its operating divisions implemented an ABC system to provide better information on the profitability of more than 3,500 products. Managers used the ABC information to set an optimal product mix and to estimate the profit margins of new products.

- Greater diversity in the types of products and customers results in greater operating complexity. Often in such situations the consumption of a company's shared resources also varies substantially across products and customers—a condition that adds to the value of ABC systems.
- Indirect costs are far more important in today's automated world-class manufacturing environment than they have been in the past. In many industries, automated equipment is replacing direct labor. Indirect costs are sometimes more than 50% of total cost. Because ABC systems focus on indirect costs, they are more common in companies with automated production processes.
- The rapid pace of technological change has shortened product life cycles. Hence, companies do not have time to make price or cost adjustments once they discover costing errors. The accurate costs produced by ABC systems are essential.
- The costs associated with bad decisions that result from inaccurate cost estimates are substantial. Examples include bids lost due to overcosted products, hidden losses from undercosted products, and failure to detect activities that are not cost effective. Companies with accurate ABC product costs have a competitive advantage over those with inaccurate costs.
- Computer technology has reduced the costs of developing and operating ABC systems. Most ERP systems (see p. 34) routinely include ABC modules.

While many companies throughout the world are adopting ABC systems, some German companies, including **Gruen Telekom** and **DaimlerChrysler**, have gone a step further. They use a cost accounting system called **Grenzplankostenrechnung (GPK)**. Most GPK systems use between 400 and 2,000 cost pools to allocate indirect manufacturing costs. The Business First box on p. 162 summarizes some of the characteristics of GPK.

Grenzplankostenrechnung (GPK)

A German cost accounting system that goes a step further than ABC systems.

Highlights to Remember

- 1. Describe the purposes of cost management systems.** Cost management systems provide cost information for external financial reporting, for strategic decision making, and for operational cost control.
- 2. Explain the relationship among cost, cost object, cost accumulation, and cost assignment.** Cost accounting systems provide cost information about various types of objects—products, customers, activities, and so on. To do this, a system first accumulates resource costs by natural classifications, such as materials, labor, and energy. Then, it assigns these costs to cost objects, either tracing them directly or assigning them indirectly through allocation.
- 3. Distinguish between direct and indirect costs.** Accountants can specifically and exclusively identify direct costs with a cost object in an economically feasible way. When this is not possible, accountants may allocate costs to cost objects using a cost driver. Such costs are called indirect costs. The greater the proportion of direct costs, the greater the accuracy of the cost system. When the proportion of indirect costs is significant, accountants must take care to find the most appropriate cost drivers.
- 4. Explain the major reasons for allocating costs.** The four main purposes of cost allocation are to predict the economic effects of planning and control decisions, to motivate managers and employees, to measure the costs of inventory and cost of goods sold, and to justify costs for pricing or reimbursement. Some costs remain unallocated because the accountants can determine no plausible and reliable relationship between resource costs and cost objects.
- 5. Identify the main types of manufacturing costs: direct-materials costs, direct-labor costs, and indirect production costs.** Accountants can trace direct-materials costs and direct-labor costs to most cost objects, but they allocate indirect production costs using a cost-allocation base.

GPK and ABC: Support for Short-Term and Long-Term Decisions

Many companies throughout the world have developed sophisticated cost accounting systems. While many U.S. companies have adopted ABC, many northern European companies, especially in France, Norway, Sweden, the Netherlands, and Germany, are increasingly using GPK, a system first developed 50 years ago in Germany. Among the GPK companies are **Porsche**, **STIHL**, **Gruen Telekom**, and **DaimlerChrysler**.

Advances in computer technology have made widespread use of these cost accounting systems more practical. When companies adopt Enterprise Resource Planning (ERP) systems that include software for ABC and GPK, they can upgrade their cost accounting systems without a huge additional investment. The ERP system of **SAP**, a German software company that helped pioneer such systems, offers the framework for GPK as part of its management accounting module, a main factor in the expanding use of GPK.

ABC and GPK embody both similarities and differences. Both allocate costs to products, services, or customers using multiple cost pools with various cost-allocation bases. A main difference is that GPK separates fixed and variable costs and applies only variable costs to products or services. Although the ABC approach could do the same, most ABC systems focus on applying all production-related costs (and, often, some nonproduction value-chain costs). Thus, GPK systems measure profitability on a contribution-margin basis, while ABC systems generally produce full-cost margins. Another difference between ABC and GPK is how they define cost pools for allocation. ABC companies focus on activities, with only a few major identified activities. In contrast, GPK companies focus on cost centers and may have thousands of them. Gruen Telekom has about 20,000, although Porsche has only 450,

and most companies have between 400 and 2,000. Most cost centers are work units of only a few people, often 10 workers or fewer. In both systems, the cost center or activity is the focus of day-to-day cost control. The GPK systems bring this focus down to a much lower level than do most ABC systems.

Which is best, ABC or GPK? Like many management accounting issues, the answer is "it depends." Because GPK focuses on contribution margins, it provides information that is more relevant for short-term decisions. In contrast, ABC starts with a long-term perspective and produces information more suited to strategic decisions. However, GPK systems can add a full-cost calculation for long-term decision purposes, and many ABC systems can separate fixed and variable costs for short-term decisions. Further, the difference between cost-center and activity-based cost pools may not be especially significant because underlying cost pools and cost drivers can be similar in both systems. Although there remain basic philosophical differences related to allocation of fixed costs and definitions of cost pools, in practice companies that use a combination of GPK and ABC principles may find the best of both worlds. For example, the **Hospital for Sick Children** in Toronto merged GPK with its ABC system to produce financial information that was more useful to management.

Sources: G. Friedl, H. Kupper, and B. Pedell, "Relevance Added: Combining ABC with German Cost Accounting," *Strategic Finance*, June 2005, pp. 56–61; K. Krumwiede, "Rewards and Realities of German Cost Accounting," *Strategic Finance*, April 2005, pp. 27–34; Carl S. Smith, "Going for GPK," *Strategic Finance*, April 2005, pp. 36–39; Brian Mackie, "Merging GPK and ABC on the Road to RCA," *Strategic Finance*, November 2006, pp. 33–39; P. Sharman and B. Mackie, "Grenzplankostenrechnung (GPK): German Cost Accounting, Flexible Planning and Control," IMA Web site, <http://www.imanet.org/pdf/3202.pdf>.

- 6. Explain how the financial statements of merchandisers and manufacturers differ because of the types of goods they sell.** The primary difference between the financial statements of a merchandiser and a manufacturer is the reporting of inventories. A merchandiser has only one type of inventory, whereas a manufacturer has three types of inventory—raw materials, work in process, and finished goods.
- 7. Understand the main differences between traditional and activity-based costing (ABC) systems and why ABC systems provide value to managers.** Traditional systems usually allocate only the indirect costs of the production function. ABC systems often allocate many of the costs of other value-chain functions. Traditional costing accumulates costs using categories such as direct material, direct labor, and production overhead. ABC systems accumulate costs by activities required to produce a product or service. The key value of ABC systems is in their increased costing accuracy and better information provided that can lead to process improvements.
- 8. Use activity-based management (ABM) to make strategic and operational control decisions.** Activity-based management is using ABC information to improve operations. A key advantage of an activity-based costing system is its ability to aid managers in decision making. ABC improves the accuracy of cost estimates, including product and customer costs and the costs of value-added versus non-value-added activities. ABC also improves managers' understanding of operations. Managers can focus their attention on making strategic decisions, such as product mix, pricing, and process improvements. ■

Appendix 4: Detailed Illustration of Traditional and Activity-Based Cost Accounting Systems

As we mentioned in the chapter, ABC systems are more complex than traditional systems. In this appendix, we go more in depth than in the Lopez Plastics Company example. You will notice, however, that the main concepts are exactly the same—only the details will change.

Suppose the billing department of one of **AT&T**'s smaller customer care centers requires accurate and useful information about the cost of providing account inquiry and bill printing services for its 120,000 residential and 20,000 commercial customer accounts. A local service bureau has offered to provide all the services currently performed by the billing department at \$4.30 per residential account and \$8.00 per commercial account. To make informed decisions, AT&T's managers need accurate estimates of the billing department's cost per residential account and cost per commercial account. They also need to know the costs of the key activities performed in the department to determine whether they can achieve cost savings through better control of their activities.

Exhibit 4-8 depicts the residential and commercial customer classes (cost objects) and the resources used to support the billing department. All the costs incurred in the department

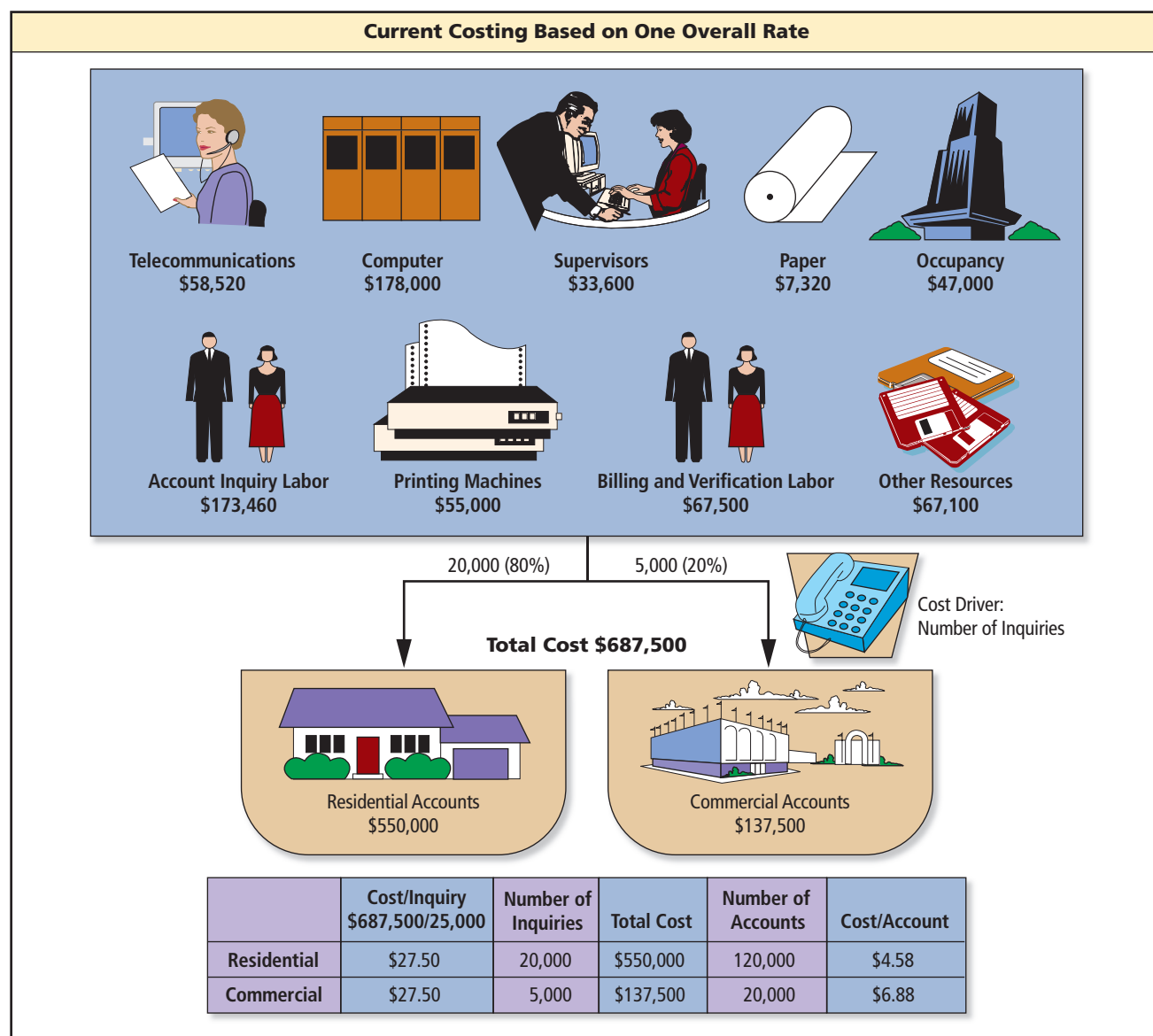


Exhibit 4-8

Traditional Costing System at the Billing Department

are indirect. There are no direct costs and no unallocated costs. The billing department currently uses a traditional costing system that allocates all indirect production costs based on the number of account inquiries.

Exhibit 4-8 shows that the cost of resources used in the billing department last month was \$687,500. The traditional cost accounting system simply allocates this entire pool of indirect costs based on the number of inquiries the department receives from each customer class. The billing department received 25,000 account inquiries during the month, so the cost per inquiry was $\$687,500 \div 25,000 = \$27.50$. There were 20,000 residential account inquiries, 80% of the total. Thus, the traditional system assigns 80% of the indirect production cost to residential accounts and 20% to commercial accounts. The resulting cost per account is $(\$687,500 \times 80\%) \div 120,000 = \$4.58$ and $(\$687,500 \times 20\%) \div 20,000 = \$6.88$ for residential and commercial accounts, respectively. Does this traditional cost accounting system provide managers with accurate estimates of the cost to serve residential and commercial customers? If the answer is yes, the billing department management should accept the service bureau's proposal to service residential accounts because of the apparent savings of $\$4.58 - \$4.30 = \$0.28$ per account. The billing department should continue to service its commercial accounts because its costs are $\$8.00 - \$6.88 = \$1.12$ less than the service bureau's bid. However, if the estimates of the cost to serve customers are not accurate, managers should develop more accurate cost estimates.

Suppose you are the billing department manager and you know that billing employees spend much of their time verifying the accuracy of commercial bills and very little time verifying residential bills. Yet the traditional cost accounting system allocates 80% of the costs of this work to residential customers. Does this make sense to you? Are you starting to doubt the accuracy of the cost-per-account data? Do you see a way to improve the assignment of billing labor costs to customers?

Suppose you also know that commercial accounts average 50 lines or two pages per bill, compared with only 12 lines or one page for residential accounts. This means that the billing department uses much more paper, computer time, and printing machine time for each commercial account. Further, suppose you believe that the actual consumption of support resources for commercial accounts is much greater than 20% because of their complexity. Again, your understanding of what drives costs does not fit with the traditional system allocation of 80% of costs to residential accounts and 20% to commercial accounts based on number of inquiries.

In summary, you would probably conclude that AT&T needs to improve the billing department's traditional cost accounting system because it is not providing managers with useful information for strategic decisions. You might also believe that a better cost accounting system would help management understand the relationships among key activities and resource costs. This is exactly what AT&T's management concluded. So, next we will design an activity-based costing system for the billing department.

Making Managerial Decisions

Suppose **AT&T**'s management retains its traditional cost accounting system but believes that a more plausible and reliable cost driver is "number of printed lines." Each residential bill averages 12 lines and each commercial bill averages 50 lines. What would be the new cost per account for residential and commercial customers based on number of lines per bill? How would this new cost accounting information affect the outsourcing decision?

Answer

The allocation of the total cost to each customer class would change. Instead of allocating 80% of total costs to residential

customers, we would allocate only $(12 \times 120,000) \div [(12 \times 120,000) + (50 \times 20,000)] = 59\%$ of total costs to residential customers and the other 41% to commercial accounts. The cost per account for residential customers would then be $(59\% \times \$687,500) \div 120,000 = \$3.38$, and the cost per commercial account would be $(41\% \times \$687,500) \div 20,000 = \$14.09$. The outsourcing decision would change because the cost per residential account is now less than the cost of outsourcing, and the cost per commercial account is not greater than the cost of outsourcing. Thus, we would outsource commercial accounts but not residential accounts. This example illustrates again how different costing systems can lead to very different decisions.

Design of an Activity-Based Cost Accounting System

How do managers actually design ABC systems? At the billing department of AT&T's customer-care center, a team of managers from the billing department and AT&T's regional controller used the following four-step procedure to design their new cost accounting system.

Step 1: Determine the Key Components of the Activity-Based Cost Accounting System

The key components of an activity-based cost accounting system are cost objects, key activities, resources, and related cost drivers. These components, together with the purpose of the new system, determine the scope of the ABC system. Management at AT&T wanted the system to (1) determine the billing department cost per account for each customer class to better support the strategic decision regarding outsourcing accounts to the local service bureau and (2) enhance the managers' understanding of key billing department activities to support operational cost control. Because the bid from the local service bureau includes performing all the activities of the department, the ABC system must include all department costs. Further, because management wants to understand the key activities and related costs, the team designed an activity-based system.

Through interviews with the department supervisors, management identified the following activities and related cost drivers to use as cost-allocation bases for the billing department.

Activity	Cost-Allocation Base
Account billing	Number of printed pages
Bill verification	Number of accounts verified
Account inquiry	Number of inquiries
Correspondence	Number of letters
Other activities	Number of printed pages

The four key billing department activities are account billing, bill verification, account inquiry, and correspondence. These activities require the vast majority of the work done in the billing department. There are other activities performed in the billing department, such as routine printer and computer maintenance, training, and preparing monthly reports. Management did not identify these as individual activities. Instead, the team lumped them together and labeled them "other activities." Why? Because the cost of the resources used for each of these individual activities was relatively small, the team could not find plausible and reliable cost drivers for them, or the cost of collecting data was too high. The cost-allocation base selected for the "other activities" cost pool is number of printed pages because most of the other activities, such as maintenance and training, are associated in some way with the printing function.

Step 2: Determine the Relationships Among Cost Objects, Activities, and Resources

An important phase of any activity-based analysis is identifying the relationships among key activities and the resources consumed. The management team does this by interviewing personnel and analyzing various internal data. AT&T interviewed all employees as part of its ABC study. For example, the company asked supervisors how they spend their time. Based on time records, the supervisors estimated that they spend most of their time (40%) supervising account inquiry activity. They also estimated that they spend about 30% of their time supervising billing activity and about 10% of their time reviewing and signing correspondence. They spend the remaining 20% of their time on all other department activities. Exhibit 4-9 shows the results of the interviews.

Implementing an ABC system requires a careful study of operations. As a result, managers often discover that they can trace directly to cost objects some previously indirect or even unallocated costs, thus improving the accuracy of product or service costs. During interviews with the billing department supervisors, the ABC team learned that several of the billing employees work exclusively on verification of commercial bills. Thus, the team could separate the \$67,500 of Billing and Verification Labor shown in Exhibit 4-8 into two cost pools. The first pool is the salaries of the employees that work exclusively on verification of commercial

Objective 9

Describe the steps in designing an activity-based costing system.

bills—\$11,250. The team could trace this cost pool, now labeled as Verification Labor, directly to the commercial customer cost object. Let's examine the second pool, the remaining \$56,250, now labeled as Billing Labor Expenses.

Look at the Computer resource row in Exhibit 4-9. The supervisor indicated that 45% of this resource supports account inquiry, 5% supports correspondence, and so on. How did the supervisor determine these percentages? Initially, he or she might simply estimate them. Later, the supervisor might gather data to support the estimates. Now consider the Occupancy resource row. The percentages used to allocate this resource might be based on the square feet used by the various employees for each activity compared to the total square feet in the department.

Next, the team determined which activities were needed by each cost object. The supervisors indicated that residential customers needed account inquiry, correspondence, and billing activities. Commercial customers needed account inquiry, correspondence, billing, and verification activities. Both also need other activities.

The process map in Exhibit 4-10 incorporates the information gathered from interviews. We allocate the costs of the 10 resources to the 5 activities based on the percentage of each resource used by each activity. For example, account inquiry activity consumes 40% of supervisor resources, 90% of account inquiry labor, 45% of computer resources, 90% of telecommunication resources, and 65% of occupancy costs. Then, we allocate the costs of the five activities to the two customer cost objects—residential and commercial. For example, commercial accounts require account inquiry, correspondence, billing, verification, and other activities. We allocate the activity costs based on a measure of the amount of activity that each customer uses. For example, we allocate the account inquiry activity cost pool based on the number of inquiries received from residential and commercial accounts.

Process maps can be a key tool for managers to gain an understanding of operations. For example, AT&T's managers considered this process map critical because it revealed how AT&T conducted business. Managers were able to see how operating activities consume costly resources. The ABC team used the process map as a guide for the next step in designing the ABC system—data collection. (Note that Exhibit 4-10 includes data on costs and cost drivers that is collected in Step 3, described next.)

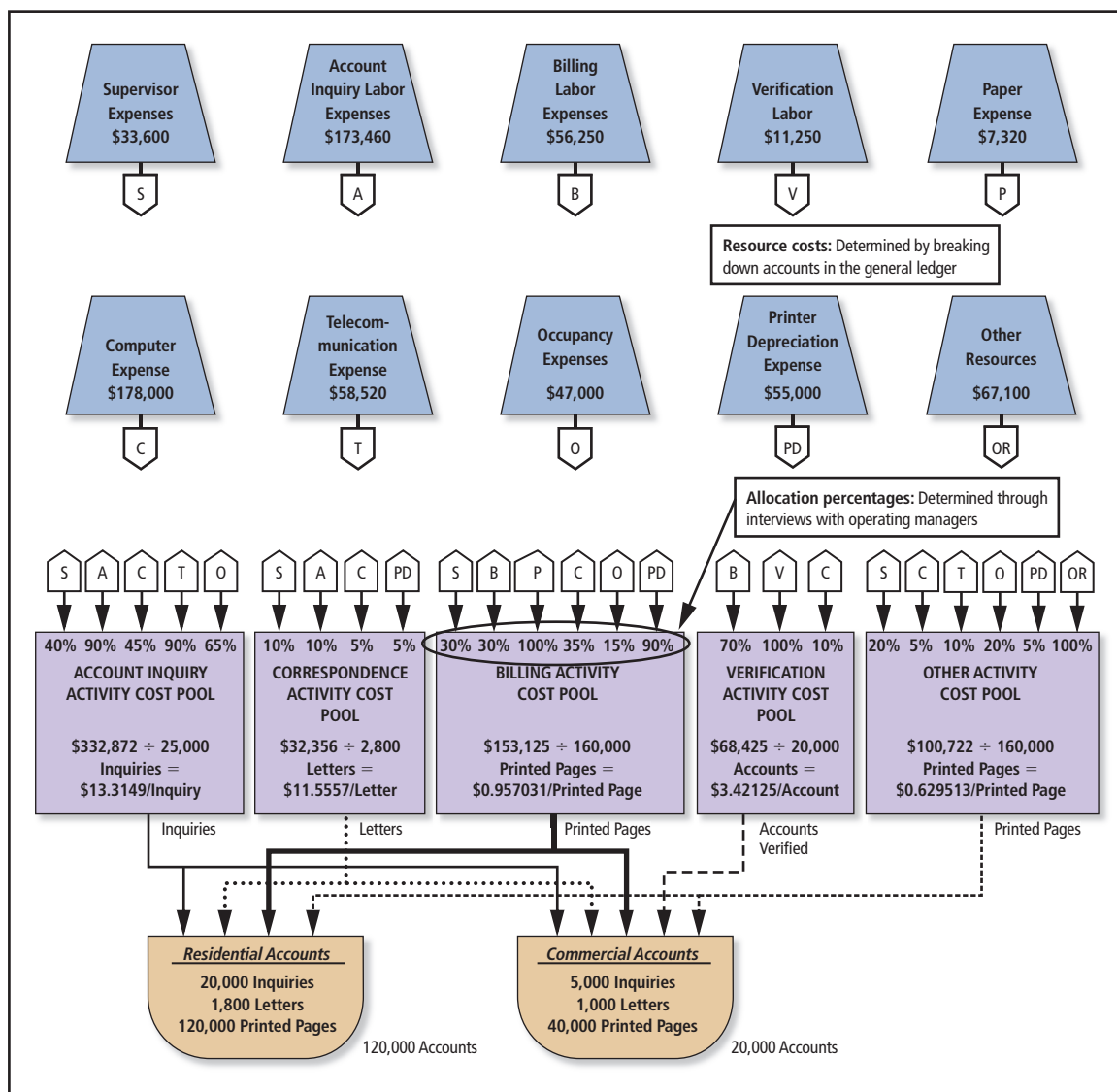
Step 3: Collect Relevant Data Concerning Costs and the Physical Flow of the Cost-Driver Units Among Resources and Activities

Using the process map as a guide, billing department managers collected the required cost and operational data by further interviews with relevant personnel. Sources of data include the accounting records, special studies, and sometimes “best estimates of managers.” The managers collected resource cost information from the general ledger (Exhibit 4-8) and data on the flow of cost drivers from various operational reports (Exhibits 4-9 and 4-11). Exhibit 4-10 shows the data collected. Management can now use the completed process map to determine costs for the strategic and operational decisions that they must make.

Resource Used to Perform Activity	Activity Performed					Total
	Account Inquiry Activity	Correspondence Activity	Billing Activity	Verification Activity	All Other Activities	
Supervisor	40%	10%	30%		20%	100%
Account inquiry labor	90	10				100%
Billing labor			30	70		100%
Verification labor				100		100%
Paper			100			100%
Computer	45	5	35	10	5	100%
Telecommunications	90				10	100%
Occupancy	65		15		20	100%
Printing machines		5	90		5	100%
All other department resources					100	100%

Exhibit 4-9

Analysis of Interviews with Supervisors from the Billing Department

**Exhibit 4-10**

Two-Stage Cost Allocation for Billing Department Operations

Activity	Cost Driver Units	Number of Cost Driver Units		
		Residential	Commercial	Total
Account inquiry	Inquiries	20,000	5,000	25,000
Correspondence	Letters	1,800	1,000	2,800
Billing	Printed pages	120,000	40,000	160,000
Verification	Accounts verified		20,000	20,000
Other activities	Printed pages	120,000	40,000	160,000

Exhibit 4-11

Number of Cost Driver Units for the Billing Department

Step 4: Calculate and Interpret the New Activity-Based Cost Information

After collecting all required financial and operational data, we can calculate the new activity-based information. Exhibit 4-12 summarizes stage 1 allocations. It shows the total costs for each of the five activity cost pools. Notice that the total costs of $\$332,872 + \$32,356 + \$153,125 + \$68,425 + \$100,722 = \$687,500$ in Exhibit 4-12 equals the total indirect costs in Exhibit 4-8. Now we can determine

the activity-based cost per account for each customer class (stage 2 allocations) from the data in step 3. Exhibit 4-13 shows the computations.

Examine the last two rows in Exhibit 4-13. Notice that traditional costing overcosted the high-volume residential accounts and substantially undercosted the low-volume, complex commercial accounts. The cost per account for residential accounts using ABC is \$3.98, which is \$0.60 (or 13%) less than the \$4.58 cost generated by the traditional costing system. The cost per account for commercial accounts is \$10.50, which is \$3.62 (or 53%) more than the \$6.88 cost from the traditional costing system. The analysis confirms management's belief that the traditional system undercosted commercial accounts. AT&T's management now has more accurate cost information for strategic decision-making and cost-control purposes.

Resource	Cost (from Exhibit 4-8)	Activity Cost Pool				
		Account Inquiry	Correspondence	Billing	Verification	Other
Supervisors	\$ 33,600	\$ 13,440*	\$ 3,360**	\$ 10,080***		\$ 6,720****
Account inquiry labor	173,460	156,114	17,346			
Billing labor	56,250			16,875	\$39,375	
Verification labor	11,250				11,250	
Paper	7,320			7,320		
Computer	178,000	80,100	8,900	62,300	17,800	8,900
Telecommunication	58,520	52,668				5,852
Occupancy	47,000	30,550		7,050		9,400
Printers	55,000		2,750	49,500		2,750
Other resources	67,100					67,100
Total cost	\$687,500	\$332,872	\$32,356	\$153,125	\$68,425	\$100,722

*From Exhibits 4-9 and 4-10, account inquiry activity uses 40% of the supervisor resource. So the allocation is $40\% \times \$33,600 = \$13,440$.

** $10\% \times \$33,600$

*** $30\% \times \$33,600$

**** $20\% \times \$33,600$

Exhibit 4-12

Total Cost of Each Activity in the Billing Department

Strategic Decisions, Operational Cost Control, and ABM

Now let's see how billing department managers can use the ABC system to improve their strategic decisions and operational cost control. Suppose that the billing department needed to find a way to increase its capacity to handle more accounts due to an expected large increase in demand from a new housing development and a business center. Managers proposed a strategic action—outsource certain customer accounts to a local service bureau. Billing department managers were also interested in reducing the operating costs of the department while not impairing the quality of the service it provided to its customers. To address both of these issues, they used the ABC information from Exhibit 4-13 to identify non-value-added activities that had significant costs. Account inquiry and bill verification activities are non-value-added and costly so management asked for ideas for cost reductions. The new information provided by the ABC system generated the following ideas:

- Use the service bureau for commercial accounts because of the significant cost savings. From Exhibit 4-13, the service bureau's bid is \$8.00 per account, compared to the billing department's activity-based cost of \$10.50, a potential savings of \$2.50 per account! In addition, department managers would try to eliminate or reduce bill verification, commercial account inquiry, and commercial account correspondence activities, all non-value-adding activities.

Driver Costs			
Activity (Driver Units)	Total Costs (from Exhibit 4-12) (1)	Total Number of Driver Units (From Exhibit 4-11) (2)	Cost per Driver Unit (1) ÷ (2)
Account inquiry (inquiries)	\$332,872	25,000 Inquiries	\$13.314880
Correspondence (letters)	\$ 32,356	2,800 Letters	\$11.555714
Account billing (printed pages)	\$153,125	160,000 Printed pages	\$ 0.957031
Bill verification (accounts verified)	\$ 68,425	20,000 Accounts verified	\$ 3.421250
Other activities (printed pages)	\$100,722	160,000 Printed pages	\$ 0.629513

Cost per Customer Class					
	Cost per Driver Unit	Residential		Commercial	
		Number of Driver Units	Cost	Number of Driver Units	Cost
Account inquiry	\$13.314880	20,000 Inquiries	\$266,298	5,000 Inquiries	\$ 66,574
Correspondence	\$11.555714	1,800 Letters	20,800	1,000 Letters	11,556
Account billing	\$ 0.957031	120,000 Pages	114,844	40,000 Pages	38,281
Bill verification	\$ 3.421250			20,000 Accts.	68,425
Other activities	\$ 0.629513	120,000 Pages	75,541	40,000 Pages	25,181
Total cost			<u>\$477,483</u>		<u>\$210,017</u>
Number of accounts			120,000		20,000
Cost per account			<u>\$ 3.98</u>		<u>\$ 10.50</u>
Cost per account, traditional system from Exhibit 4-8			<u>\$ 4.58</u>		<u>\$ 6.88</u>

Exhibit 4-13**Key Results of Activity-Based Costing Study**

Suppose AT&T outsourced commercial customers to the service bureau. Would actual costs immediately decrease by \$50,000 (\$2.50 for each of 20,000 commercial accounts)? No, only the variable portion of resource costs, such as paper, variable telecommunication charges, variable computer charges, and overtime or part time labor, would decrease immediately. The fixed portion of resource costs would not change without some specific management actions. For example, suppose billing labor used for verification is a fixed-cost resource. The change in this cost will depend on whether management decides to lay off billing employees or to keep them in anticipation of the increase in printing activity due to the expected increase in residential customers.

- Exhibit 4-13 indicates that account inquiry activity is very costly, accounting for a significant portion of total billing department costs. A benchmarking analysis showed the cost per inquiry of \$13.31 was unusually high compared to similar measures at other customer care centers. By meeting with managers from centers that had significantly lower activity cost rates, the billing department managers developed ideas for process improvements. One idea that resulted from these meetings was to implement a Web-based inquiry system to handle routine questions about bills.

The billing department, like so many companies that have adopted ABC and ABM, improved both strategic and operating decisions.

Summary Problem for Your Review

PROBLEM

Refer to the billing department illustration. Suppose that management at **AT&T**'S Youngstown area customer care center is implementing an ABC system. The center has 98,000 residential customers and 25,000 commercial customers. An ABC team has collected the data shown in Exhibit 4-14. Management has decided not to allocate the other resource costs.

Resource	Monthly Cost	Percent of Resource Used in Activity				
		Billing	Account Inquiry	Correspondence	Verification	Other
Supervisors	\$ 30,500	40%	35%	8%		17%
Account inquiry labor	102,000		85	15		
Billing labor	45,000	70			30	
Paper	5,800	100				
Computers	143,000	30	48	7	10	5
Telecommunications	49,620		85			15
Occupancy	56,000	15	70			15
Printers	75,000	80		5		15
Other	59,000					100
Total	<u>\$565,920</u>					

Activity	Cost Driver	Monthly Number of Cost Driver Units		
		Residential	Commercial	Total
Billing	Lines	1,176,000	1,250,000	2,426,000
Account inquiry	Inquiries	9,800	7,500	17,300
Correspondence	Letters	1,960	2,500	4,460
Verification	Accounts verified	49,000	12,500	61,500

Exhibit 4-14

First Stage Percentage Allocations and Monthly Number of Cost Driver Units

- Using the same format as Exhibits 4-12 and 4-13, prepare schedules to determine the cost per driver unit for each activity and the activity-based cost per account for each customer type.
- Consider the verification activity. Suppose the cost per account verified is \$0.45. The center verifies 50% of residential and commercial bills. Given that there are, on average, 50 lines on each commercial bill and only 12 lines on each residential bill, criticize the use of accounts verified as a cost driver and suggest a more plausible and reliable cost driver.

SOLUTION

- Exhibit 4-15 is a schedule showing the total cost of each activity of the billing department. From this we can determine the cost per driver unit and the activity-based cost per account for each customer class, as shown in Exhibit 4-16.
- The ABC system allocates $49,000 \div (49,000 + 12,500) = 79.7\%$ of verification costs to residential accounts based on the number of accounts verified. However, the work performed to verify a bill is probably closely related to the number of lines on the bill. Using "accounts verified" assumes that employees expend the same amount of effort verifying residential accounts and commercial accounts, even though there are many fewer lines on residential bills. Thus, the cost driver "lines verified" is more plausible and reliable. The number of lines verified for commercial accounts are 50 lines per

account $\times$ 12,500 accounts = 625,000 lines and for residential accounts are 12 lines per account $\times$ 49,000 accounts = 588,000 lines. Thus, we allocate $588,000 \div (588,000 + 625,000) = 48.5\%$ of verification costs to residential accounts based on lines verified. ABC teams should always exercise care when choosing cost drivers to use as allocation bases. The Youngstown team might also want to investigate the plausibility and reliability of the “number of inquiries” cost driver because this assumes that residential and commercial customer inquiries require the same amount of work.

Resource	Cost (from Exhibit 4-14)	Activity				
		Billing	Account Inquiry	Correspondence	Verification	Other
Supervisors	\$ 30,500	\$ 12,200 *	\$ 10,675 **	\$ 2,440 ***		\$ 5,185 ****
Account inquiry labor	102,000		86,700	15,300		
Billing labor	45,000	31,500			\$13,500	
Paper	5,800	5,800				
Computer	143,000	42,900	68,640	10,010	14,300	7,150
Telecommunication	49,620		42,177			7,443
Occupancy	56,000	8,400	39,200			8,400
Printers	75,000	60,000		3,750		11,250
Other resources	59,000					59,000
Total cost	<u>\$565,920</u>	<u>\$160,800</u>	<u>\$247,392</u>	<u>\$31,500</u>	<u>\$27,800</u>	<u>\$98,428</u>

*40% $\times$ \$30,500
 **35% $\times$ \$30,500
 ***8% $\times$ \$30,500
 ****17% $\times$ \$30,500

Exhibit 4-15

Total Cost of Each Activity in the Billing Department

Driver Costs			
Activity (Driver Units)	Total Costs (From Exhibit 4-15)	Total Number of Driver Units (From Exhibit 4-14)	Cost per Driver Unit
	(1)	(2)	(1) $\div$ (2)
Account inquiry (inquiries)	\$247,392	17,300 Inquiries	\$14.300116
Correspondence (letters)	\$ 31,500	4,460 Letters	\$ 7.062780
Account billing (lines)	\$160,800	2,426,000 Lines	\$ 0.066282
Bill verification (accounts verified)	\$ 27,800	61,500 Accounts Verified	\$ 0.452033

Cost per Customer Class					
	Cost per Driver Unit	Residential		Commercial	
		Number of Driver Units	Cost	Number of Driver Units	Cost
Account inquiry	\$14.300116	9,800 Inquiries	\$140,141	7,500 Inquiries	\$107,251
Correspondence	\$ 7.062780	1,960 Letters	13,843	2,500 Letters	17,657
Account billing	\$ 0.066282	1,176,000 Lines	77,947	1,250,000 Lines	82,853
Bill verification	\$ 0.452033	49,000 Accounts	22,149	12,500 Accounts	5,650
Total cost			<u>\$254,081</u>		<u>\$213,411</u>
Number of accounts			<u>98,000</u>		<u>25,000</u>
Cost per account			<u>\$ 2.59</u>		<u>\$ 8.54</u>

Exhibit 4-16

Cost Per Driver Unit and Activity-Based Cost Per Account

Accounting Vocabulary

activity-based costing (ABC) system, p. 153	direct costs, p. 144	manufacturing overhead, p. 149
activity-based management (ABM), p. 160	direct-labor costs, p. 149	non-value-added costs, p. 160
benchmarking, p. 160	direct-material costs, p. 149	period costs, p. 149
cost, p. 142	direct-material inventory, p. 150	process map, p. 153
cost accounting, p. 142	factory burden, p. 149	product costs, p. 149
cost accounting system, p. 142	factory overhead, p. 149	raw material, p. 149
cost accumulation, p. 143	finished-goods inventory, p. 150	raw-material inventory, p. 150
cost allocation, p. 144	Grenzplankostenrechnung (GPK), p. 161	tracing, p. 144
cost assignment, p. 143	indirect costs, p. 144	traditional costing system, p. 152
cost management system (CMS), p. 141	indirect manufacturing costs, p. 149	two-stage ABC system, p. 156
cost object, p. 142	indirect production costs, p. 149	unallocated costs, p. 147
cost objective, p. 142	inventoriable costs, p. 149	value-added cost, p. 160
cost pool, p. 146		work-in-process inventory, p. 150
cost-allocation base, p. 144		

MyLab Accounting

Fundamental Assignment Material

4-A1 Direct, Indirect, and Unallocated Costs, Process Map

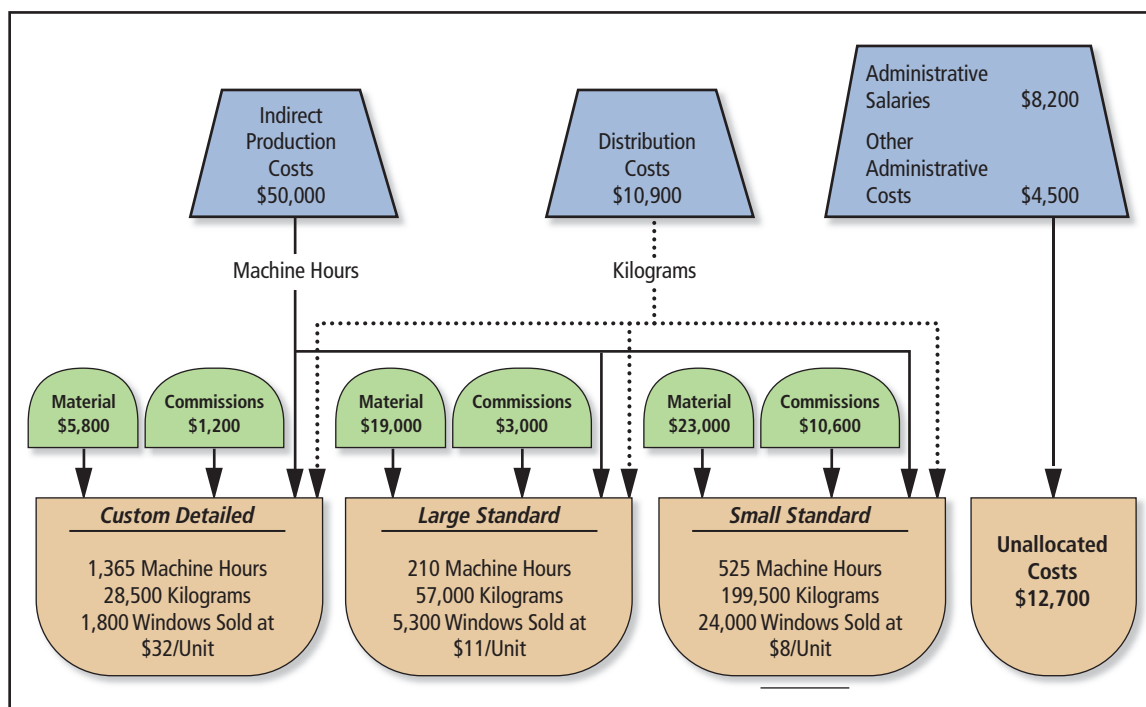
Penguin Window Company makes and sells three product lines—custom detailed windows, large standard windows, and small standard windows. The statement of operating income for the most recent period is shown below.

Penguin uses a traditional cost accounting system. A process map developed to describe this system is shown in Exhibit 4-17. To aid in the company's analysis of its product mix strategy, you have been asked to determine operating income (loss) for each product line. Use a format similar to Exhibit 4-3 on p. 148 in the text.

Penguin Window Company Statement of Operating Income		
		Total
Sales		\$307,900
Cost of goods sold		
Direct material	\$47,800	
Indirect production costs	<u>50,000</u>	<u>97,800</u>
Gross profit		210,100
Selling and administrative expenses:		
Commissions	14,800	
Distribution to warehouses	<u>10,900</u>	<u>25,700</u>
Income before unallocated expenses		184,400
Unallocated expenses		
Administrative salaries	8,200	
Other administrative expenses	<u>4,500</u>	<u>12,700</u>
Operating income before taxes		<u>\$ 171,700</u>

4-A2 Financial Statements for Manufacturing and Merchandising Companies

Annandale, Inc., produces and sells wireless reading devices. A competitor, Danube Electronic Products, sells similar wireless reading devices that it purchases at wholesale from Sonex

**Exhibit 4-17****Process Map for Penguin Window Company's Traditional Cost Allocation System**

for \$75 each. Both sell the devices for \$180. In 20X9 Annandale produced 12,000 devices at the following costs:

Direct materials purchased		<u>\$530,000</u>
Direct materials used		<u>\$490,000</u>
Direct labor		200,000
Indirect production:		
Depreciation	\$ 35,000	
Indirect labor	20,000	
Other	<u>155,000</u>	<u>210,000</u>
Total cost of production		<u>\$900,000</u>

Assume that Annandale had no beginning inventory of direct materials. Neither company had any beginning inventory of finished devices, but both had ending inventory of 2,500 finished devices. Ending work-in-process inventory for Annandale was negligible.

Each company sold 9,500 devices for \$1,710,000 in 20X9 and incurred the following selling and administrative costs:

Sales salaries and commissions	\$110,000
Depreciation on retail store	45,000
Advertising	10,000
Other	<u>5,000</u>
Total selling and administrative cost	<u>\$170,000</u>

1. Prepare the inventories section of the balance sheet for December 31, 20X9, for Danube.
2. Prepare the inventories section of the balance sheet for December 31, 20X9, for Annandale.
3. Using the cost of goods sold format on p. 134 as a model, prepare an income statement for the year 20X9 for Danube.
4. Using the cost of goods sold format on p. 134 as a model, prepare an income statement for the year 20X9 for Annandale.

5. Summarize the differences between the financial statements of Danube, a merchandiser, and Annandale, a manufacturer.
6. What purpose of a cost management system is being served by reporting the items in requirements 1–4?

4-A3 Activities, Resources, Cost Drivers, and the Banking Industry

Silver Springs Bank is a local bank located in a residential area, and it services mostly individuals and local businesses. Silver Springs' four main services are transaction processing (withdrawals, checks, currency exchange), loans, simple investments (individual clients), and complex investments (portfolios of large businesses).

To support these activities, Silver Springs employs 10 front-office staff, 12 back-office staff dealing with loan applications and investments, and 2 people to consult with customers and manage complex portfolio investments. A team of 3 supervisors manages the overall operations of the bank. As part of Silver Springs' implementation of activity-based costing, it needed to identify activities, resources, and cost drivers. The following table summarizes the cost-allocation bases Silver Springs has chosen for its activities and resources:

Cost-Allocation Base
number of investments
number of applications
number of loans
number of person hours
number of minutes
number of computer transactions
number of square feet
number of loan inquiries
number of transactions
number of schedules
number of securities

For each of the brief descriptions that follows, indicate whether it is an activity (A) or a resource (R). For each activity or resource, choose the most appropriate cost-allocation base from the preceding list and indicate for each resource whether it is a fixed-cost (F) or variable-cost (V) resource. The first item is completed as a guide.

- a. Contract maintenance of building (R; number of square feet; F)
- b. Staff for front-line customer service
- c. External computing services
- d. Development of repayment schedules
- e. Staff for consulting with customers and arranging the portfolios
- f. External service bureau providing customer credit checks for loan applications
- g. Preparing investment documents for customers
- h. Research to evaluate a loan application
- i. Overtime by back-office staff
- j. Telephones/facsimile
- k. Staff for service and background research
- l. Establish customer collateral for approved loans

4-A4 Activity-Based Costing in an Electronics Company

The wireless phone manufacturing division of a consumer electronics company uses activity-based costing. For simplicity, assume that its accountants have identified only the following three activities and related cost drivers for indirect production costs:

Activity	Cost Driver
Materials handling	Direct-materials cost
Engineering	Engineering change notices
Power	Kilowatt hours

Three types of cell phones are produced: Senior, Basic, and Deluxe. Direct costs and cost-driver activity for each product for a recent month are as follows:

	Senior	Basic	Deluxe
Direct-materials cost	\$25,000	\$ 60,000	\$135,000
Direct-labor cost	\$14,546	\$ 3,762	\$ 6,772
Kilowatt hours	230,000	220,000	100,000
Engineering change notices	21	20	69

Indirect production costs for the month were as follows:

Materials handling	\$ 15,400
Engineering	99,000
Power	<u>11,000</u>
Total indirect production cost	<u>\$125,400</u>

1. Compute the indirect production costs allocated to each product with the ABC system.
2. Suppose all indirect production costs had been allocated to products in proportion to their direct-labor costs. Compute the indirect production costs allocated to each product.
3. In which product costs, those in requirement 1 or those in requirement 2, do you have the most confidence? Why?

4-B1 Direct, Indirect, and Unallocated Costs

Cambridge Tool Co. is a supplier that assembles purchased parts into components for three distinct markets—scooter parts, lawn mower parts, and hand tool parts. Following is the statement of operating income for the most recent period:

Cambridge Tool: Statement of Operating Income		
		Total
Sales		\$1,221,500
Cost of goods sold		
Direct material	\$410,000	
Indirect production (allocated based on machine hours)	<u>60,000</u>	<u>470,000</u>
Gross profit		751,500
Selling and administrative expenses:		
Commissions	73,900	
Distribution to warehouses (allocated based on weight in kilograms)	<u>135,000</u>	<u>208,900</u>
Income before unallocated expenses		542,600
Unallocated expenses		
Corporate salaries	10,000	
Other general expenses	<u>17,000</u>	<u>27,000</u>
Operating income before taxes		<u>\$ 515,600</u>

Cambridge Tool uses a traditional cost accounting system. Operating data used in the cost accounting system are as follows:

	Scooter Parts	Lawn Mower Parts	Hand Tool Parts
Purchase cost of parts assembled	\$145,000	\$175,000	\$90,000
Machine hours	8,950	1,650	1,400
Weight of parts shipped to distributors (kilograms)	60,000	505,000	110,000
Sales commissions per unit	\$ 4.30	\$ 1.00	\$ 0.40
Units assembled and sold	7,000	21,000	57,000
Sales price per unit	\$ 80.00	\$ 16.30	\$ 5.60

You have been asked to determine operating income (loss) for each product line. Use a format similar to Exhibit 4-3 on p. 148.

4-B2 Allocation, Department Rates, and Direct-Labor Hours Versus Machine Hours

The Hernandez Manufacturing Company has two producing departments, machining and assembly. Mr. Hernandez recently automated the machining department. The installation of a CAM system, together with robotic workstations, drastically reduced the amount of direct labor required. Meanwhile, the assembly department remained labor intensive. The company had always used one firm-wide rate based on direct-labor hours as the cost-allocation base for applying all costs (except direct materials) to the final products. Mr. Hernandez was considering two alternatives: (1) continue using direct-labor hours as the only cost-allocation base, but use different rates in machining and assembly, and (2) using machine hours as the cost-allocation base in the machining department while continuing with direct-labor hours in assembly. Budgeted data for 20X0 are as follows:

	Machining	Assembly	Total
Total cost (except direct materials)	\$540,000	\$494,000	\$1,034,000
Machine hours	90,000	*	90,000
Direct-labor hours	12,000	38,000	50,000

*Not applicable.

1. Suppose Hernandez continued to use one firm-wide rate based on direct-labor hours to apply all manufacturing costs (except direct materials) to the final products. Compute the cost-application rate that would be used.
2. Suppose Hernandez continued to use direct-labor hours as the only cost-allocation base but used different rates in machining and assembly.
 - a. Compute the cost-application rate for machining.
 - b. Compute the cost-application rate for assembly.
3. Suppose Hernandez changed the cost accounting system to use machine hours as the cost-allocation base in machining and direct-labor hours in assembly.
 - a. Compute the cost-application rate for machining.
 - b. Compute the cost-application rate for assembly.
4. Three products use the following machine hours and direct-labor hours:

	Machine Hours in Machining	Direct-Labor Hours in Machining	Direct-Labor Hours in Assembly
Product A	10.0	2.5	13.0
Product B	18.0	3.0	3.3
Product C	11.0	2.7	8.5

- a. Compute the manufacturing cost of each product (excluding direct materials) using one firm-wide rate based on direct-labor hours.
- b. Compute the manufacturing cost of each product (excluding direct materials) using direct-labor hours as the cost-allocation base, but with different cost-allocation rates in machining and assembly.
- c. Compute the manufacturing cost of each product (excluding direct materials) using a cost-allocation rate based on direct-labor hours in assembly and machine hours in machining.
- d. Compare and explain the results in requirements 4a, 4b, and 4c.

4-B3 Traditional Versus ABC Costing Systems

Yoko Iwabuchi is the controller of Kondo, Inc., an electronic controls company located in Osaka. She recently attended a seminar on activity-based costing (ABC) in Tokyo. Kondo's traditional cost accounting system has three cost categories: direct materials, direct labor, and indirect production costs. The company allocates indirect production costs on the basis of direct-labor cost. The following is the 20X0 budget for the automotive controls department (in thousands of Japanese yen):

Direct materials	¥ 55,000
Direct labor	28,368
Indirect production costs	21,276
Total cost	<u>¥104,644</u>

After Ms. Iwabuchi attended the seminar, she suggested that Kondo experiment with an ABC system in the Automotive Controls Department. She identified four main activities that cause indirect production costs in the department and selected a cost driver as a cost-allocation base for each activity as follows:

Activity	Cost-Allocation Base	Predicted 20X0 Cost (¥000)
Receiving	Direct-materials cost	¥ 6,600
Assembly	Number of control units	9,900
Quality control	QC hours	1,456
Shipping	Number of boxes shipped	3,320
TOTAL		<u>¥21,276</u>

In 20X0 the Automotive Controls Department expects to produce 99,000 control units, use 560 quality control hours, and ship 8,300 boxes.

1. Explain how Kondo, Inc., allocates its indirect production costs using its traditional cost system. Include a computation of the allocation rate used.
2. Explain how Kondo, Inc., would allocate indirect production costs under Ms. Iwabuchi's proposed ABC system. Include a computation of all the allocation rates used.
3. Suppose Kondo prices its products at 40% above total production cost. An order came in from **Mazda** for 9,000 control units. Iwabuchi estimates that filling the order will require ¥4,500,000 of direct-materials cost and ¥1,800,000 of direct labor. It will require 60 hours of QC inspection time and will be shipped in 670 boxes.
 - a. Compute the price charged for the 9,000 control units if Kondo uses its traditional cost accounting system.
 - b. Compute the price charged for the 9,000 control units if Kondo uses the ABC system proposed by Ms. Iwabuchi.
4. Explain why costs are different in the two costing systems. Include an indication of which costs you think are most accurate and why.

4-B4 Traditional Costing and ABC, Activity-Based Management

Refer to the text discussion of Lopez Plastics Company on pp. 154–158. Assume that the company has the traditional cost accounting system described in Exhibit 4-6. The top management team wants to reverse the pattern of quarterly losses. The company president, Angie Oaks, has emphasized the importance of profit improvement by linking future pay raises of the two product-line managers to their respective gross profit margins. She is concerned about the profitability of the pen casing product line, while pleased with the profitability of the cell phone casing line. She also believes that the unallocated costs of the company are too high compared to competitors. The office of controller, whose costs are included in the unallocated costs, is responsible for vendor relations and purchasing of direct materials. The controller and head of the engineering department proposed 1) a price reduction, and 2) use of more standard parts:

We should use more standard parts in cell phone casings, which will dramatically reduce the purchasing department's work required for purchasing. I believe this should cut our office's costs by as much as \$20,000 per quarter. Product engineering agrees that this idea is not only feasible but, if implemented, would substantially reduce the design work required for cell phone casings. Quality would also improve.

Action	Predicted effects of action
Reduce prices of cell phone casings 25%.	The vice president of sales estimates that the improved quality of cell phone casings combined with the price reduction will yield a 100% increase in demand for cell phone casings per quarter.
Use standard parts wherever possible in cell phone casings.	The use of fewer suppliers will reduce vendor-relations work by the purchasing department. This will result in unallocated costs decreasing by \$20,000. One of the two engineers can be let go at an annual cost savings of \$80,000, which is \$20,000 quarterly. Less of the plant and machinery will be used by production support so the allocation percentages will change from 75% and 25% to 80% and 20%. Much less engineer and CAD equipment costs will be needed for production support so these percentages will change from 80% and 20% to 50% and 50%. Processing time, measured in direct-labor hours, will increase by 500 hours due to an expected 100% increase in sales and production of cell phone casings, but there is adequate capacity of labor and machine time. Direct-labor costs are fixed as are all of the indirect production costs. Quality of cell phone casings will improve due to reduced complexity of processing.

1. Evaluate this idea using the traditional cost allocation system shown in Exhibit 4-6 on p. 156. What would be the predicted profitability for each product line and the company as a whole? What would be the most likely level of support for the controller's idea by the product managers of the pen casing product line and the cell phone casing product line? What would be the level of support by the president?
2. Assume that you have the ABC system described in Exhibit 4-7 on p. 157 with the gross margin percentages as shown in the table in the solution to the first Summary Problem for Your Review on p. 158. Often, managers with ABC systems can anticipate more effects of improvement ideas because of their increased understanding of the operating system. In this case, although the total number of parts used would not change, the idea would reduce the number of distinct parts for cell phone casings from 20 to 11. Evaluate the controller's idea using the ABC system described in Exhibit 4-7. What would be the predicted profitability for each product line and the company as a whole? What would be the most likely level of support for the controller's idea by the product managers of the pen casing product line and the cell phone casing product line? What would be the level of support by the president?
3. As vice president, you have expressed concern about the traditional cost-allocation system's product-cost accuracy and its ability to provide relevant information for operational control. Does the new ABC system satisfy your concerns? Explain.

MyLab Accounting

Additional Assignment Material

QUESTIONS

- 4-1** Define a cost management system and give its three purposes.
- 4-2** Cost management systems have three primary purposes. For each of the decisions listed next, indicate the purpose of the CMS being applied.
- a. A production manager wants to know the cost of performing a setup for a production run in order to compare it to a target cost established as part of a process improvement program.
 - b. Top management wants to identify the profitability of several product lines to establish the optimum product mix.
 - c. Financial managers want to know the manufactured cost of inventory to appear on the balance sheet of the annual report.
- 4-3** Name four examples of cost objects.
- 4-4** "Products are the main cost objects. Departments are seldom cost objects." Do you agree? Explain.
- 4-5** What is the major purpose of detailed cost accounting systems?
- 4-6** What are the two major processes performed by a cost accounting system? Describe both of them.
- 4-7** Why are cost accounting systems critically important to managers?
- 4-8** Distinguish between direct, indirect, and unallocated costs.
- 4-9** "The same cost can be direct and indirect." Do you agree? Explain.
- 4-10** How does the idea of economic feasibility relate to the distinction between direct and indirect costs?
- 4-11** What are four purposes for cost allocation?
- 4-12** Why do companies assign all production costs and only production costs to products for external reporting purposes?
- 4-13** "A cost pool is a group of costs that accounting systems physically trace to the appropriate cost objective." Do you agree? Explain.
- 4-14** List five terms that are sometimes used as substitutes for the word *allocate*.
- 4-15** "The typical traditional accounting system does not allocate costs associated with value-chain functions other than production to units produced." Do you agree? Explain.
- 4-16** "It is better not to allocate some costs than to use a cost-allocation base that does not make any sense." Do you agree? Explain.
- 4-17** Production equipment maintenance, sales commissions, and process design costs are part of a company's costs. Identify which of these costs are most likely direct, indirect, and unallocated with respect to the products manufactured.
- 4-18** Distinguish between "tracing of costs" and "cost allocation."
- 4-19** "Depreciation is a period expense for financial statement purposes." Do you agree? Explain.
- 4-20** Distinguish between costs and expenses.
- 4-21** Distinguish between manufacturing and merchandising companies. How do their accounting systems differ?
- 4-22** Why is there a direct-materials inventory account but no direct-labor inventory account on a manufacturing company's balance sheet?

4-23 What are the factors that justify the implementation of ABC in an organization?

4-24 Contrast activity-based costing (ABC) with activity-based management (ABM).

4-25 Explain how the layout of a plant's production equipment can reduce non-value-added costs.

4-26 Why do managers want to distinguish between value-added activities and non-value-added activities?

4-27 What is benchmarking? What do companies use it for? How do they determine benchmarks?

4-28 Why should caution be exercised when comparing company performance to benchmarks?

4-29 Why are more organizations adopting ABC systems?

4-30 (Appendix 4) Name four steps in the design and implementation of an ABC system.

CRITICAL THINKING EXERCISES

4-31 Marketing and Capacity Planning

A company has just completed its marketing plan for the coming year. When the company's management accountant entered the projected increases in sales volume into a process map (which relates activities and resources), the accountant discovered that the company will exceed several key resource capacities. What are three alternative courses of action to solve this dilemma?

4-32 ABC and ABM Compared

During seminars on ABM, participants often ask about the difference between ABC and ABM. Explain briefly. Why is this important to managers?

4-33 ABC for Product Costing and Operational Control

When companies implement an ABC system, they often use it first for product costing. Some managers think that is the only use for an ABC system. A typical comment is, "Activity-based allocation is useful for product costing, but not for operational control." Do you agree? Explain.

4-34 ABC and Cost Management Systems

Cost management systems have three primary purposes. Two of these are providing information for strategic and operational purposes. Companies often adopt ABC systems to increase the accuracy of cost information used by managers for strategic and operational decisions. Suppose a company produces only one product. This means that 100% of its costs are direct with respect to the product cost object. The accurate product unit cost is simply all costs incurred divided by the total units produced. Might this company be interested in an ABC system? Why or why not?

4-35 ABC and Benchmarking

Suppose that **AT&T** used benchmarking to compare the activity-based costs among its various divisions. As part of its benchmarking efforts, AT&T compared the activity cost per driver unit for similar activities and cost per customer for its billing departments in various geographic regions. For example, AT&T compared the costs at the Youngstown area billing department with the similar costs in the Los Angeles area. Are these meaningful comparisons? Why or why not?

EXERCISES

4-36 Classification of Manufacturing Costs

Costs are either direct or indirect depending on whether they can be traced to a cost object, and are either variable or fixed depending on whether they vary with changes in volume. Classify each of the following cost items as direct (D) or indirect (I) with respect to a product as cost object and as variable (V) or fixed (F). For each of the following items you will have two answers, D or I and V or F.

1. Factory lighting excluding meter rental
2. Salary of storeroom security personnel
3. Bricks for a road constructor
4. Factory supervisor's salary
5. Annual maintenance contract fee for factory equipment
6. Food supplies for factory canteen
7. Group insurance premium for factory workers
8. Lubricant for factory machines
9. Aluminum tubing in bicycles
10. Power to operate factory machine

4-37 Confirm Your Understanding of the Classification of Manufacturing Costs

Classify each of the following as direct or indirect with respect to traceability to product and as variable or fixed with respect to whether the costs fluctuate in total as volume of production changes over wide ranges. Explain your classifications.

1. The cost of components that are assembled into a final product
2. The cost of supplies consumed when maintenance is performed on machines
3. The wages of machine operators who work on only one product
4. The cost of training mechanics who service processing machinery

4-38 Variable Costs and Fixed Costs; Manufacturing Costs and Other Costs

For each of the numbered items, choose the appropriate classification from the lettered items for a manufacturing company. If you are unsure if a cost item is variable or fixed, decide on the basis of whether the total costs will change substantially over a wide range of volume. Most cost items may have two answers among the following possibilities:

- a. Manufacturing costs, direct
- b. Manufacturing costs, indirect
- c. General and administration cost
- d. Selling cost
- e. Fixed cost
- f. Variable cost
- g. Other (please specify)

Examples:

Direct material	a, f
CEO's salary	c, e
Interest on bank loan	e, g (finance expenses)

Consider the following items:

1. Carriage outward
2. Idle time of assembly department
3. Travelling expenses of salesmen
4. Factory supervisor's salary
5. Salesmen's commission
6. Straight line depreciation of delivery vans
7. Cost of annual get-together
8. AMC fees for factory air conditioning system
9. Municipal taxes of office building
10. Abrasives (e.g., sandpaper)
11. Gray iron used in cylinder heads
12. Fuel used in forklift
13. Paper towel for office washroom
14. Straight line depreciation of office photocopier
15. Salary of factory security personnel
16. Insurance premium on factory machines
17. Office attendant's salary
18. Paint used on finished products

4-39 Direct, Indirect, and Unallocated Costs

Refer to the Lopez Plastics Company example on pp. 154–158 and to Exhibit 4-7. The following list gives various resources used by Lopez Plastics Company. Use the letters *D*, *I* and *U* to indicate how the cost of each resource would be classified with respect to products manufactured: *D* = direct, *I* = indirect, and *U* = unallocated.

1. Depreciation of the plant
2. Resin used to make pen casings
3. Salary of plant manager
4. Salaries of cost accountants
5. Depreciation on computers used by engineers to design cell phone casings
6. Salaries of engineers
7. Salaries of operating labor processing pen casings
8. Travel costs of purchasing agent while investigating potential new suppliers of resin

4-40 Cost Allocation in ABC

Refer to the Lopez Plastics Company illustration on pp. 154–158 and to Exhibit 4-7. Also see the table in the solution to the first Summary Problem for Your Review on p. 158. Based on new information, management has adjusted the percentages that apply to the first stage of the ABC system as shown in the following table. Prepare a schedule that shows the gross margins for both products.

Percent of Resource Used in	Indirect Resource	
	Plant and Machinery	Engineers and CAD Equipment
Processing activity	90%	30%
Production support activity	10%	70%

4-41 Activity-Based Costing

Shanghai Toys Inc. produces three types of magnetic table top games—Magnetic Chess, Magnetic Ludo, and Magnetic Monopoly—using the same production methods and equipment for each. A conventional costing system is already in place, which absorbs overhead through machine hour rate. However, the management is also considering an ABC system. The details of the three games during July 2020 were as follows:

Product	Labor Hours per Unit	Machine Hours per Unit	Materials per Unit (CNY)	Volume (Units)
Magnetic Chess	0.5	1.5	40	1,500
Magnetic Ludo	1.5	1	24	2,500
Magnetic Monopoly	1	3	50	14,000

Direct labor costs CNY12 per hour and production overheads are absorbed using machine hours. Machine hour rate is CNY28.

An analysis of various activities shows that the total production overheads can be traced to four activities as follows:

	%
Setup costs	35
Machine-related costs	20
Material handling costs	15
Testing and inspection costs	30

During July 2019, the activity volume associated with the three products were as follows:

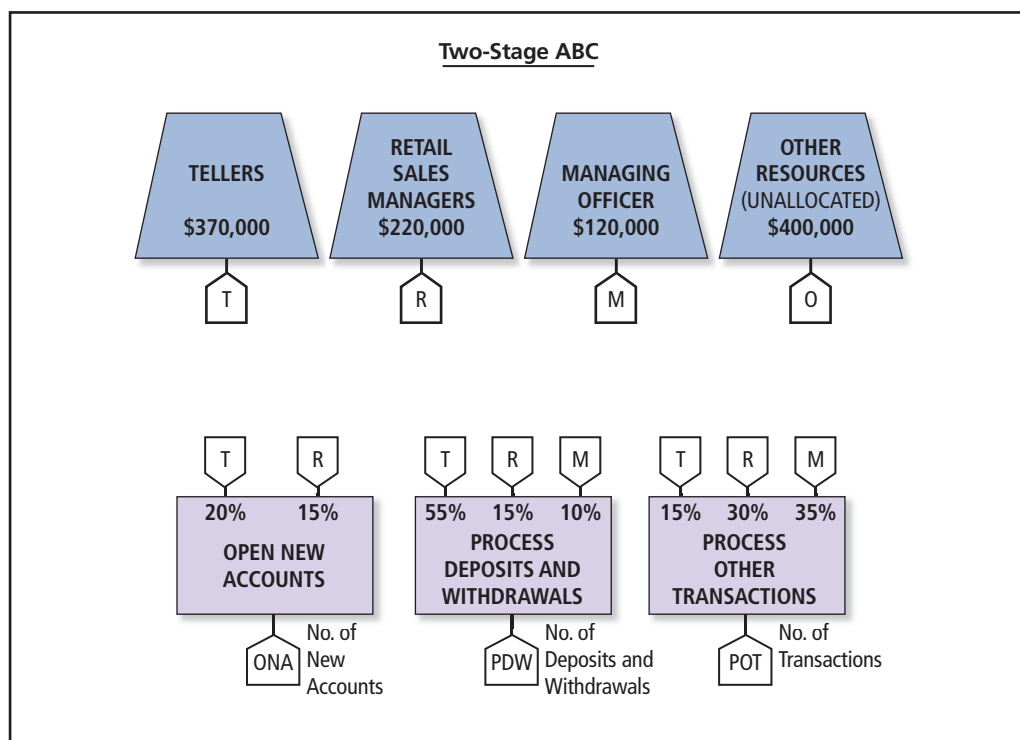
Products	No. of Setups	No. of Movements of Materials	No. of Testing and Inspections
Magnetic Chess	150	24	300
Magnetic Ludo	230	42	360
Magnetic Monopoly	960	174	1,340
Total	1,340	240	2,000

Based on the above information, compute the cost per unit for each product based on the ABC system.

(Note: The Renminbi, CNY, is the official currency of the People's Republic of China.).

4-42 Two-Stage Activity-Based Costing—Stage One

The Maple Lake branch of Buffalo State Savings Bank (BSSB) is a retail branch in a rapidly growing residential area. It services individuals and local businesses. To support its services, the branch employs 14 tellers, 3 retail sales managers (RSMs), and the branch managing officer. The branch services about 3,100 customers. Each of the 70 branches of BSSB is implementing ABC in order to improve profitability. BSSB's branch managing officers have been given the responsibility to implement activity-based costing. The managing officer at the Maple Lake branch decided to implement a two-stage ABC system. Exhibit 4-18 depicts its two-stage ABC system.

**Exhibit 4-18**

Two-Stage ABC at the Maple Lake Branch of BSSB

The Maple Lake branch has the following cost data for the last year:

Teller wages	\$ 370,000
RSM salaries and benefits	220,000
Managing officer salary and benefits	120,000
Other bank costs	<u>400,000</u>
Total	<u>\$1,110,000</u>

The “other bank costs” include depreciation on the facility including furniture, building, equipment, insurance, rentals of computers, contracted computer services, telecommunications, and utilities. These costs cannot be directly or indirectly related to routine bank activities, such as processing new accounts or processing deposits or withdrawals, and, thus, are unallocated. There are no costs that can be traced directly to customers so the Maple Lake branch has just two types of costs—indirect and unallocated. All employees have been interviewed as part of the ABC study. For example, tellers were asked how they spent their time. Three major activities were identified. They said that they spent most of their time (55%) processing deposits and withdrawals. They also estimated that they spent about 20% of their time processing new accounts and about 15% of their time processing other transactions. The remaining 10% of their time was spent on all other banking activities. The complete results of the interviews are presented in the following table:

Internal Activity Analysis					
	Open New Accounts	Process Deposits and Withdrawals	Process Other Transactions	All Other Banking Activities	Total
Teller wages	20%	55%	15%	10%	100%
Retail sales manager salary	15%	15%	30%	40%	100%
Managing officer salary	0%	10%	35%	55%	100%

Determine the total cost of each of the three major activities conducted at the Maple Lake branch of BSSB. Use Exhibit 4-18 as a guide. (Note that this represents the first stage in the two-stage ABC method.)

4-43 Two-Stage Activity-Based Costing, Banking, Benchmarking

(This exercise is a continuation of Exercise 4-42 and should be assigned only if Exercise 4-42 is also assigned.)

A part of the activity analysis conducted at the Maple Lake branch of Buffalo State Savings Bank (BSSB) was identifying potential cost drivers for each major activity. The following cost drivers were chosen because they were both plausible and reliable and data were available:

Activity	Cost Driver	Annual Flow of Cost Driver
Process new accounts	Number of new accounts	580
Process deposits and withdrawals	Number of deposits and withdrawals	166,000
Process other transactions	Number of other transactions	46,000

Of the 3,100 customers of the branch, only 400 are local businesses. The business-customer class generated 20 new accounts, 89,000 deposits and withdrawals, and 22,000 other transactions. The implementation of ABC at all branches of BSSB provided sufficient data for internal benchmarking. The following are the lowest activity costs among all branches implementing two-stage ABC systems:

Activity	Lowest Activity Cost per Driver Unit
Open new accounts	\$204.73 per new account
Process deposits and withdrawals	\$ 2.25 per deposit or withdrawal
Process other transactions	\$ 3.83 per transaction

Customer Class	Lowest Customer Cost per Account
Retail	\$126.85
Commercial	\$593.83

1. Determine the allocated (indirect) cost per account for retail and commercial accounts. Use Exhibit 4-18 as a guide.
2. Under what conditions would benchmarking between the Maple Lake branch of BSSB and the other branches be inappropriate?
3. What do the results of the ABC study suggest?

4-44 Direct, Indirect, and Unallocated Costs

Listed next are several activities and related costs that have been observed at Santana Company, a manufacturing company. The company makes a variety of products and currently uses a traditional costing system that allocates only production overhead based on direct-labor hours. It is implementing an ABC system for the design, production, and distribution functions of its value chain. You have been asked to complete the following table by indicating for each activity whether the related cost is direct, indirect, or unallocated. For each indirect cost, indicate one appropriate cost-allocation base (more than one cost-allocation base may be appropriate). The first two items have been completed for you.

Activity	Related Cost	Traditional	ABC
Supervising production	Supervisor salaries	Indirect (direct-labor hours)	Indirect (people supervised)
Designing a prototype for new product	Depreciation of computers	Unallocated	Indirect (number of parts)
Setting up for a production run	Mechanic wages		
Purchasing materials and parts to be used in products	Materials and parts cost		
Shipping sold products to customers (distributors)	Fuel used on company's fleet of trucks		
Market research study conducted by marketing staff to assess demand for potential new product	Salaries of market research staff		
Production scheduling	Salaries of production scheduling managers		
Purchasing materials and parts to be used in products	Salaries of purchasing agents		
Order processing of customer orders	Salaries of order processing staff		
Preparing cost analyses	Cost accountant salary		
Designing a new product	Salaries of design engineers that are fully dedicated to this new product		
Managing overall operations	Salary of executive of company		

PROBLEMS

4-45 Cost Accumulation and Allocation

Osaka Electronics, headquartered in Japan, produces consumer durables. It has two departments—component manufacturing and assembling. For the April–June quarter, 2020, the following costs were incurred by the company as a whole: direct material ¥800,000; direct labor ¥180,000; indirect production ¥80,000. The total costs were ¥1,060,000.

The component manufacturing department incurred 60% of direct-material costs but only 20% of direct-labor costs. Indirect production costs amounted to ¥20,000 in the component manufacturing department and ¥60,000 in the assembling department.

The company manufactured three products using the following proportions of direct materials and direct labor in the two departments:

Products	Direct Materials	Direct Labor
Refrigerators	40%	40%
Air conditioners	40%	20%
Washing machines	20%	40%
Total for component manufacturing department	<u>100%</u>	<u>100%</u>
Refrigerators	50%	40%
Air conditioners	40%	40%
Washing machines	10%	20%
Total for assembling department	<u>100%</u>	<u>100%</u>

The indirect production costs incurred by each department were allocated to products in proportion to their direct-labor costs of products within the departments.

1. Compute the total costs incurred by the component manufacturing department and added by the assembling department.
2. Compute the total costs of each product that would be shown as finished-goods inventory if all the products were transferred to finished stock after assembly. (There were no beginning inventories.)

4-46 Hospital Allocation Base

Emilio Moreno, the administrator of Cook Community Hospital, has become interested in obtaining more accurate cost allocations on the basis of cause and effect. The \$227,360 of laundry costs had been allocated on the basis of 784,000 pounds processed for all departments, or \$.29 per pound.

Moreno is concerned that government healthcare officials will require weighted statistics to be used for cost allocation. He asks you, “Please develop a revised base for allocating laundry costs. It should be better than our present base, but it should not be overly complex either.”

You study the situation and find that the laundry processes a large volume of uniforms for student nurses and physicians and for dietary, housekeeping, and other personnel. In particular, the coats or jackets worn by personnel in the radiology department take an unusual amount of handwork.

A special study of laundry for radiology revealed that 7,000 of the 23,000 pounds were jackets and coats that were five times as expensive to process as regular laundry items. Several reasons explained the difference, but it was principally because of the handwork involved.

Assume that no special requirements were needed in departments other than radiology. Revise the cost-allocation base to take into account that jackets in the radiology department use five times as much of the laundry resources as regular laundry items and compute the new cost-allocation rate. Compute the total cost charged to radiology using pounds and using the new base.

4-47 Traditional and ABC Cost Accounting, Activity-Based Management

Refer to the text discussion of Lopez Plastics Company on pp. 154–158. Assume that the company has the traditional cost accounting system described in Exhibit 4-6. The top management team wants to reverse the pattern of quarterly losses. The company president, Angie Oaks, has emphasized the importance of profit improvement by linking future pay raises of the two product-line managers to their respective gross profit margins. She is concerned about the profitability of the pen casing product line while pleased with the profitability of the cell phone casing line. She also believes that the unallocated costs of the company are too high compared to those of competitors. The office of controller, whose costs are included in the unallocated costs, is responsible for vendor relations and purchasing of direct materials. The controller presents the following idea:

We should use more standard parts in cell phone casings, which will dramatically reduce the purchasing department’s work required for purchasing. I believe this should cut our office’s costs by as much as \$25,000 per quarter. In addition, using standard parts eliminates the need to purchase several expensive resins. The larger volume of purchases of less costly resin from fewer vendors will cut the cell phone casing direct-material cost by 10%. Product engineering agrees that this idea is not only feasible but, if implemented, would improve the overall quality of cell phone casings.

The controller and marketing manager provided the following summary of actions and related effects:

Action	Expected effects
Reduce prices of cell phone casings 25%.	The vice president of sales estimates that the improved quality of cell phone casings combined with the price reduction will yield a 100% increase in demand for cell phone casings per quarter.
Use standard parts wherever possible in cell phone casings.	Total number of parts for each cell phone casing will not change, but the direct-material cost per casing will be reduced by 10% due to volume discounts from preferred vendors. The use of fewer suppliers will reduce vendor-relations work by the purchasing department. This will result in unallocated costs decreasing by \$25,000. Processing time, measured in direct-labor hours, will increase by 500 hours due to expected 100% increase in sales and production of cell phone casings, but there is adequate capacity of labor and machine time. Direct-labor costs are fixed as are all of the indirect manufacturing costs. Quality of cell phone casings will improve due to reduced complexity of processing.

1. Evaluate this idea using the traditional cost allocation system shown in Exhibit 4-6 on p. 156. What would be the predicted profitability for each product line and the company as a whole? What would be the most likely level of support for the controller’s idea by the product managers of the pen casing product line and the cell phone casing product line? What would be the level of support by the president?
2. Assume that you have the ABC system described in Exhibit 4-7 on p. 157 with the gross profit margins shown in the table in the solution to the first Summary Problem for Your Review on p. 158. Often, managers with ABC systems can anticipate more effects of improvement ideas because of their increased understanding of the operating system. In this case, although the total number of parts would not change, the idea would reduce the number of distinct parts for cell phone casings from 20 to 9. Evaluate the controller’s idea using the ABC system described in

Exhibit 4-7. What would be the predicted profitability for each product line and the company as a whole? What would be the most likely level of support for the controller's idea by the product managers of the pen casing product line and the cell phone casing product line? What would be the level of support by the president?

- As vice president, you have expressed concern about the traditional cost-allocation system's product-cost accuracy and its ability to provide relevant information for operational control. Does the new ABC system satisfy your concerns? Explain.

4-48 Activity-Based Costing and Product Line Profitability

SuperSol is a grocery company with stores throughout Spain. Suppose the company is planning an expansion of its store in central Madrid. A preliminary analysis has shown the packaged food department to be the most profitable, so the company plans to increase its space the most.

Assume that the Madrid store has just three departments: produce, packaged food, and meat. The most recent annual report for the store showed sales of €4,160,100, which generated a gross margin of €960,100. Sales and gross margins of the three departments were as follows:

	Produce	Packaged Food	Meat	Total
Revenues	€497,700	€2,100,000	€1,562,400	€4,160,100
Cost of products sold	<u>320,000</u>	<u>1,600,000</u>	<u>1,280,000</u>	<u>3,200,000</u>
Gross margin	<u>€177,700</u>	<u>€ 500,000</u>	<u>€ 282,400</u>	<u>€ 960,100</u>

In addition to cost of products sold, the store has €800,000 of support costs, so operating income is €960,100 – €800,000 = €160,100. SuperSol currently uses an accounting system that uses cost of products sold as a cost-allocation base for allocating support costs.

Francisco Ramirez, controller of SuperSol, recently attended a seminar on activity-based costing. He suggests that SuperSol management should undertake further analysis before deciding which product gets the largest increase in space in the expansion. He has asked you, his assistant, to lead this analysis.

- The starting point of your analysis is to determine product profitability under the existing cost accounting system. Compute the operating income and the operating income as a percent of sales for each department using SuperSol's existing system. Use this information to assess the relative profitability per euro of sales of each of the three departments.
- Ramirez asks you next to develop product costs using an activity-based accounting system. You determine that there are five major activities, each with a different cost driver to be used as a cost-allocation base:
 - Ordering—Placing of orders for purchases
 - Delivery—Physical delivery and receipt of merchandise
 - Shelf-stocking—Stocking of merchandise on store shelves, including ongoing restocking
 - Customer support—Assistance to customers, including check out and bagging
 - Produce monitoring—Constantly checking on the stacking and freshness of produce

The cost drivers for each activity are as follows:

Ordering	Number of purchase orders
Delivery	Number of deliveries
Shelf-stocking	Hours of stocking time
Customer support	Number of items sold
Produce monitoring	Direct trace to the Produce Department

You have determined the following information about the cost drivers:

	Produce	Packaged Food	Meat	Total
Number of purchase orders	1,400	3,300	1,470	6,170
Number of deliveries	1,240	8,770	1,190	11,200
Hours of shelf-stocking	218	2,120	1,053	3,391
Items sold	50,100	440,800	122,700	613,600

The total cost of each activity was as follows:

Ordering	€ 67,870
Delivery	179,200
Shelf-stocking	128,858
Customer support	245,440
Produce monitoring	<u>178,632</u>
Total	<u>€800,000</u>

Using these data and activity-based costing, calculate the operating income and operating income as a percent of sales for each product. (For example, note that each purchase order costs $\text{€}67,870 \div 6,170 = \text{€}11$ to process.)

- Propose a strategy for expansion. Which information, that based on the current costing system or that based on the activity-based costing system, is most useful? Why? What additional information would you like to have before making a more definitive recommendation on an expansion strategy?

4-49 Activity-Based Costing and Activity-Based Management, Automotive Supplier

O'Hanlon Company is an automotive component supplier. O'Hanlon has been approached by **Chrysler's** Ohio plant to consider expanding its production of part 24Z2 to a total annual quantity of 2,800 units. This part is a low-volume, complex product with a high gross margin that is based on a proposed (quoted) unit sales price of \$8.20. O'Hanlon uses a traditional costing system that allocates indirect manufacturing costs based on direct-labor costs. The rate currently used to allocate indirect manufacturing costs is 500% of direct-labor cost. This rate is based on the \$4,121,000 annual factory overhead cost divided by \$824,200 annual direct-labor cost. To produce 2,800 units of 24Z2 requires \$6,160 of direct materials and \$1,960 of direct labor. The unit cost and gross margin percentage for part 24Z2 based on the traditional cost system are computed as follows:

	Total	Per Unit (÷2,800)
Direct material	\$ 6,160	\$2.20
Direct labor	1,960	0.70
Indirect production: (500% of direct labor)	<u>9,800</u>	<u>3.50</u>
Total cost	<u>\$17,920</u>	\$6.40
Sales price quoted		<u>8.20</u>
Gross margin		<u>\$1.80</u>
Gross margin percentage		<u>22.0%</u>

The management of O'Hanlon decided to examine the effectiveness of their traditional costing system versus an activity-based costing system. The following data have been collected by a team consisting of accounting and engineering analysts:

Activity Center	Factory Overhead Costs (Annual)
Quality	\$ 880,000
Production scheduling	72,000
Setup	880,000
Shipping	384,000
Shipping administration	105,000
Production	<u>1,800,000</u>
Total indirect production cost	<u>\$4,121,000</u>

Activity Center	Factory Overhead Costs (Annual)
Activity Center: Cost Drivers	Annual Cost-Driver Quantity
Quality: Number of pieces scrapped	16,000
Production scheduling and set up: Number of setups	800
Shipping: Number of containers shipped	64,000
Shipping administration: Number of shipments	1,500
Production: Number of machine hours	12,000

The accounting and engineering team has performed activity analysis and provides the following estimates for the total quantity of cost drivers to be used to produce 2,800 units of part 24Z2:

Cost Driver	Cost-Driver Consumption
Pieces scrapped	150
Setups	5
Containers shipped	12
Shipments	7
Machine hours	16

1. Prepare a schedule calculating the unit cost and gross margin of part 24Z2 using the activity-based costing approach. Use the cost drivers given as cost-allocation bases.
2. Based on the ABC results, which course of action would you recommend regarding the proposal by Chrysler? List the benefits and costs associated with implementing an ABC system at O'Hanlon.

4-50 Research in Activity-Based Costing or Activity-Based Management

Select an article from *Strategic Finance*, *Cost Management*, or *Management Accounting Quarterly* (an online journal) or any other journal that describes a particular company's application of either (a) an activity-based costing system, or (b) activity-based management. Prepare a summary of 300 words or fewer that includes the following:

- Name of the company (if given)
- Industry of the company
- Description of the particular application
- Assessment of the benefits the company received from the application
- Any difficulties encountered in implementation

4-51 Review of Chapters 2, 3, and 4

Pure Sound Electronics Inc. produces wireless ear buds. The following information is available regarding its operations in 2020 (in South Korean Won ₩):

Cost of goods sold	₩200,000
Net profit	37,500
Sales	300,000
Direct materials used	87,500
Direct labor	62,500
Variable manufacturing overhead	12,500
Fixed selling and administration overhead	30,000

There are no beginning or ending inventories.

Compute (a) variable selling and administration overhead, (b) contribution margin in ₩, (c) fixed manufacturing overhead, (d) break-even point in sales ₩, and (e) gross profit.

4-52 Review of Chapters 2, 3, and 4

UK-based Cool and Casual Shoes Inc. produces luxury shoes. The company provides you the following data regarding its operations in 2018:

Break-even point in sales	£252,000
Direct materials used	87,000
Contribution margin	75,000
Direct labor	90,000
Sales	300,000
Variable manufacturing overhead	15,000
Gross profit	20% of sales

There are no beginning or ending inventories.

Compute (a) the fixed manufacturing overhead, (b) variable selling and administration overhead, and (c) fixed selling and administration overhead.

4-53 Review of Chapters 2, 3, and 4

Mobility Inc., headquartered in Singapore, produces netbooks. The company manufactured and sold 3000 netbooks during January 2020. Selected data for the month are given below (in Singaporean Dollar, S\$):

Sales	S\$ 390,000
Direct materials used	105,000
Direct labor	33,000
Variable manufacturing overhead	54,000
Fixed manufacturing overhead	39,000
Variable selling and administration overhead	?
Fixed selling and administration overhead	?
Contribution margin	165,000
Operating income	99,000

There are no beginning or ending inventories.

1. What were the variable selling and administration overheads for January?
2. What were the fixed selling and administration overheads for January?
3. What was cost of goods sold during January?
4. Assume that fixed selling and administration overheads for January 2020 were S\$ 18,750.
 - a. What was the break-even point in sales S\$?
 - b. How many units must be sold to achieve a target operating income of S\$ 52,800?
 - c. What would be the selling price per unit if the company wanted to earn an operating income of S\$ 187,950 on the sale of 2,730 units?

CASES**4-54 Multiple Allocation Bases**

The Liverpool Company produces three types of circuit boards: Alpha, Beta, and Gamma. The cost accounting system used by Liverpool until 2012 applied all costs except direct materials to the products using direct-labor hours as the only cost driver. In 2012, the company undertook a cost study. The study determined that there were six main factors that incurred costs. A new system was designed with a separate cost pool for each of the six factors. The factors and the costs associated with each are as follows:

1. Direct-labor hours—direct-labor cost and related fringe benefits and payroll taxes
2. Machine hours—depreciation and repairs and maintenance costs
3. Pounds of materials—materials receiving, handling, and storage costs
4. Number of production setups—labor used to change machinery and computer configurations for a new production batch

5. Number of production orders—costs of production scheduling and order processing
6. Number of orders shipped—all packaging and shipping expenses

The company is now preparing a budget for 2013. The budget includes the following predictions:

	Alpha	Beta	Gamma
Units to be produced	10,000	800	5,000
Direct-materials cost	£70/unit	£88/unit	£45/unit
Direct-labor hours	4/unit	18/unit	9/unit
Machine hours	7/unit	15/unit	7/unit
Pounds of materials	3/unit	4/unit	2/unit
Number of production setups	100	50	50
Number of production orders	300	200	70
Number of orders shipped	1,000	800	2,000

The total budgeted cost for 2013 is £3,866,250, of which £995,400 was direct-materials cost, and the amount in each of the six cost pools defined previously is as follows:

Cost Pool*	Cost
1	£1,391,600
2	936,000
3	129,600
4	160,000
5	25,650
6	228,000
Total	<u>£2,870,850</u>

*Identified by the cost driver used.

1. Prepare a budget that shows the total budgeted cost and the unit cost for each circuit board. Use the new system with six cost pools (plus a separate direct application of direct-materials cost).
2. Compute the budgeted total and unit costs of each circuit board if the old direct-labor-hour system had been used.
3. How would you judge whether the new system is better than the old one?

4-55 Traditional Versus ABC Systems

Northwest Desserts, Inc., (NDI) produces a variety of premium cheesecakes and sells them in individual packages directly to retail customers and in packages of 10 cakes to restaurants in Washington, Oregon, Idaho, and Northern California. NDI started as a small retail outlet, where it developed a superb reputation for quality. In the late 1990s it opened a chain of retail outlets. Only recently it started selling cheesecakes to restaurants. Its penetration into the restaurant market has been slower than predicted.

Although NDI produces several types of cheesecakes, all are about the same size and are considered a single product for costing purposes. NDI's existing costing system has a single direct-cost category—ingredients—and a single indirect-cost pool—production overhead. The system does not trace labor costs to the products; it considers them part of production overhead. Production overhead is allocated on the basis of number of cheesecakes produced. The 2013 budget projected production of 500,000 cheesecakes, 400,000 for the retail market and 100,000 for restaurants. Predicted costs were as follows:

Ingredients	\$ 900,000
Production overhead	<u>2,216,000</u>
Total	<u>\$3,116,000</u>

In early 2012 NDI had unsuccessfully bid for a large restaurant contract from the **Applebee's** chain. Its bid had been 30% above that of the successful bidder. This came as a shock because NDI had budgeted only a small profit into the bid. In addition, the NDI plant was one of the newest and most efficient in the industry.

Before completing the budget for 2013, top management of NDI asked Naomi Lester, controller of NDI, to examine the company's cost accounting system. Naomi had attended a short course by the Institute of Management Accountants on activity-based costing (ABC), and she thought some of the principles of ABC might apply to NDI. She felt that accounting for the ingredients was not a problem; the ingredients cost the same whether a cheesecake was produced for retail or restaurant markets. However, when she analyzed production overhead costs, she saw several possible improvements.

Naomi found that production overhead costs could be divided into cost pools for four activities: 1) administration, 2) facilities operations and maintenance, 3) mixing/baking, and 4) decorating/packaging. The activities in administration and facilities operations and maintenance do not involve working directly on cheesecakes, but they support the areas in which the cheese-cakes are produced. Mixing/baking and decorating/packaging are the activities that directly produce the cheesecakes. Naomi described the four activities as follows:

Administrative: Three administrative employees work in a 600 sq. ft. office providing a variety of services to NDI, including accounting, personnel, etc. It is difficult to measure the amount of administrative services provided to each product, but they are roughly proportional to the number of employees. The administrative costs are budgeted at \$140,000.

Facilities Operations and Maintenance: Two employees, located in an 800 sq. ft. office wing, operate and maintain the facilities. In addition, rent and depreciation charges and the cost of supplies for operating and maintaining the facilities are included in this cost pool. These facilities operations and maintenance costs are closely related to the number of square feet of space used. Budgeted facilities operations and maintenance costs are \$320,000.

Mixing and Baking: Five employees are located in 4,000 sq. ft. of space with a capacity to produce 600,000 cheesecakes per year. Much of the mixing and baking operation is the same for all cheesecakes produced. However, the cheesecakes sold through NDI's own retail outlets require some special handling to give them a distinctive quality. The production line produces 80 retail cheesecakes per processing hour and 100 restaurant cheesecakes per processing hour. Costs are driven by the number of processing hours. Budgeted costs in mixing and baking are \$540,000.

Decorating and Packaging: Decorating and packaging require two employees and 1,000 sq. ft. of space. There are two separate decorating/packaging lines. Only 10 retail cheesecakes can be decorated and packaged per hour, while 50 restaurant cheesecakes can be decorated and packaged in the same amount of time. Costs vary with the number of decorating/packaging hours. Budgeted costs are \$1,216,000. Of this total cost, \$376,000 is for packaging materials that could be traced to individual products, \$360,000 to retail, and \$16,000 to restaurants sales.

1. Use the existing costing system to find the budgeted cost per cheesecake for (a) the retail market and (b) the restaurant market. Comment briefly on the weaknesses of this system.
2. Use the ABC system to find the budgeted cost per cheesecake for (a) the retail market and (b) the restaurant market.
3. Prepare a memo from Naomi Lester to the president of NDI commenting on the differences in the costs between the traditional and ABC systems. Why are they different? What decisions should be made differently now that NDI has the information from the ABC system rather the information from the traditional system? How should managers use the ABC information to make better decisions?

4-56 ABC and Customer Profitability in Financial Services

To increase its share of the checking account market, Columbia City Bank in Seattle took two actions: It established a customer call center to respond to customer inquiries about account balances, checks cleared, fees charged, etc. Columbia paid year-end bonuses to branch managers who met their branch's target increase in the number of customers. While 80% of the branch managers met the target increase in the number of customers, Columbia City Bank's profits continued to decline. John Diamond, the CEO, didn't understand why profits were declining even though the bank was serving more customers. The Pierce County branch manager, Rose Perez, noticed that while small retail customers flocked to the bank, the number of business customers was declining.

Columbia City Bank's costing system, developed back in 1988, is straightforward. No costs are traced directly to customers. The bank simply assigns the total indirect costs to customer lines (retail customer line or business customer line) based on the total number of checks processed.

Perez suspected that Columbia City Bank's cost system might be part of the problem. Perez learned about ABC in school, but the applications involved manufacturing firms. She wonders whether Columbia City Bank could develop an ABC system, with the customer line as the primary cost object.

Rose's boss was skeptical. ("Our profits are going down the tubes and you want me to spend money developing a new accounting system?") However, Rose persuaded her boss to allow a pilot ABC study, using the three Tacoma branches for the pilot test.

The ABC implementation team included Perez, the managers of each of the three Tacoma branches, a bank teller, and a customer service representative from the customer call center. The team began by identifying the following three activities:

- Check payments
- Teller withdrawals and deposits
- Customer service call center

The ABC team then scrutinized the Tacoma branches' total indirect cost of \$2,850,000. They classified the components of this total indirect cost into the appropriate activity pool, coming up with the following estimates (in thousands of dollars):

Cost	Activity Cost Pool to Which Cost Is Assigned	Estimated Total Costs for Tacoma Branches
Salaries of check-processing personnel	Check payments	\$ 440
Depreciation on check-processing equipment	Check payments	700
Teller salaries	Teller withdrawals and deposits	1,200
Salaries of customer representatives at call center	Customer service call center	450
Toll-free phone lines at customer call center	Customer service call center	60
Total indirect costs		<u>\$2,850</u>

The team then identified the following cost drivers for each activity cost pool:

Activity Cost Pool	Activity Cost Driver
Check payments	number of checks processed
Teller withdrawals and deposits	number of teller transactions
Customer service call center	number of calls

The ABC team estimated that for the Tacoma branches, the retail customer line and the business customer line would require the following total resources (in thousands):

Activity Cost Driver	Number of Units of Activity Cost Driver Used by Business Customers	Number of Units of Activity Cost Driver Used by Retail Customers	Total
Checks processed	2,280	9,120	11,400
Teller transactions	320	80	400
Customer calls to call center	95	5	100
Checking accounts	150	50	200

That is, the retail customers have 320,000 teller transactions, make 95,000 calls to the customer service center, and so on.

On average, Columbia City Bank earns revenue from each type of account (from interest earned on checking account balances) as follows:

Average revenue per retail customer account	\$10
Average revenue per business customer account	\$40

1. Using the original (old) cost system complete the following:
 - a. Compute the indirect cost allocation rate.
 - b. Determine the total indirect cost assigned to the retail customer line and the business customer line.
 - c. Compute the proportion of the total indirect cost assigned to the retail customer line and the business customer line.
 - d. Determine the indirect cost per retail account and the indirect cost per business account.
 - e. Assuming that there are no direct costs, compute the average profit per account for retail customers and for business customers.
 - f. Assess the likely business strategy that might be adopted by managers using data from this original cost system.
2. What are the signs that Columbia City Bank's original cost system was broken or in need of refinement?
3. Using the new activity-based costing system complete the following:
 - a. Compute the indirect cost allocation rates for each of the three activities:
 - Check payments
 - Teller withdrawals and deposits
 - Customer call center
 - b. Use the following schedule to compute the total indirect cost allocated to each customer line:

Activity	Total Indirect Cost Assigned to Retail Customer Line	Total Indirect Cost Assigned to Business Customer Line
Check payments		
Teller withdrawals and deposits		
Customer call center		
Total indirect costs		

- c. What proportion of each activity's resources is used by the retail customer line and the business customer line?
 - d. Using the ABC data from requirement 3b, compute the indirect cost per retail customer account and the indirect cost per business customer account.
 - e. Explain why the results in requirement 1d and requirement 3d differ. Be precise and specific.
 - f. Using the new ABC data, compute the average profit per account for both retail and business customers. Assess the likely business strategy that might be adopted by managers using data from this ABC cost system.
4. Be prepared to discuss the following questions:
 - a. Was Columbia City Bank's bonus-based incentive plan to increase the number of checking account customers a wise strategy? Would you suggest any change in the strategy based on the ABC analysis?
 - b. What benefits can Columbia City Bank reap from the ABC analysis?
 - c. Why might Rose Perez have suspected that the benefits of ABC would likely outweigh the costs of implementing ABC at Columbia City Bank?
 - d. Why is it important for nonaccounting managers to understand ABC?

4-57 Identifying Activities, Resources, and Cost Drivers in Manufacturing

International Plastics is a multinational, diversified organization. One of its manufacturing divisions, Northeast Plastics, has become less profitable due to increased competition. The division produces three major lines of plastic products within its single plant. Product line A is high-volume, simple pieces produced in large batches. Product line B is medium-volume, more complex pieces. Product line C is low-volume, small-order, highly complex pieces.

Currently, the division allocates indirect production costs based on direct-labor cost. The vice president of manufacturing is uncomfortable using the traditional cost figures. He thinks the company is underpricing the more complex products. He decides to conduct an ABC analysis of the business.

Interviews were conducted with the key managers in order to identify activities, resources, cost drivers, and their interrelationships.

INTERVIEWEE: PRODUCTION MANAGER

Q1. What activities are carried out in your area?

A1. All products are manufactured using three similar, complex, and expensive molding machines. Each molding machine can be used in the production of the three product lines. Each setup takes about the same time irrespective of the product.

Q2. Who works in your area?

A2. Last year, we employed 30 machine operators, 2 maintenance mechanics, and 2 supervisors.

Q3. How are the operators used in the molding process?

A3. It requires nine operators to support a machine during the actual production process.

Q4. What do the maintenance mechanics do?

A4. Their primary function is to perform machine setups. However, they are also required to provide machine maintenance during the molding process.

Q5. Where do the supervisors spend their time?

A5. They provide supervision for the machine operators and the maintenance mechanics. For the most part, the supervisors appear to spend the same amount of time with each of the employees that they supervise.

Q6. What other resources are used to support manufacturing?

A6. The molding machines use energy during the molding process and during the setups. We put meters on the molding machines to get a better understanding of their energy consumption. We discovered that for each hour that a machine ran, it used 6.3 kilowatts of energy. The machines also require consumable shop supplies (e.g., lubricants, hoses, and so on). We have found a direct correlation between the amount of supplies used and the actual processing time.

Q7. How is the building used, and what costs are associated with it?

A7. We have a 100,000 sq. ft. building. The total rent and insurance costs for the year were \$675,000. These costs are allocated to production, sales, and administration based on square footage.

1. Identify the activities and resources for the division. For each activity, suggest an appropriate cost driver.
2. For each resource identified in requirement 1, indicate its cost behavior with respect to the activities it supports (assume a planning period of 1 month).

NIKE 10-K PROBLEM

4-58 Nike's Cost Accounting System

Examine the inventory account in the balance sheet in Nike's 10-K report in Appendix C and read Note 2 – Inventories. What does the statement about the composition of Nike's inventory imply about the company's manufacturing operations? Is Nike primarily a manufacturer or merchandiser? Can you confirm this elsewhere in the 10-K?

EXCEL APPLICATION EXERCISE

4-59 Traditional Costing Versus Activity-Based Costing

Goal: Create an Excel spreadsheet to compare traditional costing versus activity-based costing. Use the results to answer questions about your findings.

Scenario: Suppose Sunstar Corporation is one of Dell's circuit board suppliers. Sunstar currently uses traditional costing for making business decisions. At the urging of Dell, however, the company has decided to move to activity-based costing for circuit board production related to products PCB124 and PCB136. As one of the company's accountants, you have been asked to prepare a spreadsheet comparing the two costing methods for the next company board meeting. Your supervisor has given you the following quarterly data:

Total Indirect Costs for the Quarter:

Assembly	\$630,000
Soldering	\$270,000
Inspection	\$160,000

	PCB124	PCB136
Direct costs (materials, labor)	\$162,400	\$178,240
Machine hours (assembly)	480	1,080
Number of units produced (soldering)	6,000	4,000
Testing hours (inspection)	6,000	8,000

When you have completed your spreadsheet, answer the following questions:

- What is the total manufacturing cost per unit using traditional costing for PCB124? For PCB136? Use machine hours as the cost-allocation base.
- What is the total manufacturing cost per unit using activity-based costing for PCB124? For PCB136?
- What conclusions can be drawn from your spreadsheet results?

Step-by-Step:

- Open a new Excel spreadsheet.
- In column A, create a bold-faced heading that contains the following:
 Row 1: Chapter 4 Decision Guideline
 Row 2: Sunstar Corporation
 Row 3: Traditional Versus Activity-Based Costing
 Row 4: Today's Date

Note: Adjust column widths as follows: Column A (41.57), Columns B, C, and D (21.0). Column D is for check figures only. The column widths have been designed to ensure that Column D will not print on the final version of the spreadsheet if only page 1 is printed.

- Merge and center the four heading rows across columns A–C.
- In column A, create the following row headings:

Row 7: Raw data
 Row 8: Indirect costs for the quarter:
 Row 9: Assembly
 Row 10: Soldering
 Row 11: Inspection
 Row 12: Total indirect costs
 Skip two rows.
 Row 15: Direct costs (Materials, labor)
 Row 16: Machine hours (Assembly)
 Row 17: Number of units produced (Soldering)
 Row 18: Testing hours (Inspection)
 Skip two rows.
 Row 21: Traditional costing system
 Row 22: Indirect cost driver (machine hours)
 Row 23: Allocated indirect costs
 Skip a row.
 Row 25: Cost per product
 Row 26: Direct costs
 Row 27: Manufacturing overhead
 Row 28: Total manufacturing costs per product
 Skip a row.
 Row 30: Number of units
 Row 31: Total manufacturing costs per unit
 Skip two rows.
 Row 34: Activity-based costing system
 Row 35: Assembly cost driver (machine hours)
 Row 36: Allocated assembly cost
 Row 37: Soldering cost driver (units)
 Row 38: Allocated soldering cost
 Row 39: Inspection cost driver (testing hours)
 Row 40: Allocated inspection cost
 Skip a row.
 Row 42: Cost per product
 Row 43: Direct costs

Row 44: Manufacturing overhead
 Row 45: Assembly
 Row 46: Soldering
 Row 47: Inspection
 Row 48: Total manufacturing costs per product
 Skip a row.
 Row 50: Number of units
 Row 51: Total manufacturing costs per unit

5. Change the format of Raw data (row 7), Traditional costing system (row 21), and Activity-based costing system (row 34) to bold-faced headings.

Hint: Use the control key for highlighting multiple cells or rows when making changes.

6. Change the format of Cost per product (rows 25 and 42) to underlined headings.
7. In rows 14, 21, 25, 34, and 42 create the following bold-faced, right-justified column headings:
 Column B: PCB124
 Column C: PCB136
8. In rows 21 and 34 create the following bold-faced, right-justified column headings:
 Column D: Total
9. Use the scenario data to fill in the Raw data section.
 Use the SUM function to calculate Total indirect costs (row 12).
10. Traditional costing system:
 Fill in rows 26 and 30 with information from the Raw data section.
 Use appropriate formulas from this chapter to calculate the cost driver and allocated costs.
 Use the SUM function to calculate the Total column for manufacturing overhead costs.
 Complete the remainder of the Cost per product data using formulas and calculations.
 Calculate the Total manufacturing costs per product.
11. Activity-based costing system:
 Fill in rows 43 and 50 with information from the Raw data section.
 Use appropriate formulas from this chapter to calculate the cost drivers and allocated costs.
 Use the SUM function to calculate the Total columns for all allocated costs.
 Complete the remainder of the Cost per product data using formulas and calculations.
 Calculate the Total manufacturing costs per product.

Hint: If using the SUM function to calculate Total manufacturing costs, verify range.

12. Format all amounts as follows:

Number tab:

Category:	Currency
Decimal places:	2
Symbol:	None
Negative numbers:	Red with parentheses

13. Change the format of hours and units in rows 16–18, 30, and 50 to display no decimal places.
14. Change the format of the amounts in rows 9, 12, 15, 23, 26, 28, 31, 36, 38, 40, 43, 48, and 51 to display a dollar symbol.
15. Change the format of the row headings in rows 9–11, 15–18, 23, 36, 38, 40, and 45–47 to display as indented.

Alignment tab:

Horizontal:	Left (Indent)
Indent:	1

16. Change the format of the amounts in rows 12, 28, and 48 to display a top border, using the default Line Style.

Border tab:

Icon:	Top Border

17. Change the format of the cost driver calculations in rows 22, 35, 37, and 39 to display as left-justified percentages with two decimal places.

Number tab:	Category:	Percentage
	Decimal places:	2
Alignment tab:	Horizontal:	Left (Indent)
	Indent:	0

18. Accentuate the Cost per product information for each costing method by applying cell shading to columns A, B, and C of rows 25–31 and 42–51.

Patterns tab:	Color:	Lightest grey

19. Save your work, and print a copy for your files.

Note: The final version of the spreadsheet will be on page 1. You do not need to print page 2 as it should contain only the check figures.

COLLABORATIVE LEARNING EXERCISE

4-60 Internet Research, ABC, and ABM

Form groups of three to five people each. Each member of the group should pick one of the following industries:

- Manufacturing
- Insurance
- Healthcare
- Government
- Service

Each person should explore the Internet for an example of a company that implemented activity-based costing and activity-based management. Prepare and give a briefing for your group. Do this by completing the following:

1. Describe the company and its business.
2. What was the scope of the ABC/ABM project?
3. What were the goals for the ABC/ABM project?
4. Summarize the results of the project.

After each person has briefed the group on his or her company, discuss within the group the commonalities between the ABC/ABM applications.

INTERNET EXERCISE

4-61 Vermont Teddy Bear Factory

Costs are important to any manager. Managers focus on trying to keep costs as low as possible. There are many ways to report costs, such as the total amount that is often seen on the income statement or an individual cost for a particular component part.

1. Go to the home page at www.vermontteddybear.com. Scroll down to the bottom of the homepage and click on the hashtag #LoveIsInTheBEAR. What is it all about?
2. Go to the “Shop” section to the right of “About.” Click on “What’s a Bear Gram?” What do you learn about the Bear-Gram gift?
3. Click on “Where It’s Made” just below “What’s a Bear Gram?” What information do you get regarding the process of making a Bear—the materials that it needs, craftsmanship involved, quality control required, and design of the outfits of the Bear? Make a list of the activities in the entire process. Suggest two direct and two indirect costs associated with the product. Classify the costs you have suggested into variable, fixed, or mixed.
4. Would you recommend using activity-based costing in Vermont? Cite a few reasons as to why you think that an activity-based costing system will be beneficial for the company. Suggest a few activity cost-pools along with the relevant cost drivers.
5. Since Vermont Teddy Bear Company is a manufacturer, what do you expect to find in its inventories? Do you expect the company to have large work-in-process or finished goods inventory? Why or why not?

Relevant Information for Decision Making with a Focus on Pricing Decisions

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Discriminate between relevant and irrelevant information for making decisions.
2. Apply the decision process to make business decisions.
3. Construct absorption and contribution-margin income statements, and identify their relevance for decision making.
4. Decide to accept or reject a special order using the contribution-margin approach.
5. Explain why pricing decisions depend on the characteristics of the market.
6. Identify the factors that influence pricing decisions in practice.
7. Compute a sales price by various methods, and compare the advantages and disadvantages of these methods.
8. Use target costing to decide whether to add a new product.

► GRAND CANYON RAILWAY

While you are on vacation, the last thing you want to worry about is transportation. For visitors to Grand Canyon National Park, the **Grand Canyon Railway** provides a relaxing alternative to driving to the canyon. Why drive when you can sit back and enjoy the scenery across 65 miles of beautiful Arizona countryside from the comfort of a fully reconditioned steam-powered train? Strolling musicians serenade you, and western characters stage attacks, holdups, and shootouts that offer a glimpse into what train travel might have been like for Old West loggers, miners, and ranchers at the turn of the century. The Grand Canyon Railway offers a ride not only to the canyon itself but into the past as well.

Rides into the past aren't exactly cheap. Tracks for the narrow-gauge train as well as the authentic steam engines and passenger cars required an investment of more than \$20 million. Recovering that initial investment while earning a profit is not easy. According to the former company CFO, Kevin Call, "Pricing is really the key in running a successful operation."

The railway offers four different classes of service, and setting the pricing on each one determines the company's profit. To set prices, management uses the contribution-margin approach introduced in Chapter 2. Among the influences on pricing discussed in this chapter, costs and customer demands are the most important to the railway. The prices charged must not only ensure a reasonable profit, they also must be attractive to the customer.

Costs are important in the pricing decisions of many types of companies. What price should a grocery store charge for a kilogram of chicken? What should **Boeing** charge for a 787 airplane? Should an event location prioritize a wedding booking over others? Managers rely on accounting information to answer these questions and to make important decisions on a daily basis. However, not all accounting

information applies to each type of decision. In this chapter, we'll focus on identifying relevant information for decision making and apply what we learn to pricing decisions. The ability to separate relevant from irrelevant information is often the difference between success and failure in modern business. ■¹

The Concept of Relevance

What information is relevant to a decision maker? That depends on the decision being made. Decision making is essentially choosing among several alternative courses of action. Decision makers identify the available alternatives by an often time-consuming search and screening process, perhaps carried out by a company team that includes engineers, accountants, and operating executives. The accountant's role is primarily that of a technical expert on financial analysis who provides information that may be useful to the decision maker. However, the decision maker, who has the best understanding of the decision and the available alternatives, must understand what information is relevant.

What Is Relevance?

Making business decisions requires managers to compare two or more alternative courses of action. Two criteria determine whether financial information is relevant: (1) Information must be an expected future revenue or cost, and (2) it must have an element of difference among the alternatives. That is, **relevant information** is the predicted future costs and revenues that will differ among the alternatives.

Note that relevant information is a prediction of the future, not a summary of the past. Historical (past) information has no direct bearing on a decision. Such information can have an indirect bearing on a decision because it may help in predicting the future. But past figures, in themselves, are irrelevant to the decision itself. Why? Because the decision cannot change the past. Decisions affect the future. Nothing can alter what has already happened.

Of the expected future information, only data that will differ across alternatives are relevant to the decision. Any item that will remain the same regardless of the alternative selected is irrelevant. For instance, if a department manager's salary will be the same regardless of the products produced, the salary is irrelevant to the selection of products. Here are some examples to help you clarify the sharp distinctions between relevant and irrelevant information.

Suppose you always buy gasoline from either of two nearby gasoline stations. Yesterday you noticed that one station was selling gasoline at \$3.90 per gallon. The other was selling it at \$3.80. Your automobile needs gasoline today, and in making your choice of stations, you assume that these prices have not changed. The relevant costs are \$3.90 and \$3.80, the expected future costs that will differ between the alternatives. You use your past experience (that is, what you observed yesterday) for predicting today's price. Note that the relevant cost is not what you paid in the past, or what you observed yesterday, but what you expect to pay when you drive in to get gasoline. This cost meets our two criteria: (1) It is the expected future cost, and (2) it differs between the alternatives.

You may also plan to buy a special meal deal when you stop for gasoline. Suppose you expect the price of the meal deal to be the same at either station. This expected future cost is irrelevant to your decision about which station to stop at because it will be the same under either alternative. It does not meet our second criterion.

On a business level, consider the following decision. A food container manufacturer is thinking of using aluminum instead of tin in making a line of large cans. The cost of direct material is expected to decrease from \$0.30 per can if tin is used to \$0.20 per can if the manufacturer uses aluminum. The direct-labor cost will continue to be \$0.70 per unit regardless of the material used. Direct-labor cost is irrelevant because our second criterion—an element of difference between the alternatives—is not met.



© Petr Podrouzek/Shutterstock

Riding the Grand Canyon Railroad is like going back in time to the grand era of train travel.

Objective I

Discriminate between relevant and irrelevant information for making decisions.

relevant information

The predicted future costs and revenues that will differ among alternative courses of action.

¹Throughout this and the next chapter, to concentrate on the fundamental ideas, we ignore the time value of money and income taxes (discussed in Chapter 11).

	Aluminum	Tin	Difference
Direct material	\$0.20	\$0.30	\$0.10
Direct labor	0.70	0.70	—

In this example, the relevant cost is the cost of direct materials. We can safely exclude direct labor from the comparison of alternatives because it does not differ between the alternatives.

Objective 2

Apply the decision process to make business decisions.

decision model

Any method for making a choice, sometimes requiring elaborate quantitative procedures.

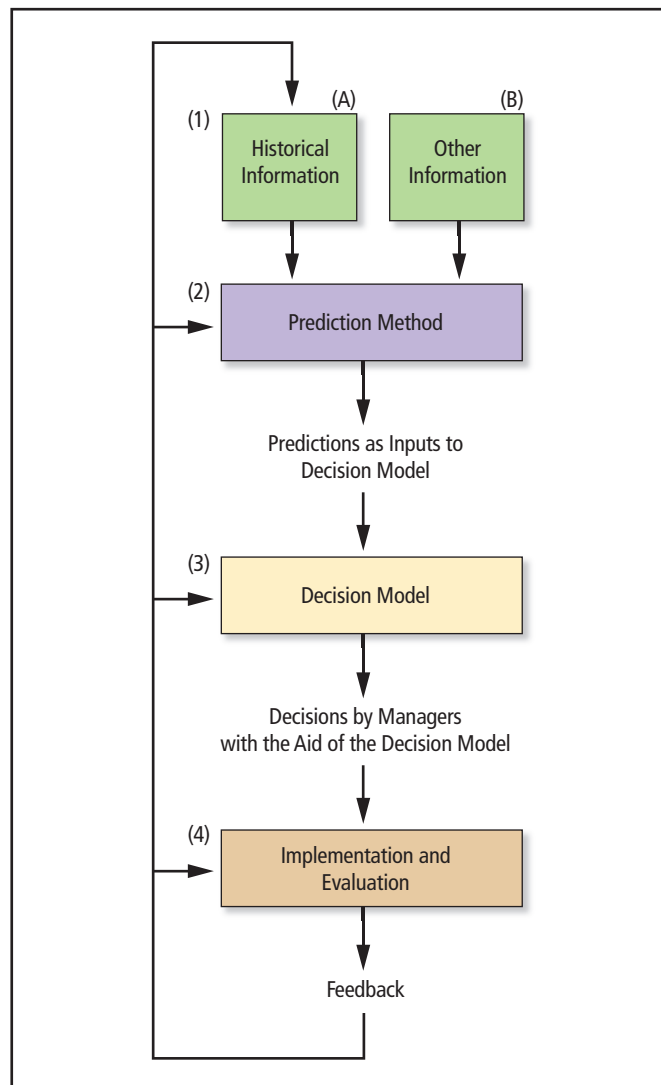
A Decision Model

Exhibit 5-1 illustrates this simple decision process, and it serves to show the appropriate framework for more complex decisions. Box 1(A) represents historical data from the accounting system. Box 1(B) represents other data, such as price indices or industry statistics, gathered from outside the accounting system. Regardless of their source, the data in step 1 help the formulation of predictions in step 2. (Remember that historical data are only relevant as a guide to predicting future costs and revenues. In the large-can manufacturing example, the historical costs of tin and aluminum are only relevant as predictors of future prices.)

In step 3, these predictions become inputs to the decision model. A **decision model** is any method used for making a choice. Such models sometimes require elaborate quantitative procedures, such as a petroleum refinery's mathematical method for choosing what products to manufacture for any given day or week. A decision model, however, may also be simple. It may be confined to a single comparison of costs for choosing between two materials, as in the

Exhibit 5-1

Decision Process and Role of Information



previous example of the tin versus aluminum cans. In this example, our decision model is to compare the predicted unit costs and, assuming that everything else is equal, select the alternative with the lower cost.

The decision process in Exhibit 5-1 applies to all business decisions, no matter how simple or complicated they may be. By using this process, you will be able to focus squarely on the relevant information—the predicted future differences between alternatives—in any decision. In the rest of this chapter, we will use this decision process to apply the concept of relevance to several specific pricing decisions.

Accuracy and Relevance

In the best of all possible worlds, decision-making information would always be both perfectly relevant and precisely accurate. However, in reality, such information is often too difficult or too costly to obtain. Accountants are sometimes forced to choose between more relevance or more accuracy.

Precise but irrelevant information is worthless for decision making. For example, a university president's salary may be \$450,000 per year, to the penny, but may have no bearing on the question of whether to buy or rent data-processing equipment. In contrast, imprecise but relevant information can be useful. For example, sales predictions for a new product may be subject to error, but they are still helpful in deciding whether to manufacture the product. Relevant information must be reasonably accurate but not precisely so.

The degree to which information is relevant or precise often depends on the degree to which it is qualitative or quantitative. Qualitative aspects are those for which measurement in financial terms is difficult and imprecise; quantitative aspects are those for which financial measurement is easy and precise. Accountants, statisticians, and mathematicians try to express as many decision factors as feasible in quantitative terms. Why? Because this approach reduces the number of qualitative (subjective) factors they need to consider. Just as we noted that relevance is more crucial than precision in decision making, so may qualitative aspects dominate quantitative (financial) impacts in many decisions. For example, the extreme opposition of a militant labor union to new labor-saving machinery may cause a manager to forgo installation of such machinery even if it would reduce manufacturing costs. In a similar way, a company may pass up the opportunity to purchase a component from a supplier at a price below the cost of producing it themselves to avoid a long-range dependence on that particular supplier.

Likewise, managers sometimes introduce new technology (for example, advanced computer systems or automated equipment) even though the immediate quantitative results seem unattractive. Managers defend such decisions on the grounds that long-term financial results, although hard to predict, are likely to be improved by the technology.

The Relevance of Alternative Income Statements

In many cases, income statement information is relevant to decision making because it specifies how alternative choices impact income. Additionally, since executives use income statements to evaluate performance, managers need to know how their decisions will affect reported income. There are different ways to organize income statement information. Some income statements track fixed and variable costs using the contribution approach, whereas others adopt the absorption approach used in reporting to external parties.

Let's examine the relevance of contribution and absorption income statements. To highlight the different effects of these approaches, consider the Cordell Company. Suppose Cordell produces and sells 1,000,000 units of seat covers for seats on airplanes, buses, and railroad passenger cars. Cordell sells these to companies such as **US Airways** and the **Grand Canyon Railway Company**. The total manufacturing cost of making 1,000,000 seat covers is \$30,000,000. The unit manufacturing cost of the product is $\$30,000,000 \div 1,000,000$, or \$30 per unit. We will assume that in 20X1 the Cordell Company has direct-materials costs of \$14 million, direct-labor costs of \$6 million, indirect manufacturing costs as illustrated in Exhibit 5-2, selling and administrative expenses as illustrated in Exhibit 5-3, and no beginning or ending inventories. Total sales are predicted at \$40 million.

Note that Exhibits 5-2 and 5-3 subdivide costs as variable or fixed. As explained next, most companies do not make such subdivisions in their absorption income statements for external reporting. However, many companies use such partitioning in contribution income statements to align with the information managers often use in decision making.

Objective 3

Construct absorption and contribution-margin income statements, and identify their relevance for decision making.

Exhibit 5-2

Cordell Company
*Schedules of Predicted Indirect
 Manufacturing Costs for the
 Year Ended December 31, 20X1
 (thousands of dollars)*

Schedule 1: Variable Costs

Supplies (lubricants, expendable tools, coolants, sandpaper)	\$ 600	
Materials-handling labor (forklift operators)	2,800	
Repairs on manufacturing equipment	400	
Power for factory	<u>200</u>	\$ 4,000

Schedule 2: Fixed Costs

Managers' salaries in factory	\$ 400	
Factory employee training	180	
Factory picnic and holiday party	20	
Factory supervisory salaries	1,400	
Depreciation, plant, and equipment	3,600	
Property taxes on plant	300	
Insurance on plant	<u>100</u>	<u>6,000</u>
Total indirect manufacturing costs		<u><u>\$10,000</u></u>

Exhibit 5-3

Cordell Company
*Schedules of Predicted Selling
 and Administrative Expenses for
 the Year Ended December 31,
 20X1 (thousands of dollars)*

Schedule 3: Selling Expenses

Variable		
Sales commissions	\$1,400	
Shipping expenses for products sold	<u>600</u>	\$2,000
Fixed		
Advertising	\$1,400	
Sales salaries	2,000	
Other	<u>600</u>	<u>4,000</u>
Total selling expenses		<u><u>\$6,000</u></u>

Schedule 4: Administrative Expenses

Variable		
Some clerical wages	\$ 160	
Computer time rented	<u>40</u>	\$ 200
Fixed		
Office salaries	\$ 200	
Other salaries	400	
Depreciation on office facilities	200	
Public-accounting fees	80	
Legal fees	200	
Other	<u>720</u>	<u>1,800</u>
Total administrative expenses		<u><u>\$2,000</u></u>

**absorption approach
 (absorption costing)**

A costing approach that considers all indirect manufacturing costs (both variable and fixed) to be product (inventoriable) costs that become an expense in the form of manufacturing cost of goods sold only as sales occur.

Absorption Approach

Exhibit 5-4 presents Cordell's income statement using the **absorption approach** (or **absorption costing**), the method used by companies for external financial reporting. Firms that take this approach consider all direct and indirect manufacturing costs (both variable and fixed) to be product (inventoriable) costs that become an expense in the form of manufacturing cost of goods sold only when the firm sells the related product.

Note that gross profit or gross margin is the difference between sales and the manufacturing cost of goods sold. Note too that the primary classifications of costs on the income statement are by three major management functions: manufacturing, selling, and administrative.

Sales		\$40,000
Less: Manufacturing cost of goods sold		
Direct materials	\$14,000	
Direct labor	6,000	
Indirect manufacturing (Schedules 1 plus 2)*	<u>10,000</u>	<u>30,000</u>
Gross margin or gross profit		\$10,000
Selling expenses (Schedule 3)	\$ 6,000	
Administrative expenses (Schedule 4)	<u>2,000</u>	
Total selling and administrative expenses		<u>8,000</u>
Operating income		<u>\$ 2,000</u>

*Schedules 1 and 2 are in Exhibit 5-2. Schedules 3 and 4 are in Exhibit 5-3.

Exhibit 5-4

Cordell Company

*Predicted Absorption Income
Statement for the Year Ended
December 31, 20X1 (thousands
of dollars)*

Contribution Approach

In contrast, Exhibit 5-5 presents Cordell's income statement using the **contribution approach** (also called variable costing or direct costing). For decision purposes, the major difference between the contribution approach and the absorption approach is that the former emphasizes the distinction between variable and fixed costs. Its primary cost classification is by variable- and fixed-cost behavior patterns, not by business functions. Note that it is difficult to classify a given cost as variable, fixed, or mixed (for example, repairs), so often approximations must suffice.

The contribution income statement provides a contribution margin—revenue less all variable costs, including variable selling and administrative costs. This approach makes it easier to understand the impact of changes in sales volume on operating income. It also dovetails nicely with the cost-volume-profit (CVP) analysis illustrated in Chapter 2 and the decision analyses in this chapter and Chapter 6.

Another major benefit of the contribution approach is that it stresses the role of fixed costs in operating income. Before a company can earn income, its total contribution margin must exceed the fixed costs it has incurred for manufacturing and other value-chain functions. This highlighting of contribution margin and total fixed costs focuses management attention on cost behavior and control in making both short-run and long-run decisions. Remember that advocates of the contribution approach do not maintain that fixed costs are unimportant or irrelevant. They do stress, however, that the distinctions between behaviors of variable and fixed costs are crucial for certain decisions. Decisions usually affect fixed costs in a different way than they affect variable costs.

contribution approach

A method of internal (management accounting) reporting that emphasizes the distinction between variable and fixed costs for the purpose of better decision making.

Sales		\$40,000
Less: Variable expenses		
Direct materials	\$14,000	
Direct labor	6,000	
Variable indirect manufacturing costs (Schedule 1)*	<u>4,000</u>	
Total variable manufacturing cost of goods sold	\$24,000	
Variable selling expenses (Schedule 3)	2,000	
Variable administrative expenses (Schedule 4)	<u>200</u>	
Total variable expenses		<u>26,200</u>
Contribution margin		\$13,800
Less: Fixed expenses		
Manufacturing (Schedule 2)	\$ 6,000	
Selling (Schedule 3)	4,000	
Administrative (Schedule 4)	<u>1,800</u>	<u>11,800</u>
Operating income		<u>\$ 2,000</u>

*Note: Schedules 1 and 2 are in Exhibit 5-2. Schedules 3 and 4 are in Exhibit 5-3.

Exhibit 5-5

Cordell Company

*Predicted Contribution Income
Statement for the Year Ended
December 31, 20X1 (thousands
of dollars)*

The distinction between the gross margin (from the absorption approach) and the contribution margin (from the contribution approach) is important, especially for manufacturing companies. Consider the following computations of contribution margin (CM) and gross margin (GM):

$$\text{CM/unit} = \text{Price} - (\text{Variable manufacturing cost/unit} + \text{Variable selling \& admin. cost/unit})$$

$$\text{GM/unit} = \text{Price} - (\text{Variable manufacturing cost/unit} + \text{Fixed manufacturing cost/unit})$$

The variable selling and administrative cost per unit affects the contribution margin but not the gross margin, while the fixed manufacturing cost affects the gross margin but not the contribution margin. Because fixed manufacturing costs do not change with small changes in volume of units, it can be misleading to express such costs on a per unit basis. Thus, it can be misleading to use gross margin to predict the effect of changes in volume.

Comparing Contribution and Absorption Approaches

The contribution approach separates fixed costs from variable costs. It deducts variable costs from sales to compute a contribution margin and then deducts fixed costs to measure profit. In contrast, the absorption approach separates manufacturing costs from nonmanufacturing costs. It deducts manufacturing costs from sales to compute a gross margin and then deducts nonmanufacturing costs to measure profit. Both formats can be relevant for decision making, depending on the type of decision being contemplated. In situations where decisions affect variable costs differently than they affect fixed costs, such as the short-run pricing decisions we will discuss in this chapter, the contribution approach will yield great value. In contrast, the absorption approach is well suited for long-run pricing decisions, where it is important that the prices over a product's life cover all manufacturing costs, including fixed costs.

Regulators do not allow the contribution approach for external financial reporting. However, many companies use the contribution approach for internal decision-making purposes and an absorption format for external purposes. Why? Because they expect the benefits of making better decisions using the contribution approach to exceed the extra costs of using two different reporting systems simultaneously.

Pricing Special Sales Orders

Before considering more general approaches to pricing, it is helpful to examine how a manager might approach a specific pricing decision—whether to accept a special sales order. We will highlight the value of the contribution approach in such a decision.

Illustrative Example

In our illustration, we'll focus again on the Cordell Company. Suppose **Branson Gray Line Tours** offered Cordell \$26 per unit for a 100,000-unit special order of seat covers that (1) would not affect Cordell's regular business in any way, (2) would not affect total fixed costs, (3) would not require any additional variable selling and administrative expenses, (4) would use some otherwise idle manufacturing capacity, and (5) would not raise any antitrust issues concerning price discrimination. Should Cordell sell the 100,000 seat covers for the price of \$26 each?

Perhaps we should state the question more precisely: What is the difference in the short-run financial results between not accepting and accepting the order? As usual, the key question is as follows: What are the differences between alternatives? Exhibit 5-5 presents the income statement of the Cordell Company without the special order, using the contribution approach. Let's see how Cordell's operating income would change if it accepts the special order.

Correct Analysis—Focus on Relevant Information and Cost Behavior

The correct analysis focuses on determining relevant information and cost behavior. It employs the contribution-margin technique. As Exhibit 5-6 shows, this particular order affects only variable manufacturing costs, at a rate of \$24 per unit. All other variable costs and all fixed costs are unaffected and, thus, irrelevant. Therefore, a manager may safely ignore them in making this special-order decision. Note how the distinction between variable- and fixed-cost behavior patterns in the contribution-margin technique aids the necessary cost analysis. Total short-run income will increase by \$200,000 if Cordell accepts the order—despite the fact that the unit selling price of \$26 is less than the total unit manufacturing cost of \$30.

Objective 4

Decide to accept or reject a special order using the contribution-margin approach.

	Without Special Order 1,000,000 Units	Effect of Special Order, 100,000 Units		With Special Order, 1,100,000 Units
		Total	Per Unit	
Sales	\$40,000,000	\$2,600,000	\$26	\$42,600,000
Less: Variable expenses				
Manufacturing	\$24,000,000	\$2,400,000	\$24	\$26,400,000
Selling and administrative	2,200,000	—	—	2,200,000
Total variable expenses	\$26,200,000	\$2,400,000	\$24	\$28,600,000
Contribution margin	\$13,800,000	\$ 200,000	\$ 2	\$14,000,000
Less: Fixed expenses				
Manufacturing	\$ 6,000,000	—	—	\$ 6,000,000
Selling and administrative	5,800,000	—	—	5,800,000
Total fixed expenses	\$11,800,000	—	—	\$11,800,000
Operating income	\$ 2,000,000	\$ 200,000	\$ 2	\$ 2,200,000

Exhibit 5-6

Cordell Company
Comparative Predicted Income
Statements, Contribution-Margin
Technique for Year Ended
December 31, 20X1

Why did we deduct fixed costs in Exhibit 5-6? After all, they are irrelevant because they do not differ across the alternatives considered in this decision. We included them because management often focuses on the bottom line—operating income. Both the contribution margin and the operating income increase by \$200,000, so we could ignore the fixed costs and come to the same conclusion. However, management may prefer to see the effect of its decisions on operating income, so we include the irrelevant fixed costs in the presentation.

Note that our conclusion is that *short-run* income will increase by \$200,000. In this example, we assumed that this special order would neither affect Cordell's regular business nor cause any additional fixed costs. These assumptions may be appropriate in the short run, but they may not hold in the long run. Accepting the special order may eventually affect sales to other customers, and it may at some time entail additional fixed costs for expanded capacity. If there are any expected long-run differences between accepting versus not accepting the special order, those differences should also be incorporated in the analysis.

Making Managerial Decisions

Suppose you are at a meeting of Cordell Company managers and someone asked the following questions. Some of the answers given by your colleagues follow:

Q: What will be the change in the contribution margin if we accept this order?

A: The contribution margin will increase to \$14,000,000.

Q: In your analysis (Exhibit 5-6), you show that fixed costs do not change if we accept the order. Are these costs relevant?

A: No. Fixed costs are not relevant.

Q: OK. But do incurred fixed costs have an effect on the bottom line of our company?

A: Certainly. That is why we deduct fixed costs from the contribution margin to get operating income.

Q: Well, if fixed costs affect the bottom line, how can you say they are not relevant?

Comment on your colleague's answers, and answer the last question.

Answer

Your colleague's answer to the first question is technically incorrect. The question asks for change, not the new total

contribution margin. The correct answer to this question is that contribution margin will increase by \$200,000 (and therefore become \$14,000,000 in total). Be careful to differentiate between terms that imply totals and terms that imply changes. In this case, \$14,000,000 is the answer to "What is the new total contribution margin if we accept the order?"

Your colleague's responses to the second and third questions are correct. The fixed costs of Cordell are not relevant for this particular special order situation. Nevertheless, the bottom line—operating income—includes all costs and revenues. Do not confuse this with relevant costs—a term we associated with this specific decision. In a decision situation, relevant costs include only those future costs that differ between alternatives. If a manager wants to know the "bottom line" after accepting the order, we would need to include the fixed cost. However, the fixed costs do not affect the difference between the preorder bottom line and the bottom line after accepting the order. The difference is the same \$200,000 amount by which the contribution margin increases.

Incorrect Analysis—Misuse of Unit Cost

Faulty cost analysis sometimes occurs because of misinterpreting unit fixed costs, especially with an absorption approach. For instance, Cordell's managers might erroneously use the \$30 per-unit total manufacturing cost under the absorption approach ($\$30,000,000 \div 1,000,000$ units per Exhibit 5-4) to make the following prediction for the year:

Incorrect Analysis	Without Special Order 1,000,000 Units	Incorrect Effect of Special Order 100,000 Units	With Special Order 1,100,000 Units
Sales	\$40,000,000	\$2,600,000	\$42,600,000
Less: Manufacturing cost of goods sold at \$30	<u>30,000,000</u>	<u>3,000,000</u>	<u>33,000,000</u>
Gross margin	10,000,000	(400,000)	9,600,000
Selling and administrative expenses	<u>8,000,000</u>	<u>—</u>	<u>8,000,000</u>
Operating income	<u>\$ 2,000,000</u>	<u>\$ (400,000)</u>	<u>\$ 1,600,000</u>

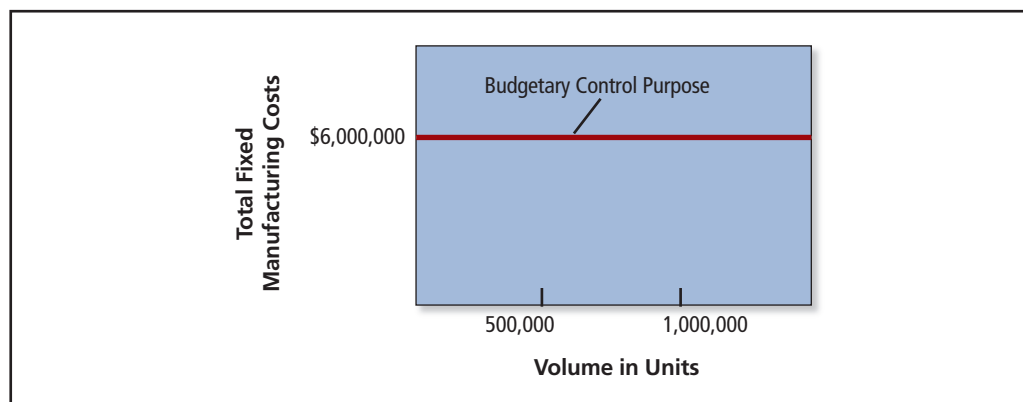
The incorrect prediction of a \$3 million increase in costs results from multiplying 100,000 units by \$30. The fallacy in this approach is that it treats a fixed cost (fixed manufacturing cost) as if it were variable. Avoid the mistake of using total unit costs as a basis for predicting how total costs will behave. Unit costs are useful for predicting variable costs, but can be misleading when used to predict fixed costs.

Confusion of Variable and Fixed Costs

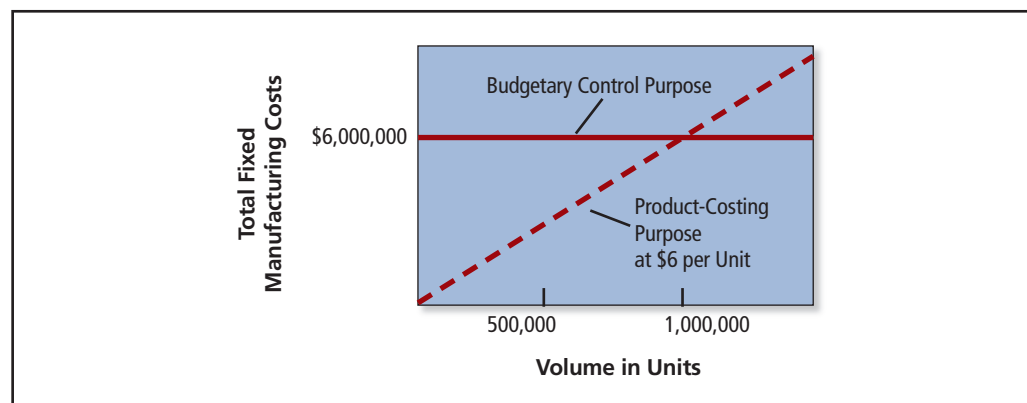
Consider the relationship between total fixed manufacturing costs and a fixed manufacturing cost per unit of product (per Exhibit 5-5):

$$\begin{aligned}
 \text{fixed manufacturing cost} &= \frac{\text{total fixed manufacturing costs}}{\text{some selected volume level as the denominator}} \\
 \text{per unit of product} &= \frac{\$6,000,000}{1,000,000 \text{ units}} = \$6 \text{ per unit}
 \end{aligned}$$

As we noted in Chapter 1, the typical cost accounting system serves two purposes simultaneously: (1) planning and control and (2) product costing. We can graph the total fixed cost for planning and control purposes as a lump sum:



For product-costing purposes, however, it is easy to misinterpret the fixed unit manufacturing cost—to act as if these fixed costs behave as if they are variable costs, which is contrary to fixed-cost behavior:



The addition of 100,000 units will not add any fixed costs as long as total output is within the relevant range. The incorrect analysis, however, includes $100,000 \times \$6 = \$600,000$ of additional fixed cost in the predictions of increases in total costs.

In short, we should compute the increase in manufacturing costs by multiplying 100,000 units by only the variable cost portion of cost, \$24, not by \$30. The \$30 includes a \$6 fixed-cost-per-unit component that will not affect the total manufacturing costs as volume changes within the relevant range. Alternatively, one way to avoid this misinterpretation is to use the contribution approach, which does not unitize fixed costs, as illustrated in Exhibit 5-6.

Making Managerial Decisions

We have discussed two key lessons so far in this chapter: relevant information and misuse of unit costs. We cannot stress enough how important it is to clearly understand the definition and concept of relevant information. It is also important to understand why the use of unit fixed costs can lead to an incorrect analysis.

Suppose you are a manager in a company that makes small appliances. You are deciding whether to accept or reject a special order for 1,000 units. (Assume there is sufficient excess capacity available for the order.)

1. Which of the following costs are relevant: (a) parts for the order, (b) supervisor's salary, (c) assembly equipment depreciation, (d) power to operate the assembly equipment?
2. Suppose the total unit manufacturing cost for the 1,000 units is \$100 per unit. We determined this amount by dividing the total cost by 1,000 units. If the customer decided to double the order to 2,000 units, which costs listed in number 1 would change? Which costs per unit would change? Would the total cost of the order double?

Answers

1. Relevant costs and revenues are predicted future costs and revenues that differ among alternative courses of action. In this case, the cost of parts and power would increase if management accepts the order, and, thus, they are relevant. The other costs are fixed costs that would not change because excess capacity is available.
2. Only the relevant costs, in this case the total variable costs of parts and power, would change. Doubling production would cause these costs to double. In contrast, total fixed costs would be unaffected. However, the fixed cost per unit will decrease, whereas the variable cost per unit will stay the same. For example, fixed supervisory salaries and assembly equipment depreciation will be divided by 2,000 units instead of by only 1,000 units. Therefore, the per-unit supervisory cost will decrease while the per-unit cost of parts and power would stay the same. So, the total cost per unit would fall, and the total cost of the order would increase but by less than double the cost of 1,000 units.

Activity-Based Costing, Special Orders, and Relevant Costs

To identify relevant costs affected by a special order (or by other special decisions), many firms extend their analysis beyond simply identifying fixed and variable costs. As we pointed out in Chapters 3 and 4, a company's operations include many different activities. Businesses that have identified all their significant activities and related cost drivers can produce more detailed relevant information to predict the effects of special orders more accurately.

Suppose the Cordell Company examined its \$24 million of variable manufacturing costs using activity-based costing (ABC) and identified two significant activities and related cost drivers: \$21 million of processing activity that varies directly with units produced (\$14 million in direct materials, \$6 million in direct labor, and \$1 million of variable manufacturing overhead) at a rate of \$21 per unit and \$3 million of setup activity (the remainder of variable manufacturing overhead) that varies with the number of production setups. Normally, Cordell produces 2,000 units per setup. Therefore, for processing 1,000,000 units, Cordell has 500 setups at a cost of \$6,000 per setup, which explains the total setup cost of \$3 million. Additional sales generally require a proportional increase in the number of setups.

Now suppose the special order is for 100,000 units that vary only slightly in production specifications. Instead of the normal 50 setups, Cordell will need only 5 setups for the special order. So processing 100,000 units will take only \$2,130,000 of additional variable manufacturing cost:

Additional unit-based variable manufacturing cost, $100,000 \times \$21$	\$2,100,000
Additional setup-based variable manufacturing cost, $5 \times \$6,000$	30,000
Total additional variable manufacturing cost	<u>\$2,130,000</u>

Instead of the original estimate of $100,000 \times \$24 = \$2,400,000$ additional variable manufacturing cost, ABC shows the special order will cost only \$2,130,000, or \$270,000 less than the original estimate. Therefore, ABC allows managers to realize that the special order is \$270,000 more profitable than predicted from the simple unit-based assessment of variable manufacturing cost.

A special order may also be more costly than predicted by a simple fixed- and variable-cost analysis. Suppose the 100,000-unit special order calls for a variety of models and colors delivered at various times so that it requires 100 setups. The variable cost of the special order would be \$2.7 million, \$300,000 more than the original estimate of \$2.4 million:

Additional unit-based variable manufacturing cost, $100,000 \times \$21$	\$2,100,000
Additional setup-based variable manufacturing cost, $100 \times \$6,000$	600,000
Total additional variable manufacturing cost	<u>\$2,700,000</u>

ABC systems often provide more detailed and relevant information for special-order decisions, but the fundamental concepts remain the same—focus your attention on future costs and revenues that differ because of the special order. Also, be careful to recognize and properly use terms such as *impact*, *change*, and *total*. The summary problem for your review that follows gives you more practice at analyzing a special order.

Summary Problem for Your Review

PROBLEM

- Suppose **Nike** produces and sells 500,000 units of Naomi Osaka's "GKG Gotta Keep Going" edition tennis shirts. The selling price is \$35, and there is excess capacity to produce an additional 300,000 shirts. The absorption cost of the shirts is $\$10,000,000 \div 500,000$, or \$20 per shirt, consisting of variable manufacturing costs of \$7,000,000 ($\$7,000,000 \div 500,000$ or \$14 per shirt) and fixed manufacturing costs of \$3,000,000 ($\$3,000,000 \div 500,000$ or \$6 per shirt). Variable selling and administrative costs are \$3 per shirt, and fixed selling and administrative costs are \$2,000,000. Assume Nike receives an offer from **The Chinese Open** to buy 100,000 shirts at a price of \$18.00 per shirt. If Nike accepts the order it would not incur any additional variable selling and administrative costs, but it would have to pay a flat fee of \$80,000 to the manufacturer's agent who had obtained the potential order. Should Nike accept the special order?
- What if the order was for 250,000 units at a selling price of \$13.00 and there was no \$80,000 agent's fee? One manager argued for acceptance of such an order as follows: "Of course, we will lose \$1.00 each on the variable manufacturing costs (\$13 – \$14),

but we will gain \$2.00 per unit by spreading our fixed manufacturing costs over 750,000 shirts instead of 500,000 shirts. Consequently, we should take the offer because it represents an advantage of \$1.00 per shirt.” The manager’s analysis follows:

Old fixed manufacturing cost per unit, $\$3,000,000 \div 500,000$	\$6.00
New fixed manufacturing cost per unit, $\$3,000,000 \div 750,000$	4.00
“Savings” in fixed manufacturing cost per unit	\$2.00
Loss on variable manufacturing cost per unit, $\$13.00 - \$14.00$	1.00
Net savings per unit in manufacturing cost	<u>\$1.00</u>

Explain why this is faulty thinking.

SOLUTION

1. Focus on relevant information—the differences in future revenues and costs. In this problem, in addition to the difference in variable costs, there is a difference in fixed costs between the two alternatives.

Additional revenue, 100,000 units at \$18.00 per shirt	\$1,800,000
Less: Additional costs	
Variable costs, 100,000 units at \$14 per unit	1,400,000
Fixed costs, agent’s fee	80,000
Increase in operating income from special order	<u>\$ 320,000</u>

So, from a strictly financial perspective, Nike should accept the special order.

2. The faulty thinking comes from attributing a “savings” to the decrease in unit fixed costs. Regardless of how we “unitize” the fixed manufacturing costs or “spread” them over the units produced, the special order will not change the total of \$3 million. Remember that we have a negative contribution margin of \$1.00 per unit on this special order. Thus, there is no way we can cover any amount of fixed costs! Fixed costs are not relevant to this decision.

Basic Principles for Pricing Decisions

One of the major decisions managers face is pricing. Pricing decisions can take many forms in addition to pricing special orders. For example, managers make the following pricing decisions:

1. Setting the price of a new or refined product
2. Setting the price of products sold under private labels
3. Responding to a new price of a competitor
4. Pricing bids in both sealed and open bidding situations

Pricing decisions are so important that we will spend the rest of the chapter discussing the many aspects of pricing. Let us now consider some of the basic concepts behind pricing.

Pricing Under Perfect and Imperfect Competition

Pricing decisions depend on the market characteristics in which a firm operates. In **perfect competition** all competing firms sell the same type of product at the same price. Thus, a firm can sell as much of a product as it can produce, all at a single market price. If it charges more, no customer will buy. If it charges less, it sacrifices profits. Therefore, every firm in such a market will charge the market price, and the only decision for managers is how much to produce.

Objective 5

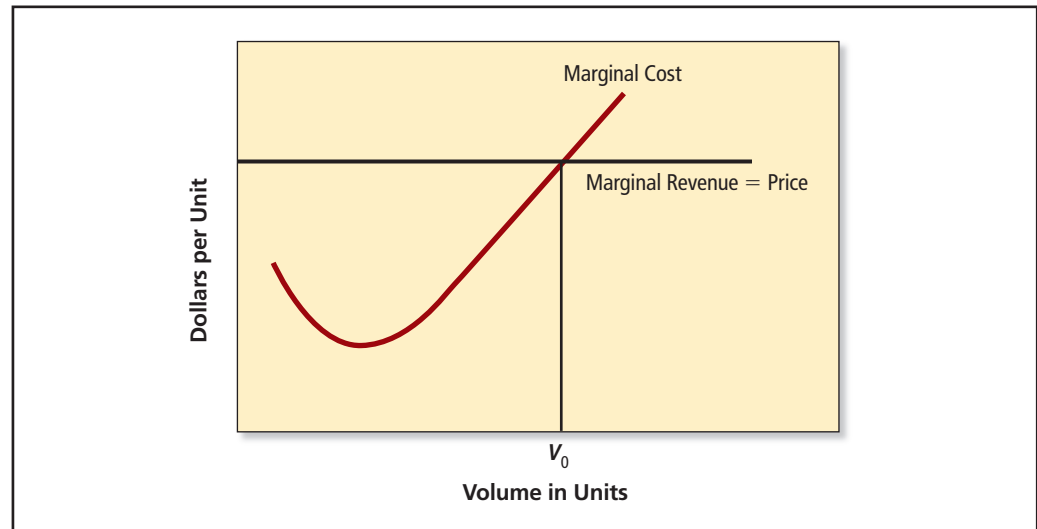
Explain why pricing decisions depend on the characteristics of the market.

perfect competition

A market in which a firm can sell as much of a product as it can produce, all at a single market price.

Exhibit 5-7

Marginal Revenue and Cost
in Perfect Competition

**marginal cost**

The additional cost resulting from producing and selling one additional unit.

marginal revenue

The additional revenue resulting from the sale of an additional unit.

imperfect competition

A market in which the price a firm charges for a unit influences the quantity of units it sells.

Although costs do not directly influence prices in perfect competition, they do affect the production decision. Consider the marginal cost curve in Exhibit 5-7. The **marginal cost** is the additional cost resulting from producing and selling one additional unit—for **Indian Railways**, it's the cost of serving one additional passenger; for **Tan Chong Motor**, it's the cost of producing one additional car. With a fixed set of production facilities, the marginal cost often decreases as production increases up to a point because of efficiencies created by larger volumes. At some point, however, marginal costs begin to rise with increases in production because facilities become overcrowded or overused, resulting in inefficiencies.

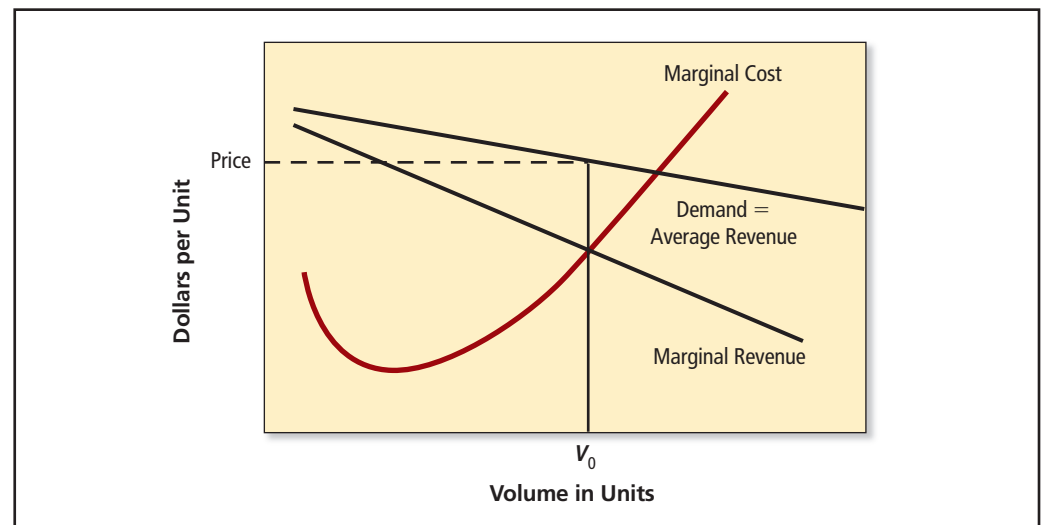
Exhibit 5-7 also includes a marginal revenue curve. The **marginal revenue** is the additional revenue resulting from the sale of an additional unit. In perfect competition, the marginal revenue curve is a horizontal line equal to the price per unit at all volumes of sales.

As long as the marginal cost is less than the marginal revenue (price), additional production and sales are profitable. When marginal cost exceeds price, however, the firm loses money on each additional unit. Therefore, the profit-maximizing volume is the quantity at which marginal cost equals price. In Exhibit 5-7, the firm should produce V_0 units. Producing fewer units passes up profitable opportunities, and producing more units reduces profit because each additional unit costs more to produce than it generates in revenue.

In **imperfect competition**, the price a firm charges for a unit influences the quantity of units it sells. At some point, the firm must reduce prices to generate additional sales. Exhibit 5-8 contains a *demand curve* (also called the *average revenue curve*) for imperfect competition that

Exhibit 5-8

Marginal Revenue and Cost
in Imperfect Competition



Units Sold	Price per Unit	Total Revenue		Marginal Revenue	Marginal Cost	Profit from Production and Sale of Additional Unit
10	\$50	$10 \times$	$\$50 =$	\$500		
11	49	$11 \times$	$49 =$	539	$\$539 - \$500 =$	\$39
12	48	$12 \times$	$48 =$	576	$576 - 539 =$	37
13	47	$13 \times$	$47 =$	611	$611 - 576 =$	35

Exhibit 5-9

Profit Maximization in Imperfect Competition

shows the volume of sales at each possible price. To sell additional units, the firm must reduce the price of all units sold. Therefore, the *marginal revenue curve*, also shown in Exhibit 5-8, is below the demand curve. That is, the marginal revenue for selling one additional unit is less than the price at which the company sells it because the price of all other units falls as well. For example, suppose a firm can sell 10 units for \$50 per unit. However, the firm must drop the price to \$49 per unit to sell 11 units, to \$48 to sell 12 units, and to \$47 to sell 13 units. The fourth column of Exhibit 5-9 shows the marginal revenue for units 11–13. Notice that the marginal revenue decreases as volume increases.

To estimate marginal revenue, managers must predict the **price elasticity**—the effect of price changes on sales volume. If small price increases create large volume declines, demand is highly elastic. If prices have little or no effect on volume, demand is highly inelastic.

For the marginal costs shown in the fifth column of Exhibit 5-9, the optimal production and sales level is 12 units. The last column of that exhibit illustrates that the eleventh unit adds \$4 to profit, and the twelfth adds \$1, but production and sale of the thirteenth unit would decrease profit by \$2. In general, firms should produce and sell units until the marginal revenue equals the marginal cost, represented by volume V_0 in Exhibit 5-8. The optimal price charged will be the amount that creates a demand for V_0 units.

Notice that the marginal cost is relevant for pricing decisions. In managerial accounting, we often use variable cost as an approximation for marginal cost. What is the major difference between marginal cost and variable cost? Accountants assume that variable cost is constant within a relevant range of volume, whereas marginal cost may change with each unit produced. Within large ranges of production volume, however, changes in marginal cost are often small. Therefore, variable cost can be a reasonable approximation of marginal cost in many situations.

Pricing and Accounting

Accountants seldom compute marginal revenue and marginal cost curves. Instead, they use estimates based on judgment to predict the effects of additional production and sales on profits. In addition, they examine selected volumes, not the whole range of possible volumes. Such simplifications are justified because the cost of a more sophisticated analysis would exceed the benefits.

Consider a division of **Weili Electrical Appliances Co. (WEA)** that makes microwave ovens. Suppose market researchers estimate that WEA can sell 700,000 ovens at \$200 per unit and 1,000,000 ovens at \$180. The variable cost of production is \$130 per unit at production levels of both 700,000 and 1,000,000. Both volumes are also within the relevant range so that changes in volume do not affect fixed costs. Which price should WEA charge?

WEA's accountant would determine the relevant revenues and costs. Relative to selling 700,000 ovens at \$200, the additional revenue and extra costs of selling 1,000,000 ovens at the \$180 price are as follows:

Additional revenue: $(1,000,000 \times \$180) - (700,000 \times \$200) =$	\$40,000,000
Additional costs: $300,000 \times \$130 =$	39,000,000
Additional profit	<u>\$ 1,000,000</u>

price elasticity

The effect of price changes on sales volume.

So the \$180 price is optimal since it generates \$1,000,000 more profit. On the other hand, the accountant could compare the total contribution for each alternative:

Contribution at \$180: $(\$180 - \$130) \times 1,000,000 =$	\$50,000,000
Contribution at \$200: $(\$200 - \$130) \times 700,000 =$	49,000,000
Difference	<u>\$ 1,000,000</u>

Notice that comparing the total contributions is essentially the same as computing the additional revenues and costs—both use the same relevant information. Further, both approaches correctly ignore fixed costs, which are unaffected by this pricing decision.

Influences on Pricing in Practice

Several factors interact to shape the market in which managers make pricing decisions. Legal requirements, competitors' actions, and customer demands all influence pricing.

Legal Requirements

Managers must consider constraints imposed by United States and international laws when making pricing decisions. These laws often protect consumers, but they also help protect competing companies from predatory and discriminatory pricing.

Predatory pricing means firms set prices so low that they drive competitors out of the market, after which the firm faces no significant competition and can raise prices dramatically. In 2020, it was found that six bank lenders, HSBC, Barclays, Lloyds, NatWest, Santander, and Nationwide, controlled 87% of the retail banking sector in the United Kingdom. The UK government's All-Party Parliamentary Group (APPG) reported that the institutions had profited by using predatory pricing models. They had attracted customers with low price deals and then used customer inertia to profit from poorer offers.

Discriminatory pricing is charging different prices to different customers for the same product or service. For example, a large group of retail druggists and big drugstore chains sued several large drug companies. The drugstores alleged that the drug companies' practice of allowing discounts—some as large as 40%—to mail-order drug companies, health maintenance organizations, and other managed-care entities constitutes discriminatory pricing. However, pricing is not discriminatory if it reflects a cost differential incurred in providing the good or service.

Both predatory and discriminatory pricing practices are not only illegal but unethical business practices. Management accountants have an ethical obligation to perform their duties in accordance with relevant laws and to refrain from engaging in or supporting any activity or practice that would discredit the profession.

Competitors' Actions

Competitors usually react to the price changes of their rivals. Many companies gather information regarding a rival's capacity, technology, and operating policies. In this way, managers make more informed predictions of competitors' reactions to a company's prices. The study of game theory focuses on predicting and reacting to competitors' actions.

A manager's expectations of competitors' reactions and of the overall effects of price changes on an industry's demand heavily influence pricing policies. For example, an airline might cut prices even if it expects matching price cuts from its rivals, hoping that total customer demand for the tickets of all airlines will increase sufficiently to offset the reduction in the price per ticket.

Competition is becoming increasingly global in its scope. Overcapacity in some countries often causes aggressive pricing policies for a company's exported goods. For example, companies might "dump" products by selling them at a low price in a foreign market that is isolated from its other markets. As you can imagine, when companies' markets expand globally, their pricing policies become more complex.

Customer Demands

More than ever before, managers are recognizing the needs of customers. Pricing is no exception. If customers believe a price is too high, they may turn to other sources for the product, substitute a different product, or decide to produce the item themselves. As the

Objective 6

Identify the factors that influence pricing decisions in practice.

predatory pricing

Establishing prices so low that they drive competitors out of the market. The predatory pricer then has no significant competition and can raise prices dramatically.

discriminatory pricing

Charging different prices to different customers for the same product or service.

controller for the **Grand Canyon Railway** states, “... prices charged must be attractive to the customer.” If not, customers can simply drive their own cars to the Grand Canyon or choose to ride a bus.

Cost-Plus Pricing

Accounting influences pricing by providing costs. The exact role costs play in pricing decisions depends on both the market conditions and the company’s approach to pricing. This section discusses cost-plus pricing, the most common use of costs in pricing decisions.

What Is Cost-Plus Pricing?

Many managers set prices by “cost-plus” pricing. For example, **Grand Canyon Railway** sets its prices by computing an average cost and then adding a desired **markup**—the amount by which price exceeds cost—that will generate a desired level of income. The key is how to determine the “plus” in cost plus. Instead of being a fixed markup, the “plus” will usually depend on both costs and the demands of customers. For example, a lakeside resort may have a standard price (the rack rate) that does not change during the year, but it may offer discounts during the slow winter season.

The most direct case of cost-plus pricing is in industries where revenue is based on cost reimbursement. Cost-reimbursement contracts generally specify how to measure costs and what costs are allowable. In the United Kingdom, this is a common pricing model in construction; the contract covers the cost of the work plus a fee to the contractor.

Ultimately, in most cases the market sets prices. Why? Because companies inevitably adjust the price as set by a cost-plus formula “in light of market conditions.” The maximum price a company can charge is the one that does not drive the customer away. The minimum price might be considered to be zero (for example, companies may give out free samples to gain entry into a market).

A practical guide is that, in the short run, the minimum price sales personnel should quote on an order is the marginal cost that the company incurs if it gets the order (in effect its relevant costs of filling the order)—often all variable costs of producing, selling, and distributing the good or service. However, in the long run, the price must be high enough to cover all costs, including fixed costs. Therefore, many companies add an allocation of fixed costs per unit to the variable cost per unit to get a minimum price they want to achieve in the long run. They acknowledge that market conditions sometimes dictate sales at a price lower than this minimum price. Yet, to continue to produce and sell such a product in the long run, there must be a prospect of eventually achieving a price at or above the long-run minimum.

Cost Bases for Cost-Plus Pricing

To set a desired price for products or services, managers often add a markup to some measure of costs—thus, the term *cost plus*. The size of the “plus” depends on the definition of cost and the desired operating income. Prices can be based on a host of different markups that are in turn based on a host of different definitions of cost. Thus, there are many ways to arrive at the same price.

Exhibit 5-10 displays the relationships of costs to selling prices, assuming a desired operating income of \$1 million on a volume of 1 million units. The exhibited percentages represent four popular markup formulas for pricing based on percentages of four different measures of cost: (1) variable manufacturing costs, (2) total variable costs, (3) total manufacturing cost, and (4) full costs. Notice that the first two formulas are consistent with the contribution approach and the latter two are based on absorption costing numbers. Note also that **full cost** means the total of all manufacturing costs plus the total of all selling and administrative costs. As noted in earlier chapters, we use “selling and administrative” to include all value-chain functions other than production.

To achieve the same prices, the percentages in Exhibit 5-10 differ for each definition of cost. For instance, the markup on variable manufacturing costs is 66.67%, and on full costs it is only 5.26%. Regardless of the formula used, the decision maker setting prices will be led toward the same \$20 price. If the decision maker is unable to obtain such a price consistently, the company will not achieve its goal of \$1 million in operating income.

markup

The amount by which price exceeds cost.

Objective 7

Compute a sales price by various methods, and compare the advantages and disadvantages of these methods.

full cost

The total of all manufacturing costs plus the total of all selling and administrative costs.

Exhibit 5-10

Relationships of Costs to Same Target Selling Price

		Alternative Markup Percentages to Achieve Same Sales Price	
	Sales price	<u>\$20.00</u>	
	Variable cost:		
(1)	Manufacturing	\$12.00	$(\$20.00 - \$12.00) \div \$12.00 = 66.67\%$
	Selling and administrative*	<u>1.10</u>	
(2)	Unit variable costs	\$13.10	$(\$20.00 - \$13.10) \div \$13.10 = 52.67\%$
	Fixed costs:		
	Manufacturing†	\$ 3.00	
	Selling and administrative	<u>2.90</u>	
	Unit fixed costs	<u>\$ 5.90</u>	
(4)	Full costs	<u>\$19.00</u>	$(\$20.00 - \$19.00) \div \$19.00 = 5.26\%$
	Desired operating income	<u>\$ 1.00</u>	

*Selling and administrative costs include costs of all value-chain functions other than production.
†(3) A frequently used formula is based on total manufacturing costs: $[\$20.00 - (\$12.00 + \$3.00)] \div \$15.00 = 33.33\%$.

We have seen that managers can base prices on various types of cost information, from variable manufacturing costs to full costs. Each of these costs can be relevant to the pricing decision. Each approach has advantages and disadvantages.

Advantages of the Contribution Approach in Cost-Plus Pricing

Prices based on variable costs represent a contribution approach to pricing. When used intelligently, the contribution approach has some advantages over the total-manufacturing-cost and full-cost approaches because the latter two often fail to highlight different cost behavior patterns.

The contribution approach offers more detailed information because it displays variable- and fixed-cost behavior patterns separately. Because the contribution approach is sensitive to cost-volume-profit relationships, it is a helpful basis for developing pricing formulas. As a result, this approach allows managers to prepare price schedules at different volume levels.

The correct analysis in Exhibit 5-11 shows how changes in volume affect operating income. The contribution approach helps managers with pricing decisions by readily displaying the interrelationships among variable costs, fixed costs, and potential changes in selling prices.

In contrast, pricing with full costing presumes a given volume level. When the volume changes, the unit cost used at the original planned volume may mislead managers. Managers sometimes erroneously assume that they can compute the change in total costs by multiplying any change in volume by the full unit cost.

	Correct Analysis			Incorrect Analysis		
Volume in units	900,000	1,000,000	1,100,000	900,000	1,000,000	1,100,000
Sales at \$20.00	\$18,000,000	\$20,000,000	\$22,000,000	\$18,000,000	\$20,000,000	\$22,000,000
Unit variable costs at \$13.10*	<u>11,790,000</u>	<u>13,100,000</u>	<u>14,410,000</u>			
Contribution margin	6,210,000	6,900,000	7,590,000			
Fixed costs†	5,900,000	5,900,000	5,900,000			
Full costs at \$19.00*				<u>17,100,000</u>	<u>19,000,000</u>	<u>20,900,000</u>
Operating income	<u>\$ 310,000</u>	<u>\$ 1,000,000</u>	<u>\$ 1,690,000</u>	<u>\$ 900,000</u>	<u>\$ 1,000,000</u>	<u>\$ 1,100,000</u>
*From Exhibit 5-10.						
†Fixed manufacturing costs	\$3,000,000					
Fixed selling and administrative costs	<u>2,900,000</u>					
Total fixed costs	<u>\$5,900,000</u>					

Exhibit 5-11

Analyses of Effects of Changes in Volume on Operating Income

The incorrect analysis in Exhibit 5-11 shows how using the \$19 full cost per unit (based on a volume of 1,000,000 units from Exhibit 5-10) to predict effects of volume changes on operating income can mislead managers. Suppose a manager incorrectly uses the \$19 figure to predict an operating income of \$900,000 if the company sells 900,000 instead of 1,000,000 units. However, since the correct analysis predicts operating income of \$310,000, the manager may be stunned by the actual results—and possibly be looking for a new job. Notice the only volume where the incorrect analysis is actually appropriate is at the 1 million unit volume level, which is also the only volume where the \$19 full cost per unit is valid.

The contribution approach also offers insight into the short-run versus long-run effects of cutting prices on special orders. For example, recall the 100,000 unit special order at a lower than normal selling price (\$26 versus \$40) for Cordell Company displayed in Exhibit 5-6 (p. 205). As you saw earlier, the contribution approach generated the most relevant information, showing that accepting this special order yielded a short-run advantage of \$200,000.

However, the manager should also consider long-run effects. Will acceptance of the offer undermine the long-run price structure? In other words, is the short-run advantage of \$200,000 more than offset by highly probable long-run financial disadvantages? The manager may think so and, thus, reject the offer. But—and this is important—by doing so the manager is, in effect, forgoing \$200,000 now to protect certain long-run market advantages. Generally, the manager can assess problems of this sort by asking whether the probability of long-run benefits is worth an “investment” equal to the forgone contribution margin (\$200,000, in this case). Under full-cost approaches, the manager must ordinarily conduct a one-time special study to find the short-run effects of a volume increase associated with a special order. Under the contribution approach, the manager has a system that will routinely provide such information.

Advantages of Absorption-Cost Approaches in Cost-Plus Pricing

Frequently, companies do not employ a contribution approach because they fear that managers will indiscriminately substitute variable costs for full costs and will, therefore, lead to suicidal price cutting. This problem should not arise if managers use the data wisely. However, if top managers perceive a pronounced danger of underpricing when they disclose variable-cost data, they may justifiably prefer an absorption-cost approach (either total manufacturing costs or full costs) for guiding pricing decisions.

Actually, in practice more companies use absorption cost than the contribution approach. Why? In addition to the reasons we have already mentioned, managers have cited the following:

1. In the long run, a firm must recover all costs to stay in business. Additionally, fixed costs eventually fluctuate as volume changes (all costs are variable in the long run, even if some are fixed in the short run). Therefore, it is prudent to emphasize the absorption-cost approach over the contribution approach.
2. Computing prices based on absorption cost may indicate what competitors might charge, especially if they have approximately the same level of efficiency as you and also aim to recover all costs in the long run.
3. Absorption-cost formula pricing meets the cost-benefit test. It is too expensive to conduct individual cost-volume analyses for the many products (sometimes thousands) that a company offers.
4. There is much uncertainty about the shape of demand curves and the correct price-output decisions. Absorption-cost pricing copes with this uncertainty by not encouraging managers to take too much marginal business.
5. Absorption-cost pricing tends to promote price stability. Managers prefer price stability, primarily because it makes planning more dependable.
6. Absorption-cost pricing provides the most defensible basis for justifying prices to all interested parties, including government antitrust regulators.
7. Absorption-cost pricing provides convenient reference points to simplify hundreds or thousands of pricing decisions.

Using Multiple Approaches

To say that either a contribution approach or an absorption-cost approach provides the “best” guide to pricing decisions is a dangerous oversimplification of one of the most perplexing issues in business. Lack of understanding and judgment can lead to unprofitable pricing regardless of the kind of cost data available or cost accounting system used.

No single method of pricing is always best. Many companies use both full-cost and variable-cost information in pricing decisions. Modern accounting systems, such as ERP systems, often identify variable and fixed costs, producing both full-cost and variable-cost information. This allows assessment of both short-run and long-run effects. In contrast, most older systems focus on absorption-cost and do not organize their data collection to distinguish between variable and fixed costs. When using such older systems, managers must use special studies or educated guesses to designate costs as variable or fixed.

Managers are especially reluctant to focus on variable costs and ignore allocated fixed costs when their performance evaluations, and possibly their bonuses, are based on income shown in published financial statements. Why? Because companies base such statements on absorption costing, and thus allocations of fixed costs affect reported income.

Formats for Pricing

Exhibit 5-10 showed how to compute alternative general markup percentages that would produce the same selling prices if used day after day. In practice, the format and arithmetic of quote sheets, job proposals, or similar records vary considerably.

Exhibit 5-12 is from an actual quote sheet used by the manager of a small job shop that bids on welding machinery orders in a highly competitive industry. The approach in Exhibit 5-12 is a tool for making informed pricing decisions. Notice that the maximum price is not a matter of cost at all. It is what you think you can obtain. The minimum price is the total variable cost.

The manager will rarely bid the minimum price. Businesses do need to make a profit. Still, the manager wants to know the effect of a job on the company’s total variable costs. Occasionally, a company will bid near or even below that minimum price to establish a presence in new markets or with a new customer, especially when the company expects to receive cost reductions in the future or when the new product is tied to other products that generate profits for the firm, as in the Business First box on p. 217 regarding **Microsoft**’s Xbox 360.

Note that Exhibit 5-12 classifies costs specifically for the pricing task. More than one person may make pricing decisions in a particular company. The accountant’s responsibility is to prepare an understandable format that requires a minimum of computations. Exhibit 5-12 combines direct labor and variable manufacturing overhead. It lumps together all fixed costs—whether manufacturing, selling, or administrative—and applies them to the job using a single fixed-overhead rate per direct-labor hour. If the company wants more accuracy, it could formulate many more detailed cost items and overhead rates. To obtain the desired accuracy, many companies are turning to activity-based costing.

Some managers, particularly in construction and in service industries (such as auto repair), compile separate categories of costs of (1) direct materials, parts, and supplies and (2) direct labor. These managers then use different markup rates for each category. They

Exhibit 5-12
 Quote Sheet for Pricing

Direct materials, at cost	\$25,000
Direct labor and variable manufacturing overhead, 600 direct-labor hours × \$30 per hour	18,000
Sales commission (varies with job)	2,000
Total variable costs—minimum price*	45,000
Add fixed costs allocated to job, 600 direct-labor hours × \$20 per hour	12,000
Total costs	57,000
Add desired markup	30,000
Selling price—maximum price that you think you can obtain*	<u>\$87,000</u>

*This sheet shows two prices, maximum and minimum. Any amount you can get above the minimum price provides contribution margin.

Xbox 360 Pricing

Despite all the hype surrounding the Xbox 360 video game console in May of 2005, **Microsoft** didn't initially make any money on the machine itself. A tear-down analysis by market researcher **iSuppli** of the high-end Xbox 360 found that the materials (e.g., hard drive, computer chip, cables, etc.) cost Microsoft \$525 before assembly. The console initially sold at retail for \$399, for a loss of \$126 per unit. iSuppli analyst Chris Crotty said efficiency gains would shave \$50 off chip costs, which, with other reductions over time, would get Microsoft closer to breakeven. Microsoft expected that, including sales of its own game software, the Xbox line would start out "gross margin neutral"—breakeven—and would eventually turn a profit.

Microsoft continued this low-price strategy by reducing the price of its Xbox 360 Arcade system to less than \$200 in 2008. As a result, Asian shipments of the Xbox in October 2008 grew by 53% compared to the prior month. Microsoft officials claim "...what is really driving our growth momentum right now is how we are broadening our consumer base to include not only hardcore gamers but also individuals who would have previously not thought about buying a game

console." Microsoft also commented that "...current shipment volumes had reached such high levels that the company could afford to depend on volume to rake in a profit despite the lower prices." This pricing strategy also boosted company profits from related software-game sales, additional equipment, and internet products for the Xbox, which is consistent with its fundamental claim that "Microsoft is a software company at heart, and we will continue to work with our partners and by ourselves to develop new software for the market." In fact, for calendar year 2011, Microsoft reported that the Xbox 360 was the fastest-growing console in the United States, with an industry-leading \$6.7 billion in sales (more than \$2.1 billion on consoles and \$4.6 billion on games and accessories). The firm also reported more than 66 million Xbox 360 consoles and 16 million Kinect sensors sold worldwide, and almost 40 million Xbox Live memberships.

Sources: Adapted from Paul Lilly, "Xbox 360 Sales Smoked the Competition in 2011, Microsoft Says," MAXIMUMPC, January 13, 2012; Reuters, "Microsoft Eyes '09 Market-Beating Xbox Sales," December 17, 2008; Arik Kesseldahl, "For Every Xbox, A Big Fat Loss," *Business Week*, December 5, 2005.

use these rates to provide enough revenue to cover both indirect and unallocated costs and operating profit. For example, an automobile repair shop might have the following format for each job:

	Billed to Customers
Auto parts (\$200 cost plus 40% markup)	\$280
Direct labor (Cost is \$20 per hour. Bill at 300% to recover indirect and unallocated costs and provide for operating profit. Billing rate is $20 \times 300\% = \$60$ per hour. Total billed for 10 hours is $60 \times 10 = \$600$.)	<u>600</u>
Total billed to customer	<u>\$880</u>

Another example is an Italian printing company in Milan that wants to price its jobs so that each one generates a margin of 28% of revenues—14% to cover selling and administrative expenses and 14% for profit. To achieve this margin, the manager uses a pricing formula of 140% times predicted materials cost plus €25 per hour of production time. The latter covers labor and overhead costs of €18 per hour. For a product with €400 of materials cost and 30 hours of production time, the price would be €1,310:

	Cost	Price	Margin
Materials	€400	€ 560	€160
Labor and overhead	<u>540</u>	<u>750</u>	<u>210</u>
Total	<u>€940</u>	<u>€1,310</u>	<u>€370</u>

The margin of €370 is approximately 40% of the cost of €940 and 28% of the price of €1,310.

You can see there are numerous ways to determine selling prices. However, some general words of caution are appropriate here. Managers are better able to understand their options and the effects of their decisions on profits if they know their costs. That is, it is more informative to pinpoint costs first, before adding markups, than to have a variety of markups already embedded in the "costs" used as guides for setting selling prices. For example, if materials cost \$1,000, a price quotation guide should show them at \$1,000, not at, for example, a marked-up \$1,400 because that is what the seller hopes to receive.

Summary Problem for Your Review

PROBLEM

Akuahakusan is a Tokoyo-based printing company that bids on a wide variety of design and printing jobs. The owner of the company, Himari Watanabe, prepares the bids for most jobs. Her cost budget for 20X1 follows:

Materials		\$ 350,000
Labor		250,000
Overhead		
Variable	\$300,000	
Fixed	<u>150,000</u>	<u>450,000</u>
Total production cost of jobs		1,050,000
Selling and administrative expenses*		
Variable	\$ 75,000	
Fixed	<u>125,000</u>	<u>200,000</u>
Total costs		<u>\$1,250,000</u>

*These expenses include costs of all value-chain functions other than production.

Watanabe has a target profit of \$250,000 for 20X1.

Compute the average target markup percentage for setting prices as a percentage of the following:

1. Materials plus labor
2. Variable production cost of jobs (assume labor is a variable-cost resource)
3. Total production cost of jobs
4. All variable costs
5. All costs

SOLUTION

The purpose of this problem is to emphasize that many different approaches to pricing might be used that would achieve the same selling price. To achieve \$250,000 of profit, the desired revenue for 20X1 is \$1,250,000 + \$250,000 = \$1,500,000. The required markup percentages are as follow:

1. Percent of materials and labor = $\frac{(\$1,500,000 - \$600,000)}{\$600,000} = 150\%$
2. Percent of variable production cost of jobs = $\frac{(\$1,500,000 - \$900,000)}{\$900,000} = 66.7\%$
3. Percent of total production cost of jobs = $\frac{(\$1,500,000 - \$1,050,000)}{\$1,050,000} = 42.9\%$
4. Percent of all variable costs = $\frac{(\$1,500,000 - \$975,000)}{\$975,000} = 53.8\%$
5. Percent of all costs = $\frac{(\$1,500,000 - \$1,250,000)}{\$1,250,000} = 20\%$

Target Costing

The pricing approaches so far have all developed a price based on measures of costs. Another approach to the relationship between costs and prices is to take a product's market price as given and determine the maximum cost the company can spend to make the product and still achieve the desired profitability. We call this **target costing**.

Consider a company that is deciding whether to develop and market a new product. In evaluating the feasibility of the new product, management must predict both the cost to produce the product and the price at which it will sell. The degree to which management actions can affect price and cost determines the most effective approach to use for pricing and cost management purposes. Companies use cost-plus pricing for products where management actions (for example, advertising) can influence the market price. Although cost management is important in this case, there is a strong focus on marketing and the revenue side of the profit equation.

But what if the market conditions are such that management cannot influence prices? If a company is to achieve management's desired profit, it must focus on the product's cost. What management needs is an effective tool to reduce costs without reducing value to the customer. A growing number of companies faced with this situation are adopting target costing. Based on the product's predicted price and the company's desired profit, managers set a desired, or target, cost before creating or even designing the product. Managers must then design the product and manufacturing process so that the product's cost does not exceed its target cost. Why focus on the product design phase? Because the design affects a vast majority of costs. For example, the design of the product and the associated production process largely determines the costs of resources, such as new machinery, materials, parts, and even future refinements. It is not easy to reduce these costs once production begins. So, the emphasis of target costing is on proactive, up-front planning throughout every activity of the new-product development process.

Target Costing and New Product Development

Exhibit 5-13 shows a real company's target costing process for a new product. Based on the existing technology and related cost structure, the new product has three parts, requires direct labor, and has four types of indirect costs. The first step in the target-costing process is to determine the market price. The market sets this price. So why does management have to determine it?

Objective 8

Use target costing to decide whether to add a new product.

target costing

Taking a product's market price as given and determining the maximum cost the company can spend to make the product and still achieve the desired profitability.

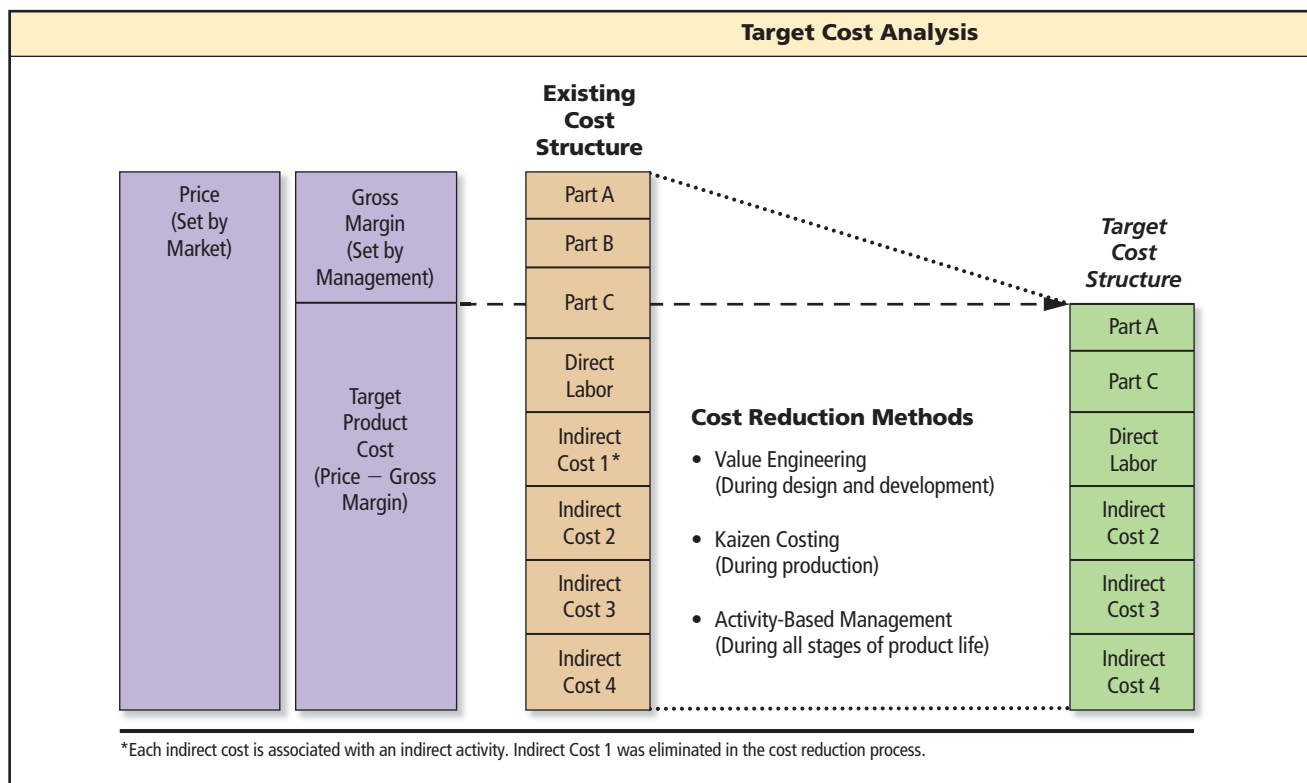


Exhibit 5-13

The Target Costing Process

Remember that the product is new and has not actually been on the market. So, management has to estimate what the market will pay for the product. There are several tools, such as market focus group studies and surveys, that a firm can use to determine this price. Management also sets a desired gross margin for the new product. The market price less the gross margin is the target cost for the new product. The company determines the existing cost structure for the product by building up costs on an individual component level. This product has two components. Component 1 consists of parts A and B. Component 2 is part C. Both components and the final assembly use direct labor. Finally, the activities necessary to plan and process the product create indirect costs.

Marketing plays a large role in target costing. Market research in the early planning stages guides the whole product development process by supplying information about customer demands and requirements. One of the key characteristics of successful target costing is a strong emphasis on understanding customer demands. Many companies actively seek customer input on the design of product features. Then, they compare the cost of each feature to its value to determine whether to add it to the product. For example, one of **Boeing**'s customers wanted heated floors in its airplanes. However, the cost of the heated floors was too high, and the customer reconsidered.

In the example in Exhibit 5-13, the existing cost is too large to generate the desired profit. Does this mean that the new product is not feasible? Not necessarily. A cross-functional team consisting of engineers, sales personnel, key suppliers, and accountants now must determine if the company can implement cost reductions large enough to meet the target cost. In the example in Exhibit 5-13, the company reduced the cost of parts by changing the design of the product so that it could use part C in place of part B. The company also asked suppliers of parts A and C to reduce their costs. Design and process engineers were also able to eliminate the activity that generated one type of indirect cost (Indirect Cost 1). These cost reductions resulted from **value engineering**—a cost-reduction technique, used primarily during the design stage, that uses information about all value-chain functions to satisfy customer needs while reducing costs. In total, the planned cost reductions were adequate to reduce costs to the target.

Not all the reductions in cost have to take place before production begins. For example, **kaizen costing** is the Japanese term for continuous improvement during manufacturing. How do companies apply kaizen costing? They establish kaizen goals each year as part of the planning process. Examples include the continual reduction in setup and processing times due to increased employee familiarity with the procedure. In total, target costing during design and kaizen costing during manufacturing may allow the firm to achieve the target cost over the product's life, even if initial cost predictions look too high.

Underlying these cost-reduction methods is the need for accurate cost information. Activity-based costing often provides this information. Companies can then use activity-based management (ABM) to identify and eliminate non-value-added activities, waste, and their related costs. ABM is applied throughout both the design and manufacturing stages of the product's life. For examples of how accountants are using ABC and ABM in target costing, see the Business First box on p. 221.

Illustration of Target Costing

Consider the target-costing system used by **ITT Automotive**—one of the world's largest automotive suppliers. The company designs, develops, and manufactures a broad range of products including brake systems, electric motors, and lamps. Also, the company is the worldwide market leader in antilock braking systems (ABS), producing 20,000 such systems per day.

What pricing approach does ITT Automotive use for the ABS? The pricing process starts when one of ITT's customers, for example **Mercedes-Benz**, sends an invitation to bid. The market for brake systems is so competitive that very little variance exists in the prices companies can ask (bid). ITT then forms a target-costing group and charges it with determining whether the price and costs allow for enough of a profit margin. This group includes engineers, management accountants, and sales personnel. Factors the group considers in their determination include competitor pricing, inflation rates, interest rates, and potential cost reductions during both the design (value engineering) and production (kaizen costing) stages of the ABS product life. ITT purchases many of the component parts that make up the ABS. Thus, the target-costing group works closely with suppliers. After making product and process design improvements and receiving commitments from suppliers, the company has the cost information needed to decide whether the bid price will provide the required profit margin.

The target-costing system has worked well at ITT Automotive. The company's bid for the ABS resulted in Mercedes-Benz U.S. International selecting ITT Automotive as the developer and supplier of ABS for the automaker's M-Class All-Activity Vehicle.

value engineering

A cost-reduction technique, used primarily during design, that uses information about all value-chain functions to satisfy customer needs while reducing costs.

kaizen costing

The Japanese term for continuous improvement during manufacturing.

Target Costing, ABC, and the Role of Management Accounting

The Consortium for Advanced Manufacturing—International defines target costing as a set of management tools that (1) guide design and planning activities for new products, (2) provide a basis for controlling subsequent operational phases, and (3) ensure that products achieve their profitability targets. Many companies use target costing together with an ABC system. ABC provides data on the costs of the various activities needed to produce the product. Knowing the costs of activities allows product and production process designers to predict the effects of their designs on the product's cost. Target costing essentially takes activity-based costs and uses them for strategic product decisions.

For example, **Culp**, a North Carolina manufacturer of furniture upholstery fabrics and mattress fabrics, uses target costing and ABC to elevate cost management into one of the most strategically important areas of the firm. Culp found that 80% of its product costs are predetermined at the design stage, but earlier cost control efforts had focused only on the other 20%. By shifting cost management efforts to the design stage and getting accurate costs of the various activities involved in production, cost management at Culp evolved into a process of cutting costs when engineers design a product, not identifying costs that are out of line after the production is complete.

A basic goal of target costing is to reduce costs before they occur. After all, once a company has incurred costs, it cannot change them. Such a strategy is especially important when product life cycles are short. Because most product life cycles are shrinking, use of target costing is expanding. Target costing focuses on reducing costs in the product design and development stages—when costs can really

be affected. For example, target costing heavily influenced **Boeing's** pricing of specialized design features in its planes, and **Procter & Gamble's** CEO credits target costing for helping eliminate costs that could cause managers to price products too high for the market to bear. According to Ron Gallaway, CFO of **Micrus Semiconductors** (now part of **NXP Semiconductors**), "The design process is where you can truly leverage [reduce] your costs."

What role does management accounting play in target costing? At Micrus, management accountants are responsible for setting final target costs for all components and processes. One survey reports that 86% of companies using target costing take data directly from their cost systems to estimate product costs during product design. At **Eastman Kodak**, management accountants were a vital part of the cross-functional team that implemented target costing. This team included design and manufacturing engineers, procurement, and marketing, as well as management accounting. Peter Zampino, director of research at the Consortium for Advanced Manufacturing—International, stated, "It's like anything else; if finance doesn't bless the numbers, they won't have the credibility throughout the organization."

Sources: Adapted from R. Banham, "Off Target," *CFO*, May 2000; M. Kocakulah and A.D. Austill, "Product Development and Cost Management Using Target Costing: A Discussion and Case Analysis," *Journal of Business and Economics Research*, February, 2006, pp. 61–72; D. Swensen, S. Anasri, J. Bell, and I. Kim, "Best Practices in Target Costing," *Management Accounting Quarterly*, Winter, 2003, pp. 12–17; G. Boer and J. Ettlie, "Target Costing Can Boost Your Bottom Line," *Strategic Finance*, July 1999, pp. 49–52; J. Brausch, "Target Costing for Profit Enhancement," *Management Accounting*, November 1994, pp. 45–49; G. Hoffman, "Future Vision," *Grocery Marketing*, March 1994, p. 6.

Target Costing and Cost-Plus Pricing Compared

Successful companies understand the market in which they operate and use the most appropriate pricing approach. To see how target costing and cost-plus pricing can lead to different decisions, suppose that ITT Automotive receives an invitation from **Ford** to bid on the ABS to be used in a new model car.

Assume the following data apply:

- The specifications contained in Ford's invitation lead to an estimated current manufacturing cost (component parts, direct labor, and manufacturing overhead) of \$154.
- ITT Automotive had a desired gross margin rate of 30% on sales, which means that actual cost should make up 70% of the price.
- Highly competitive market conditions exist and have established a sales price of \$200 per unit.

If ITT had used cost-plus pricing to bid on the ABS, the bid price would be $\$154 \div 0.7 = \$220$. Ford would most likely reject this bid because others are likely to bid \$200. ITT Automotive's pricing approach would lead to a lost opportunity.

Suppose that managers at ITT Automotive recognize that market conditions dictate a set price of \$200. If ITT used a target-costing system, what would be its pricing decision? The target cost is \$140 (that is, $\$200 \times 0.7$) so a required cost reduction of \$14 per unit is necessary. The target-costing group would work with product and process engineers and suppliers to determine

if they could reduce the average unit cost by \$14 over the product's life. Note that it is not necessary to get costs down to the \$140 target cost before production begins if the company expects additional cost reductions during the production period. For example, an initial unit cost of \$145 is acceptable if continuous improvement over the product's life will result in an additional \$5 of cost reductions. If the managers receive commitments for cost reductions, they will decide to bid \$200 per unit. Note that if ITT Automotive wins the bid, it must carry through with its focus on cost management throughout the life of the product.

Target costing originated in Japan and is a common practice there. However, a growing number of companies now use it worldwide, including **Boeing**, **Eastman Kodak**, **Honda of America**, **Mercedes-Benz**, **Procter & Gamble**, and **Caterpillar**, as well as ITT Automotive. Even some hospitals use target costing.

Why the increasing popularity of target costing? With increased global competition in many industries, companies are increasingly limited in influencing market prices. Cost management then becomes the key to profitability. Target costing forces managers to focus on costs to achieve the desired profits.

Highlights to Remember

- 1. Discriminate between relevant and irrelevant information for making decisions.** To be relevant to a particular decision, a cost (or revenue) must meet two criteria: (1) It must be an expected future cost (or revenue), and (2) it must have an element of difference between the alternative courses of action.
- 2. Apply the decision process to make business decisions.** All managers make business decisions based on some decision process. The best processes help decision making by focusing the manager's attention on relevant information.
- 3. Construct absorption and contribution-margin income statements, and identify their relevance for decision making.** The major difference between the absorption and contribution approaches for the income statement is that the contribution approach focuses on cost behavior (fixed and variable), whereas the absorption approach reports costs by business functions (manufacturing versus nonmanufacturing). The contribution approach makes it easier for managers to evaluate the effects of changes in volume on income and thus is well suited for shorter-run decision making.
- 4. Decide to accept or reject a special order using the contribution-margin approach.** Decisions to accept or reject a special sales order should use the contribution-margin technique and focus on the additional revenues and additional costs of the order.
- 5. Explain why pricing decisions depend on the characteristics of the market.** Market demand and supply, the degree of competition, and marginal revenue and marginal cost concepts impact market price and must be incorporated into any pricing decision.
- 6. Identify the factors that influence pricing decisions in practice.** Market conditions, the law, customers, competitors, and costs influence pricing decisions. The degree that management actions can affect price and cost determines the most effective approach to use for pricing and cost-management purposes.
- 7. Compute a sales price by various methods, and compare the advantages and disadvantages of these methods.** Companies use cost-plus pricing for products when management actions can influence the market price. They can add profit markups to a variety of cost bases including variable manufacturing costs, all variable costs, full manufacturing costs, or all costs. The contribution approach to pricing has the advantage of providing detailed cost behavior information that is consistent with cost-volume-profit analysis.
- 8. Use target costing to decide whether to add a new product.** When market conditions are such that management cannot significantly influence prices, companies must focus on cost control and reduction. They use target costing primarily for new products, especially during the design phase of the value chain. They deduct a desired target margin from the market-established price to determine the target cost. Cost management then focuses on controlling and reducing costs over the product's life cycle to achieve that target cost.

Accounting Vocabulary

absorption approach, p. 202	imperfect competition, p. 210	predatory pricing, p. 212
absorption costing, p. 202	kaizen costing, p. 220	price elasticity, p. 211
contribution approach, p. 203	marginal cost, p. 210	relevant information, p. 199
decision model, p. 200	marginal revenue, p. 210	target costing, p. 219
discriminatory pricing, p. 212	markup, p. 213	value engineering, p. 220
full cost, p. 213	perfect competition, p. 209	

Fundamental Assignment Material

MyLab Accounting

5-A1 Straightforward Income Statements

The Liberty Company had the following manufacturing data for the year 2012 (in thousands of dollars):

Beginning and ending inventories	None
Direct material used	\$410
Direct labor	330
Supplies	25
Utilities—variable portion	42
Utilities—fixed portion	17
Indirect labor—variable portion	93
Indirect labor—fixed portion	51
Depreciation	215
Property taxes	18
Supervisory salaries	59

Selling expenses were \$296,000 (including \$76,000 that were variable) and general administrative expenses were \$149,000 (including \$21,000 that were variable). Sales were \$2.5 million.

Direct labor and supplies are regarded as variable costs.

1. Prepare two income statements, one using the contribution approach and one using the absorption approach.
2. Suppose that all variable costs fluctuate directly in proportion to sales and that fixed costs are unaffected over a very wide range of sales. What would operating income have been if sales had been \$2.3 million instead of \$2.5 million? Which income statement did you use to help obtain your answer? Why?

5-A2 Special Order

Consider the following details of the income statement of the McGregor Pen Company (MPC) for the year ended December 31, 20X0:

Sales	\$15,900,000
Less cost of goods sold	<u>9,450,000</u>
Gross margin or gross profit	\$ 6,450,000
Less selling and administrative expenses	<u>4,350,000</u>
Operating income	<u><u>\$ 2,100,000</u></u>

MPC's fixed manufacturing costs were \$3.6 million and its fixed selling and administrative costs were \$3.3 million. Sales commissions of 3% of sales are included in selling and administrative expenses.

The division had produced and sold 3 million pens. Near the end of the year, **Pizza Hut** offered to buy 140,000 pens on a special order. To fill the order, a special Pizza Hut logo would have to be added to each pen. Pizza Hut intended to use the pens for special promotions in an eastern city during early 20X1.

Even though MPC had some idle plant capacity, the president rejected the Pizza Hut offer of \$610,400 for the 140,000 pens. He said,

The Pizza Hut offer is too low. We'd avoid paying sales commissions, but we'd have to incur an extra cost of \$.35 per pen to add the logo. If MPC sells below its regular selling prices, it will begin a chain reaction of competitors' price cutting and of customers wanting special deals. I believe in pricing at no lower than 8% above our full costs of $\$13,800,000 \div 3,000,000 \text{ units} = \$4.60$ per unit plus the extra \$.35 per pen less the savings in commissions.

1. Using the contribution-margin technique, prepare an analysis similar to that in Exhibit 5-6 on p. 205. Use four columns: without the special order, the effect of the special order (one column total and one column per unit), and totals with the special order.
2. By what percentage would operating income increase or decrease if the order had been accepted? Do you agree with the president's decision? Why?

5-A3 Formulas for Pricing

Gavin Petrosino, a building contractor, builds houses in tracts, often building as many as 20 homes simultaneously. Petrosino has budgeted costs for an expected number of houses in 20X0 as follows:

Direct materials	\$ 3,000,000
Direct labor	2,000,000
Job construction overhead	<u>2,500,000</u>
Cost of jobs	\$ 7,500,000
Selling and administrative costs	<u>4,500,000</u>
Total costs	<u><u>\$12,000,000</u></u>

The job construction overhead includes approximately \$1,500,000 of fixed costs, such as the salaries of supervisors and depreciation on equipment. The selling and administrative costs include \$2,250,000 of variable costs, such as sales commissions and bonuses that depend fundamentally on overall profitability.

Petrosino wants an operating income of \$1.2 million for 20X0.

Compute the average target markup percentage for setting prices as a percentage of the following:

1. Direct materials plus direct labor
2. The full "cost of jobs"
3. The variable "cost of jobs"
4. The full "cost of jobs" plus selling and administrative costs
5. The variable "cost of jobs" plus variable selling and administrative costs

5-A4 Target Costing

Dan's Discount Corporation uses target costing to aid in the final decision to release new products to production. A new product is being evaluated. Market research has surveyed the potential market for this product and believes that its unique features will generate a total demand over the product's life of 65,000 units at an average price of \$380. The target costing team has members from market research, design, accounting, and production engineering departments. The team has worked closely with key customers and suppliers. A value analysis of the product has determined that the total cost for the various value-chain functions using the existing process technology are as follows:

Value-Chain Function	Total Cost over Product Life
Research and development	\$ 2,100,000
Design	250,000
Manufacturing (40% outsourced to suppliers)	5,000,000
Marketing	1,400,000
Distribution	1,500,000
Customer service	<u>3,070,000</u>
Total cost over product life	<u><u>\$13,320,000</u></u>

Management has a target contribution to profit percentage of 50% of sales. This contribution provides sufficient funds to cover corporate support costs, taxes, and a reasonable profit.

1. Should the new product be released to production? Explain.
2. Approximately 40% of manufacturing costs for this product consists of materials and parts that are purchased from suppliers. Key suppliers on the target-costing team have suggested process improvements that will reduce supplier cost by 15%. Should the new product be released to production? Explain.
3. New process technology can be purchased at a cost of \$220,000 that will reduce non-outsourced manufacturing costs by 30%. Assuming the supplier's process improvements and new process technology are implemented, should the new product be released to production? Explain.

5-B1 Contribution and Absorption Income Statements

The following information is taken from the records of the Zealand Manufacturing Company for the year ending December 31, 2012. There were no beginning or ending inventories.

Sales	\$14,000,000	Long-term rent, factory	\$ 85,000
Sales commissions	470,000		
Advertising	430,000	Factory superintendent's salary	31,000
Shipping expenses	320,000	Factory supervisors' salaries	105,000
		Direct materials used	3,500,000
Administrative executive salaries	100,000	Direct labor	1,700,000
		Cutting bits used	53,000
Administrative clerical salaries (variable)	370,000	Factory methods research	42,000
		Abrasives for machining	99,000
Fire insurance on factory equipment	4,000	Indirect labor	950,000
Property taxes on factory equipment	26,000	Depreciation on factory equipment	430,000

1. Prepare a contribution income statement and an absorption income statement. If you are in doubt about any cost behavior pattern, decide on the basis of whether the total cost in question will fluctuate substantially over a wide range of volume. Prepare a separate supporting schedule of indirect manufacturing costs subdivided between variable and fixed costs.
2. Suppose that all variable costs fluctuate directly in proportion to sales, and that fixed costs are unaffected over a wide range of sales. What would operating income have been if sales had been \$12 million instead of \$14 million? Which income statement did you use to help get your answer? Why?

5-B2 Special Order, Terminology, and Unit Costs

Following is the income statement of Pelle Company, a manufacturer of men's blue jeans:

Pelle Company Income Statement for the Year Ended December 31, 20X0		
	Total	Per Unit
Sales	\$77,000,000	\$35.00
Less: Cost of goods sold	<u>46,200,000</u>	<u>21.00</u>
Gross margin	\$30,800,000	\$14.00
Less selling and administrative expenses	<u>28,600,000</u>	<u>13.00</u>
Operating income	<u>\$ 2,200,000</u>	<u>\$ 1.00</u>

Pelle had manufactured 2.2 million pairs of jeans, which had been sold to various clothing wholesalers and department stores. At the start of 20X0, the president, Ruth Catone, died unexpectedly. Her son, Chuck, became the new president. Chuck had worked for 15 years in the marketing phases of the business. He knew very little about accounting and manufacturing, which were his mother's strengths. Chuck has several questions, including inquiries regarding the pricing of special orders.

1. To prepare better answers, you decide to recast the income statement in contribution form. Variable manufacturing cost was \$35.2 million. Variable selling and administrative expenses, which were mostly sales commissions, shipping expenses, and advertising allowances paid to customers based on units sold, were \$16.5 million. Prepare the revised income statement.

2. Chuck asks, “I can’t understand financial statements until I know the meaning of various terms. In scanning my mother’s assorted notes, I found the following pertaining to both total and unit costs: full manufacturing cost, variable cost, full cost, fully allocated cost, gross margin, and contribution margin. Using our data for 20X0, please give me a list of these costs, their total amounts, and their per-unit amounts.”
3. He also says, “Near the end of 20X0, I brought in a special order from **Costco** for 140,000 jeans at \$34 each. I said I’d accept a flat \$47,600 sales commission instead of the usual 5% of selling price, but my mother refused the order. She usually upheld a relatively rigid pricing policy, saying that it was bad business to accept orders that did not at least generate full manufacturing cost plus 65% of full manufacturing cost.

That policy bothered me. We had idle capacity. The way I figured, our manufacturing costs would go up by $140,000 \times \$21 = \$2,940,000$, but our selling and administrative expenses would go up by only \$47,600. That would mean additional operating income of $140,000 \times (\$34 - \$21)$ minus \$47,600, or \$1,820,000 minus \$47,600, or \$1,772,400. That’s too much money to give up just to maintain a general pricing policy. Was my analysis of the impact on operating income correct? If not, please show me the correct additional operating income.”

4. After receiving the explanations offered in number 2 and 3, Chuck said, “Forget that I had the Costco order. I had an even bigger order from **Lands’ End**. It was for 600,000 units and would have filled the plant completely. I told my mother I’d settle for no commission. There would have been no selling and administrative costs whatsoever because Lands’ End would pay for the shipping and would not get any advertising allowances.

Lands’ End offered \$15.00 per unit. Our fixed manufacturing costs would have been spread over 2.8 million instead of 2.2 million units. Wouldn’t it have been advantageous to accept the offer? Our old fixed manufacturing costs were \$5.00 per unit. The added volume would reduce that cost more than our loss on our variable costs per unit.

Am I correct? What would have been the impact on total operating income if we had accepted the order?”

5-B3 Cost-Plus Pricing and Target Costing

A Fortune 100 company, **Caterpillar** is the world’s leading manufacturer of construction and mining equipment, diesel and natural gas engines, and industrial gas turbines. Caterpillar also manufactures custom piston pins for other manufacturers in the same facility used to make pins for its own heavy-duty engines. Piston pins are made with cost effective CNC bar feeders and multispindle barstock machines. This process is a high-output, high-efficiency operation that eliminates the added costs of purchasing special cut-to-length barstock or cutting barstock to specific lengths.

The market research department has indicated that a proposed new piston pin for a manufacturer of truck engines would likely sell for \$46. A similar piston pin currently being produced has the following manufacturing costs:

Direct materials	\$24.00
Direct labor	10.00
Overhead	16.00
Total	<u>\$50.00</u>

Assume that Caterpillar desires a gross margin of 30% of the manufacturing cost.

1. Suppose Caterpillar used cost-plus pricing, setting the price 30% above the manufacturing cost. What price would be charged for the piston pin? Would you produce such a piston pin if you were a manager at Caterpillar? Explain.
2. Caterpillar uses target costing. What price would the company charge for a piston pin? What is the highest acceptable manufacturing cost for which Caterpillar would be willing to produce the piston pin?
3. As a user of target costing, what steps would Caterpillar managers take to try to make production of this product feasible?

Additional Assignment Material

QUESTIONS

- 5-1** Describe the accountant's role in decision making.
- 5-2** "Any future cost is relevant." Do you agree? Explain.
- 5-3** Why are historical or past data irrelevant to special decisions?
- 5-4** Describe the role of past or historical costs in the decision process. That is, how do these costs relate to the prediction method and the decision model?
- 5-5** "The distinction between precision and relevance should be kept in mind." Explain.
- 5-6** Distinguish between the quantitative and qualitative aspects of decisions.
- 5-7** What is the advantage of the contribution approach as compared with the absorption approach?
- 5-8** What is the primary classification of costs under absorption costing?
- 5-9** "There is a commonality of approach to various special decisions." Explain.
- 5-10** "Fixed costs are not relevant costs." Do you agree? Explain.
- 5-11** Why are customers one of the factors influencing pricing decisions?
- 5-12** "Basing pricing on only the variable costs of a job results in suicidal underpricing." Do you agree? Why?
- 5-13** Provide three examples of pricing decisions other than the special order.
- 5-14** List three popular markup formulas for pricing.
- 5-15** List two factors that influence pricing decisions in practice.
- 5-16** Give two reasons why full costs are more widely used than variable costs for guiding pricing.
- 5-17** What is target cost per unit?
- 5-18** What is value engineering?
- 5-19** What is kaizen costing?
- 5-20** "In target costing, prices determine costs rather than vice versa." Explain.
- 5-21** Many companies that use target costing involve both customers and suppliers in product and process design. Explain why.
- 5-22** If a target-costing system is used and the existing cost cannot be reduced to the target cost through cost reductions, management should not produce and sell the product. Do you agree? Explain.

CRITICAL THINKING EXERCISES

5-23 Fixed Costs and the Sales Function

Many sales managers have a good intuitive understanding of costs, but they often are imprecise in how they describe the costs. For example, one manager said the following: "Increasing sales will decrease fixed costs because it spreads them over more units." Do you agree? Explain.

5-24 Income Statements and Sales Managers

Suppose Chee Wong is in charge of selling **Nantucket Nectars**' juice cocktails. What type of income statement, absorption or contribution, would Wong find most useful for his decisions? Why?

5-25 The Economics of the Pricing Decision

Economic theory states that managers should set price equal to marginal cost in perfect competition. Accountants use variable cost to approximate marginal costs. Compare and contrast marginal cost and variable cost, and explain whether using variable costs as an approximation for marginal cost is appropriate for making pricing decisions.

5-26 Pricing Decisions, Ethics, and the Law

Managers should base pricing decisions on both cost and market factors. In addition, they must also consider ethical and legal issues. Describe the influence that ethics and the law have on pricing decisions.

5-27 Target Costing and the Value Chain

According to Keith Hallin, program affordability manager (target costing) for **Boeing**'s MMA Program in Integrated Defense Systems, reaching target costs is a challenge for the company's entire value chain. Explain how managers of the various value-chain functions at Boeing might be involved in the target costing process.

EXERCISES

5-28 Pinpointing Relevant Costs

Smith is a sports lover and often spends his weekends attending sports events. This week, he has two important events, a baseball match of his favorite team and a soccer match where the team he supports will play to qualify for the semi-finals. Unfortunately, he has a limited budget and cannot attend both. He visited the previous matches of both the tournaments. The baseball match tickets are valued at \$30 while the soccer match tickets cost \$42. He habitually buys snacks while attending matches, and his favorite food item is available at \$10 at both the stadiums.

Identify the relevant costs. Explain your answer.

5-29 Information and Decisions

Suppose the historical costs for the manufacture of a calculator by **Radio Shack** were as follows: direct materials, \$5.00 per unit; and direct labor, \$6.00 per unit. Management is trying to decide whether to replace some materials with different materials. The replacement should cut material costs by 10% per unit. However, direct-labor time will increase by 5% per unit. Moreover, direct-labor rates will be affected by a recent 10% wage increase.

Prepare an exhibit like Exhibit 5-1 (p. 200), showing where and how the data about direct material and direct labor fit in the decision process.

5-30 Identification of Relevant Costs

Benjamin and Emma Jones are trying to decide whether to watch a Broadway show or attend a western classical music concert. They already have two non-refundable tickets to the Broadway show that cost \$150 each. This is going to be the last performance of the show, which has been praised by the critics as the best one this season. The western classical music concert is close to their heart and today is the last performance of the troop before they leave for their world tour. The couple can purchase tickets to the concert for \$70 each.

Benjamin and Emma will drive 60 miles round trip to either event. Variable costs for operating their car are \$.70 per mile, and fixed costs average at \$.50 per mile for the 15,000 miles they cover annually. Parking at Broadway is free, but it costs \$10 at the music concert.

To attend either event, Benjamin and Emma will hire a babysitter at \$20 per hour. They expect to be gone for four hours to attend the concert or three hours to attend the Broadway show.

Compare the cost of attending the concert with the cost of attending the Broadway show. Focus on relevant costs. Compute the difference in cost and indicate the costlier alternative.

5-31 Straightforward Absorption Statement

Smart Storage Company manufactures and sells external hard disk storage devices. The company had the following data (in thousands) for the year 2021.

Sales	\$1,560
Direct materials	360
Direct labor	460
Indirect manufacturing costs	420
Selling and administrative overhead	260

There were no beginning or ending inventories. Compute the (1) manufacturing cost of goods sold, (2) gross profit, (3) operating income, and (4) conversion cost (total manufacturing cost less materials cost).

5-32 Straightforward Contribution Income Statement

LivPure Water Purifiers had the following data (in million ¥, the official currency of Japan) for December 2021.

Sales	¥2,970
Direct materials	750
Direct labor	420
Variable factory overhead	195
Variable selling and administrative overhead	345
Fixed factory overhead	330
Fixed selling and administrative overhead	225

There were no beginning or ending inventories. Compute the (1) variable manufacturing cost of goods sold, (2) contribution margin, and (3) operating income.

5-33 Straightforward Absorption and Contribution Income Statement

Zenith Inc. produces LaserJet printers. The company had the following data (in millions) for the third quarter of 2021.

a. Sales	€2,760
b. Direct materials	1,050
c. Direct labor	630
Indirect manufacturing costs:	
d. Variable	300
e. Fixed	150
f. Variable manufacturing cost of goods sold	—
g. Manufacturing cost of goods sold	—
Selling and administrative expenses:	
h. Variable	270
i. Fixed	240
j. Gross profit	—
k. Contribution margin	—

There were no beginning or ending inventories. Fill in the blanks.

5-34 Absorption Statement

Exclusive Fashions Inc. is a leading brand in the Canadian fashion industry. The company had the following data (in thousand C\$, the official currency of Canada) for the year 2021. Assume there are no inventories. Fill in the blanks.

Sales	C\$_____
Direct materials	1,420
Direct labor	_____
Indirect manufacturing costs	_____
Manufacturing cost of goods sold	2,980
Gross margin	540
Selling and administrative expenses	_____
Operating income	120
Prime cost (direct materials + direct labor)	2,300

5-35 Contribution Income Statement

The Diamond Saga is a leading diamond jewelry company in South Africa. The company has the following data (in thousand ZAR, the official currency of South Africa) for the first quarter of 2021.

Sales	ZAR17,100
Direct materials	3,200
Direct labor	3,300
Variable indirect manufacturing costs	2,000
Contribution margin	3,700
Fixed selling and administrative expenses	2,100
Operating income	900

Compute the (1) variable manufacturing cost of goods sold, (2) variable selling and administration expenses, and (3) fixed indirect manufacturing costs.

5-36 Special-Order Decision

Belltown Athletic Supply (BAS) makes game jerseys for athletic teams. The F. C. Kitsap soccer club has offered to buy 100 jerseys for the teams in its league for \$15 per jersey. The team price for such jerseys normally is \$18, an 80% markup over BAS's purchase price of \$10 per jersey. BAS adds a name and number to each jersey at a variable cost of \$2 per jersey. The annual fixed cost of equipment used in the printing process is \$6,000, and other fixed costs allocated to jerseys are \$2,000. BAS makes about 2,000 jerseys per year, so the fixed cost is \$4 per jersey. The equipment is used only for printing jerseys and stands idle 75% of the usable time.

The manager of BAS turned down the offer, saying, “If we sell at \$15 and our cost is \$16, we lose money on each jersey we sell. We would like to help your league, but we can’t afford to lose money on the sale.”

1. Compute the amount by which the operating income of BAS would change if it accepted F. C. Kitsap’s offer.
2. Suppose you were the manager of BAS. Would you accept the offer? In addition to considering the quantitative impact computed in requirement 1, list two qualitative considerations that would influence your decision—one qualitative factor supporting acceptance of the offer and one supporting rejection.

5-37 Unit Costs and Total Costs

You are a CPA who belongs to a downtown business club. Annual dues are \$150. You use the club solely for lunches, which cost \$9 each. You have not used the club much in recent years, and you are wondering whether to continue your membership.

1. You are confronted with a variable-cost plus a fixed-cost behavior pattern. Plot each on a graph, where the vertical axis is total cost and the horizontal axis is annual volume in number of lunches. Also plot a third graph that combines the previous two graphs.
2. What is the cost per lunch if you pay for your own lunch once a year? Twelve times a year? Two hundred times a year?
3. Suppose the average price of lunches elsewhere is \$10. (a) How many lunches must you have at the luncheon club so that the total costs of the lunches would be the same, regardless of where you ate for that number of lunches? (b) Suppose you ate 200 lunches a year at the club. How much would you save in relation to the total costs of eating elsewhere?

5-38 Advertising Expenditure and Nonprofit Organizations

Imperial College is a reputed undergraduate university in the United Kingdom with a heritage of more than 100 years. The university is well known for its expert faculty members and high placement records. It has a capacity of 2,000 students and offers residential programs only.

The administration of the college has noticed a decline in student admission during the last two academic sessions. This year too, the admission department has predicted an enrollment of 1,500 students only.

The university charges a comprehensive annual fee of £15,000 for tuition, room, and board. The costs per student for the next academic session have been estimated as follows:

	Variable	Fixed	Total
Educational programs	£5,300	£3,750	£ 9,050
Room	1,000	2,400	3,400
Board	2,700	550	3,250
	<u>£9,000</u>	<u>£6,700*</u>	<u>£15,700</u>

*Based on 1,500–2,000 students for the year.

The assistant director of admissions has proposed a two-month advertising campaign using newspaper and television advertisements and advertisements in social media, along with extensive e-mailing of brochures to the prospective candidates.

1. Suppose the advertisement campaign will cost £1.53 million. What is the minimum number of additional students the campaign must attract to make the campaign break even?
2. Suppose the admission department predicts that the campaign will attract additional 320 students. What is the most Imperial College should pay for the campaign and still break even?
3. Suppose a three-month (instead of two-month) campaign will attract 410 students instead of 320 students. What is the most Imperial College should pay for the one-month extension of the campaign and still break even?

5-39 Variety of Cost Terms

Consider the following data:

Variable selling and administrative costs per unit	\$ 7.00
Total fixed selling and administrative costs	\$810,000
Total fixed manufacturing costs	\$500,000
Variable manufacturing costs per unit	\$ 12.00
Units produced and sold	100,000

Compute the following per unit of product: (1) total variable costs, (2) full manufacturing cost, (3) full cost.

5-40 Acceptance of Low Bid

Smooth Write Ball Pens Company produces and sells a variety of ball pens. For the past few months, the product has been facing low demand, as a result of which the company is saddled with idle capacities. Fortis Healthcare, which runs more than 100 polyclinics and diagnostic centers, has approached Smooth Write Ball Pens Company to produce and supply 300,000 ball pens with its name engraved on it. Fortis will pay \$3.00 for each pen.

Smooth Write predicts that its variable costs will be \$3.20 each. Its fixed costs, which had been averaging at \$2.00 per unit on a variety of other products, will now be spread over twice as much volume. Justifying the acceptance of the offer, the CEO of the company has issued a statement saying that “Though the company will lose \$.20 each on the variable cost, it will gain \$1.00 per unit by spreading its fixed costs. Therefore, acceptance of this offer will lead to a gain of \$.80 per unit.”

Suppose the regular business of the company had a current volume of 300,000 units, sales of \$1,200,000, variable costs of \$960,000, and fixed costs of \$600,000. Do you agree with the CEO? Why?

5-41 Pricing by Auto Dealer

Neon Motors is a dealer in motorcycles in Germany. It has an operating policy slightly different from the other dealers in the industry. Each month, Neon aims at a unit volume quota that approximates its break-even point. Until the break-even point is achieved, Neon follows a premium pricing policy, under which the minimum deal value must contain a relatively high markup in order to ensure a contribution to profit of at least €250. Once the break even is reached, units are quoted at a lower price for the rest of the month.

What do you think about this policy? As a prospective buyer, how would you react to this policy?

5-42 Pricing to Maximize Contribution

Reynolds Company produces and sells picture frames. One particular frame for 8×10 photos was an instant success in the market, but recently competitors have come out with comparable frames. Reynolds has been charging \$12.50 wholesale for the frames, and sales have fallen from 10,000 units last year to 7,000 units this year. The product manager in charge of this frame is considering lowering the price to \$10 per frame. He believes sales will rebound to 10,000 units at the lower price, but they will fall to 6,000 units at the \$12.50 price. The unit variable cost of producing and selling the frames is \$6, and \$60,000 of fixed cost is assigned to the frames.

1. Assuming that the only prices under consideration are \$10 and \$12.50 per frame, which price will lead to the largest profit for Reynolds? Explain why.
2. What subjective considerations might affect your pricing decision?

5-43 Target Selling Prices

The manager of Sleepwell, a leading producer and supplier of mattresses in India, has prepared the following budgeted income statement (in thousand rupees).

Target sales	₹1,935,000
Variable costs	
Manufacturing	645,000
Selling and administrative	129,000
Total variable costs	<u>774,000</u>
Fixed costs	
Manufacturing	172,000
Selling and administrative	129,000
Total fixed costs	<u>301,000</u>
Total of all costs	<u>1,075,000</u>
Operating income	<u>₹ 860,000</u>

Compute the following markup percentages that would be used for obtaining the same target sales as a percentage of (1) total variable costs, (2) full costs, and (3) variable manufacturing costs.

5-44 Competitive Bids

Griffy, Rodriguez, and Martinez, a CPA firm, is preparing to bid for a consulting job. Although Alicia Martinez will use her judgment about the market in finalizing the bid, she has asked you to

prepare a cost analysis to help in the bidding. You have estimated the costs for the consulting job to be as follows:

Materials and supplies, at cost	\$ 30,000
Hourly pay for consultants, 2,000 hours at \$35 per hour	70,000
Fringe benefits for consultants, 2,000 hours at \$12 per hour	<u>24,000</u>
Total variable costs	124,000
Fixed costs allocated to the job	
Based on labor, 2,000 hours at \$10 per hour	20,000
Based on materials and supplies, 80% of 30,000	<u>24,000</u>
Total cost	<u>\$168,000</u>

Of the \$44,000 allocated fixed costs, \$35,000 will be incurred even if the job is not undertaken.

Alicia normally bids jobs at the sum of (1) 150% of the estimated materials and supplies cost and (2) \$75 per estimated labor hour.

1. Prepare a bid using the normal formula.
2. Prepare a minimum bid equal to the additional costs expected to be incurred to complete the job.
3. Prepare a bid that will cover full costs plus a markup for profit equal to 20% of full cost.

5-45 Target Costing

The Founder and CEO of Smart Home Solutions Company, Peter Burton, believes that there is a market for wireless home security systems. A recent survey conducted by the market research division of the company on the features and prices of existing wireless home security systems has confirmed Mr. Burton's belief. Based on the research, the company has decided that a price of £500 will justify their offering. At this price, marketing believes that about 160,000 wireless home security systems can be sold over the product's life cycle. It will cost the company about £1,150,000 to design and develop the product. The company has a target profit of 20% on sales.

Determine the total and unit target cost to manufacture, sell, distribute, and service the wireless home security systems.

5-46 Target Costing

Innovation lies at the core of the success of Xenon Electronics Inc. Over the last five years, the company has achieved tremendous success on its innovative products, ranging from smartphones to smart watches to various other lifestyle products. The company relies heavily on its research and development (R&D) program and also uses target costing to inform final decisions to release new products. Presently, the company is evaluating a new product, a smart speaker integrated with two voice assistants, Alexa and Google. The speaker will allow the customers to choose between the two. Market research has revealed that the speaker's unique features will generate a total demand of 100,000 units at an average price of \$250. The design and production engineering departments have performed a value analysis of the product and have determined the total cost for the various value-chain functions using the existing process technology:

Value-Chain Functions	Total Cost over Product Life
Research and development	\$ 3,000,000
Design	1,500,000
Manufacturing	10,000,000
Marketing	1,600,000
Distribution	2,400,000
Customer service	<u>1,500,000</u>
Total cost over product life	<u>\$20,000,000</u>

The management has a target profit percentage of 25% on sales. The production engineering department indicates that a new process technology can reduce the manufacturing cost by 40%, but it will cost \$2,200,000.

1. Assuming the existing process technology is used, should the new product be released to production? Explain.
2. Assuming the new process technology is purchased, should the new product be released to production? Explain.

PROBLEMS

5-47 Pricing, Ethics, and the Law

Great Lakes Pharmaceuticals, Inc. (GLPI), produces both prescription and over-the-counter medications. In January, GLPI introduced a new prescription drug, Capestan, to relieve the pain of arthritis. The company spent more than \$50 million over the last five years developing the drug, and advertising alone during the first year of introduction will exceed \$10 million. Production cost for a bottle of 100 tablets is approximately \$12. Sales in the first three years are predicted to be 500,000, 750,000, and 1,000,000 bottles, respectively. To achieve these sales, GLPI plans to distribute the medicine through three sources: directly to physicians, through hospital pharmacies, and through retail pharmacies. Initially, the bottles will be given free to physicians to give to patients, hospital pharmacies will pay \$25 per bottle, and retail pharmacies will pay \$40 per bottle. In the second and third year, the company plans to phase out the free distributions to physicians and move all other customers toward a \$50-per-bottle sales price.

Comment on the pricing and promotion policies of GLPI. Pay particular attention to the legal and ethical issues involved.

5-48 Analysis with Contribution Income Statement

The following data have been condensed from LaGrande Corporation's report of 2012 operations (in millions of euros):

	Variable	Fixed	Total
Manufacturing cost of goods sold	€300	€280	€580
Selling and administrative expenses	140	60	200
Sales			900

- Prepare the 2012 income statement in contribution form, ignoring income taxes.
- LaGrande's operations have been fairly stable from year to year. In planning for the future, top management is considering several options for changing the annual pattern of operations. You are asked to perform an analysis of their estimated effects. Use your contribution income statement as a framework to compute the estimated operating income (in millions) under each of the following separate and unrelated assumptions:
 - Assume that a 10% reduction in selling prices would cause a 30% increase in the physical volume of goods manufactured and sold.
 - Assume that an annual expenditure of €30 million for a special sales promotion campaign would enable the company to increase its physical volume by 10% with no change in selling prices.
 - Assume that a basic redesign of manufacturing operations would increase annual fixed manufacturing costs by €80 million and decrease variable manufacturing costs by 15% per product unit, but with no effect on physical volume or selling prices.
 - Assume that a basic redesign of selling and administrative operations would double the annual fixed expenses for selling and administration and increase the variable expenses for selling and administration by 25% per product unit; it would also increase physical volume by 20%. Selling prices would be increased by 5%.
 - Would you prefer to use the absorption form of income statement for the preceding analyses? Explain.
- Discuss the desirability of alternatives a–d in number 2. If only one alternative could be selected, which would you choose? Explain.

5-49 Pricing and Contribution-Margin Technique

Global Logistics Inc., South Korea, has the following operating results for 2021 (figures in thousand ₩, the official currency of South Korea):

Operating revenues	₩450,000
Operating costs	360,000
Operating income	₩ 90,000

A Geojje manufacturer wants to know whether Global Logistics would be interested in transporting a large order of auto parts to Ulsan. Chin Sun, the operations manager at Global Logistics, has investigated the situation and estimated that the “fully allocated costs” of servicing the order would be ₩15,000,000. Using the general pricing formula, he has quoted price of ₩18,750,000. The manufacturer, however, is ready to pay only ₩12,000,000. In a recent study on the behavior of Global

Logistics' operating costs, it was found that ₩270 million of ₩360 million could be characterized as variable costs. Chin Sun discussed the matter with the researcher and decided that this order would probably generate the same cost behavior as the general operations at Global Logistics.

1. Using the contribution-margin technique, prepare an analysis for Global Logistics.
2. Should Global Logistics accept the order? Explain.

5-50 Cost Analysis and Pricing

Travel Accessories Company manufactures and sells various travel accessories. The budget for the company for 2021 is as follows:

Sales		£3,078,500
Direct materials	£737,500	
Direct labor	850,000	
Overhead	<u>977,500</u>	<u>2,565,000</u>
Net income		<u>£ 513,500</u>

The company typically uses a cost-plus pricing system. Direct materials and direct labor costs are computed, and overhead is added at 115% of direct-labor costs. A 20% of the total cost is added to obtain the selling price.

Amelia Baker, the sales manager of the company, has placed a £57,500 bid on a particularly large order. The order will cost £13,250 for direct materials and £15,500 for direct labor. The customer is, however, ready to pay only £40,000 for the order. If Amelia accepts the order, the total sales of the company will be £3,118,500.

Amelia refuses the order as she thinks accepting orders at below cost while the company is following a cost-plus pricing system would not be appropriate. According to her, the company will lose £6,575 on the order.

The company's annual fixed overhead is £425,000.

1. What would the operating income have been with the order? Without the order? Show your calculations.
2. Give a short description of a contribution margin technique to pricing that Amelia might follow to achieve a price of £57,500 on the order.

5-51 Pricing of Education

Benjamin Connor is the director of Acacia Business School, Ontario University. Apart from a full-time MBA program on finance, Acacia Business School arranges short-term certificate courses of two weeks' duration on specialized functional areas of business ranging from operations management and customer relationship management to risk management. The courses are restricted to mid-level business executives only. The performance of these courses for the current fiscal year 2020, excluding the final course on "treasury and risk management in banking" scheduled for December 7 to December 21, 2020, is as follows:

Tuition revenue	\$3,000,000
Costs of courses (variable)	<u>1,200,000</u>
Contribution margin	\$1,800,000
General administrative expenses (fixed)	<u>600,000</u>
Operating income	<u>\$1,200,000</u>

The costs of the courses include remuneration for faculty members, rentals of the classroom and equipment, advertising, and other costs, such as travel, that can be exclusively identified with a particular course.

The general administrative expenses include salary of the director, compensation of one secretary, and a lump-sum payment to the university for its share of overhead.

The fee for the two-week course is \$250 per candidate and 40 students have already enrolled for the course. However, a few days before the course is to begin, the manager of LBS Finance contacts Benjamin to inform that they are interested in sending 10 mid-level executives of their company for the course, provided that the course fee is reduced to \$150 per person. The extra cost of including these 10 executives would entail lunches at \$25 each and course materials at \$35 each.

1. Prepare a tabulation of the performance for the full year, including the final course. Assume that the costs of the final course for the 40 enrollees' instruction, travel, advertising, rental of

classroom, lunches, and course materials would be \$6,000. Show a tabulation in four columns: before final course, final course with 40 registrants, effect of 10 more registrants, and grand totals.

- What major considerations would probably influence the pricing policies for these courses? For setting regular university tuition in private universities?

5-52 Profit from Direct Selling vs. Royalty from Pay per View

The recent advancement in online streaming services poses a greater challenge for many movie studio executives. Eric, the senior executive of the marketing division of Sony Pictures needs to present before the board of directors the appropriate pricing strategy for online viewing of the upcoming movies produced by the studio.

Eric has explored two alternatives—

- to make the movie available in its own website wherefrom anyone can download and watch the movie paying \$13; or
- to make the movie available to various online streaming platforms like Amazon Prime, Netflix etc. wherefrom the viewers can watch (but cannot download) the movie at pay per view basis and in turn the streaming platforms will pay the studio 40% of the revenue collected per view as royalty.

Assume that variable cost associated with each download of a movie from its own website will be \$3.00.

- For the next movie of the studio, *Jumanji 2*, after its theatrical release at least 20 million views are expected on the online streaming platforms at an average pay per view rate of \$5.00. How many direct downloads are necessary to make direct selling a more profitable option to the movie studio?
- Suppose, the studio has decided to select alternative (a) and expects at 5.5 million downloads. At the presently negotiated deal with the streaming platforms, how many views must be warranted to provide the studio the same profit as expected from the direct selling.
- How does the cost of producing and promoting the movie affect this decision?

5-53 Use of Passenger Jets

In a recent year **Continental Airlines** filled about 50% of the available seats on its flights, a record about 15% below the national average.

Continental could have eliminated about 4% of its runs and raised its average load considerably. The improved load factor would have reduced profits, however. Give reasons for or against this elimination. What factors should influence an airline's scheduling policies?

When you answer this question, suppose that Continental had a basic package of 3,000 flights per month, with an average of 100 seats available per flight. Also suppose that 52% of the seats were filled at an average ticket price of \$200 per flight. Variable costs are about 70% of revenue.

Continental also had a marginal package of 120 flights per month, with an average of 100 seats available per flight. Suppose that only 20% of the seats were filled at an average ticket price of \$100 per flight. Variable costs are about 50% of this revenue. Prepare a tabulation of the basic package, marginal package, and total package, showing percentage of seats filled, revenue, variable expenses, and contribution margin.

5-54 Effects of Volume on Operating Income

The Hester Division of Melbourne Sports Company manufactures boomerangs, which are sold to wholesalers and retailers. The division manager has set a target of 220,000 boomerangs for next month's production and sales has developed an accurate budget for that level of sales. The manager has also prepared an analysis of the effects on operating income of deviations from the target:

Volume in units	170,000	220,000	260,000
Sales at \$3.20	\$544,000	\$704,000	\$832,000
Full costs at \$2.10	357,000	462,000	546,000
Operating income	<u>\$187,000</u>	<u>\$242,000</u>	<u>\$286,000</u>

The costs have the following characteristics: Variable manufacturing costs are \$0.85 per boomerang; variable selling costs are \$0.65 per boomerang; fixed manufacturing costs per month are \$109,000; and fixed selling and administrative costs per month are \$23,000.

- Prepare a correct analysis of the changes in volume on operating income. Prepare a tabulated set of income statements at levels of 170,000, 220,000, and 260,000 boomerangs. Also show percentages of operating income in relation to sales.
- Compare your tabulation with the manager's tabulation. Why is the manager's tabulation incorrect?

5-55 Pricing for a Guided Tour in Darjeeling Himalayan Railway

The Darjeeling Himalayan Railway, also known as the DHR or the Toy Train, is a 2 ft (610 mm) gauge railway that runs between New Jalpaiguri and Darjeeling in the Indian state of West Bengal. The railway is operated by Northeast Frontier Railway and has been declared a World Heritage Site by UNESCO.

Recently, Dolphin Tour and Travels has approached the general manager of Northeast Frontier Railway with a proposal to offer a special guided tour to the operator's clients. The tour will occur 30 times per year and be a part of a larger itinerary that the tour operator is putting together. The operator has presented two options before the manager:

- (a) a special 88 km tour with the agent's 30 clients as the only passengers on the train; or
- (b) adding a car to an existing train to accommodate the 30 clients on an already scheduled 88 km tour.

Under either option, Northeast Frontier Railway would hire a tour guide for ₹24,000 for the trip. The railway has extra cars in its switching yard, and it would cost ₹4,800 to clean and move a car to the main track and join it with the existing train. The extra fuel cost to pull one extra car is ₹24 per km. To run an engine and a passenger car on the trip will cost ₹264 per km. Other costs including engineering supervision will be ₹48,000 per trip.

Depreciation on passenger cars is ₹600,000 per year and depreciation on engines is ₹2,400,000 per year. Each passenger car and each engine travels about 75,000 km a year. They are replaced every eight years.

Dolphin offers to pay ₹3,840 per passenger for the special tour and ₹1,800 per passenger for simply adding an extra car.

1. Which of the two options is more profitable to Northeast Frontier Railway? Comment on which costs are irrelevant to this decision.
2. Should Northeast Frontier Railway accept the proposal for the option you find best in number 1? Comment on what costs are relevant for this decision but not for the decision in number 1?

5-56 Pricing of Special Order

The Drosselmeier Corporation, located in Munich, makes Christmas nutcrackers and has an annual plant capacity of 2,400 product units. Suppose its predicted operating results (in euros) for the year are as follows:

Production and sales of 2,000 units, total sales	€180,000
Manufacturing costs	
Fixed (total)	70,000
Variable (per unit)	25
Selling and administrative expenses	
Fixed (total)	30,000
Variable (per unit)	10

Compute the following, ignoring income taxes:

1. If the company accepts a special order for 300 units at a selling price of €40 each, how would the total predicted net income for the year be affected, assuming no effect on regular sales at regular prices?
2. Without decreasing its total net income, what is the lowest unit price for which the Drosselmeier Corporation could sell an additional 100 units not subject to any variable selling and administrative expenses, assuming no effect on regular sales at regular prices?
3. List the numbers given in the problem that are irrelevant (not relevant) in solving number 2.
4. Compute the expected annual net income (with no special orders) if plant capacity can be doubled by adding additional facilities at a cost of €500,000. Assume that these facilities have an estimated life of four years with no residual scrap value, and that the current unit selling price can be maintained for all sales. Total sales are expected to equal the new total plant capacity each year. No changes are expected in variable costs per unit or in total fixed costs except for depreciation.

5-57 Pricing and Confusing Variable and Fixed Costs

Emphasis Electricals produces synchronous motors which are used in microwave ovens to drive the turntables. For the year 2020, it had a fixed factory overhead budget of €84 million. The company

planned to make and sell 6 million units of synchronous motors. All variable manufacturing costs per unit were €12. The budgeted income statement contained the following:

Sales	€168,000,000
Manufacturing cost of goods sold	<u>156,000,000</u>
Gross margin	€ 12,000,000
Selling and administration expenses	<u>6,000,000</u>
Operating income	<u>€ 6,000,000</u>

The actual variable costs per unit and the total fixed costs were exactly as budgeted.

1. Compute company's budgeted fixed factory overhead per unit.
2. Near the end of 2020, Emphasis received a special offer from a large multinational home appliances company to supply 150,000 units for €2.3 million. The CEO of the company is not in favor of accepting the offer as he thinks selling below the full manufacturing cost is not right. Therefore, even if the offer would have a modest effect on the selling and administrative costs (additional sales commission payable was €10,000 only), he wanted to reject the offer. Compute the effect on operating income if the offer is accepted.
3. What factors should the CEO of Emphasis consider before finally deciding whether to accept the offer?
4. Suppose the original budget for fixed manufacturing costs was €48 million, but budgeted output was 3 million. How would your answers to numbers 1 and 2 change? Be specific.

5-58 Demand Analysis

Bright Colors Inc. produces and sells printer colors in 200 ml bottles for Deskjet Ink-tank printers. During 2020, the company produced and sold 130,000 bottles at an average price of \$25 per bottle. At the existing capacity the company can produce 150,000 bottles per year.

While preparing the budget for 2021, the management of the company has to make several decisions on the product pricing as well as output.

1. A recent market survey has revealed that the demand of the product varies inversely with its price with an absolute price elasticity of 3.33 approximately (i.e., for each \$1 price drop there will be an increase in demand by 20,000 bottles).
2. The company's expected cost structure for 2021 is as follows:
 - a. Fixed costs (regardless of production and sales) \$250,000.
 - b. Variable cost of goods sold per bottle \$12.00.
3. In the event of an increase in demand, the company can increase the installed capacity from 150,000 bottles per year to 210,000 bottles per year at an additional capital investment of \$1,250,000. The estimated average life of the additional investment would be 10 years without any salvage value at the end. This results into an increase in annual fixed costs by \$125,000. (Expansion of less than 60,000 additional bottles would cost only slightly lower than \$1,250,000.)

State, with reason, what the level of production and selling price should be for 2021. Also indicate whether the company should go for the plant expansion or not. Show your calculations. Ignore income tax considerations and time value of money.

5-59 Target Costing

GenNext Home and Life Solutions Company produces and sells small smart home products. A recent study by the marketing division of the company has discovered a potential market for smart LED bulbs. The study also indicates that a 9-watt Wi-Fi enabled smart LED bulb compatible with voice assistants like Amazon Alexa and Google Assistant can be sold at \$25.

The production department has provided the following rough estimate of the manufacturing cost of each smart LED bulb.

Direct materials	\$12.00
Direct labor	6.00
Overhead	<u>6.00</u>
Total	<u>\$24.00</u>

GenNext desires a gross margin of 15% on the manufacturing cost.

1. Suppose GenNext uses cost-plus pricing, setting the price 15% above the manufacturing cost. What price will be charged for the smart LED bulbs? Will you produce such smart LED bulbs if you were a manager at GenNext? Explain.

2. Suppose GenNext uses target costing. What price will the company charge for a smart LED bulb? What is the highest acceptable manufacturing cost for which GenNext will be willing to produce the product?
3. As a user of target costing, what steps will GenNext take to try to make production of this product feasible?

5-60 Target Costing and ABM

Cleveland Plastics makes plastic parts for other manufacturing companies. Cleveland has an ABC system for its production, marketing, and customer service functions. The company uses target costing as a strategic decision-making tool. One of Cleveland's product lines—consumer products—has over 100 individual products with life cycles of less than three years. This means that about 30–40 products are discontinued and replaced with new products each year. Cleveland's top management has established the following tool to be used by the target-cost team for evaluating proposed new products:

Required Cost Reduction (RCR) as a Percent of Market Price	Action
$\text{RCR} \leq 0\%$	Release to production
$0 < \text{RCR} \leq 5\%$	Release to production and set kaizen improvement plan
$5\% < \text{RCR} \leq 25\%$	Product and process redesign
$\text{RCR} > 25\%$	Abandon subject to top management review and approval

The following operational and ABC data are for four proposed new products:

		Estimated Number of Driver Units over Product Life Cycle			
Value-Chain Function	Cost per Driver Unit	C-200472	C-200473	C-200474	C-200475
Production					
Direct material	\$1.60 per pound	2,000	1,000	4,000	800
Setup/Maintenance	\$1,015 per setup	10	4	12	5
Processing hour	\$370 per machine	20	12	32	12
Marketing	\$860 per order	30	10	50	16
Customer service	\$162 per sales call	55	35	20	28
Estimated life-cycle demand in units		2,000	1,400	4,000	600
Estimated market price per unit		\$39	28	35	50

Top management has set a desired contribution to cover unallocated value-chain costs, taxes, and profit of 40% of the estimated market price.

Prepare a schedule that shows for each proposed new product, the target cost, estimated cost using existing technology, and any required cost reduction as a percent of the estimated market price. Use the evaluation tool to make a decision regarding the four proposed new products.

5-61 Target Costing over Product Life Cycle

River Line Corp. makes a variety of small home utility machines. The market research team recently identified snowblowers as a potentially lucrative market. As a first entry into the market the company is considering gas driven two-stage snowblowers that can remove heavy snow up to 20 inches deep. Market research indicates that snowblowers would sell for about \$1,050 at retail and \$950 wholesale. At that price River Line expects life cycle sales as follows:

Year	Sales
2021	1,700
2022	5,600
2023	10,700
2024	10,700
2025	8,600
2026	6,200
2027	4,200

The production department has estimated that the variable cost of production will be \$610 per snowblower and annual fixed costs will be \$900,000 per year for each of the seven years. Variable selling cost will be \$45 per snowblower and fixed selling costs will be \$75,000 per year. In addition, the product development department estimates that \$5.3 million of development cost will be necessary to design the snowblower and the production process for it. (Ignore time value of money.)

1. Compute the expected profit over the entire product life cycle of the proposed snowblower.
2. Suppose River Line expects a pre tax profit equal to 10% of sales on new products. Would the company undertake a production and selling of the snowblower?
3. River Line uses a target costing approach to new products. What steps would management like take to try to make a profitable product of the snowblower?

CASES

5-62 Use of Capacity

St. Tropez S.A. manufactures several different styles of jewelry cases in southern France. Management estimates that during the second quarter of 20X1 the company will be operating at 80% of normal capacity. Because the company desires a higher utilization of plant capacity, it will consider a special order.

St. Tropez has received special-order inquiries from two companies. The first is from Lyon, which would like to market a jewelry case similar to one of St. Tropez's cases. The Lyon jewelry case would be marketed under Lyon's own label. Lyon has offered St. Tropez €67.5 per jewelry case for 20,000 cases to be shipped by July 1, 20X1. The cost data for the St. Tropez jewelry case, which would be similar to the specifications of the Lyon special order, are as follows:

Regular selling price per unit	€100
Costs per unit:	
Raw materials	€ 35
Direct labor, 0.5 hour at €60	30
Overhead, 0.25 machine hour at €40	<u>10</u>
Total cost per unit	<u>€ 75</u>

According to the specifications provided by Lyon, the special-order case requires less expensive raw materials, which will cost only €32.5 per case. Management has estimated that the remaining costs, labor time, and machine time will be the same as those for the St. Tropez jewelry case.

The second special order was submitted by the Avignon Co., for 7,500 jewelry cases at €85 per case. These cases would be marketed under the Avignon label and would have to be shipped by July 1, 20X1. The Avignon jewelry case is different from any jewelry case in the St. Tropez line. Its estimated per-unit costs are as follows:

Raw materials	€43
Direct labor, 0.5 hour at €60	30
Overhead, 0.5 machine hour at €40	<u>20</u>
Total costs	<u>€93</u>

In addition, St. Tropez will incur €15,000 in additional setup costs and will have to purchase a €20,000 special device to manufacture these cases; this device will be discarded once the special order is completed.

The St. Tropez manufacturing capabilities are limited by the total machine hours available. The plant capacity under normal operations is 90,000 machine hours per year, or 7,500 machine hours per month. The budgeted fixed overhead for 20X1 amounts to €2.16 million, or €24 per hour. All manufacturing overhead costs are applied to production on the basis of machine hours at €40 per hour.

St. Tropez will have the entire second quarter to work on the special orders. Management does not expect any repeat sales to be generated from either special order. Company practice precludes St. Tropez from subcontracting any portion of an order when special orders are not expected to generate repeat sales.

Should St. Tropez accept either special order? Justify your answer and show your calculations. (Hint: Distinguish between variable and fixed overhead.)

NIKE 10-K PROBLEM

5-63 Special Order

As discussed in Item 1 of **Nike's** 10-K, one of the companies it owns is **Converse**. Converse makes a variety of footwear, apparel, and accessories. One of these products is men's casual sneakers. This shoe is in strong demand. Suppose sales on the casual sneakers during the present year, 20X0, are expected to hit the 1,000,000 mark. Full plant capacity is 1,150,000 units, but the 1,000,000 unit mark is considered normal capacity. The following unit price and cost breakdown is applicable in 20X0:

	Per unit
Sales price	\$145.00
Less: Manufacturing costs	
Materials	\$ 49.00
Direct labor	22.00
Overhead: Variable	14.00
Fixed	16.00
Total manufacturing costs	<u>\$101.00</u>
Gross margin	\$ 44.00
Less selling and administrative expenses	
Selling: Variable	\$ 5.50
Fixed	9.00
Administrative, fixed	12.00
Packaging, variable*	<u>3.50</u>
Total selling and administrative expenses	<u>\$ 30.00</u>
Net profit before taxes	<u>\$ 14.00</u>

*Two types of packaging are available: deluxe, \$3.50 per unit; and standard, \$2.00 per unit.

During March, the company received two special-order requests from **Nordstrom** and **Macy's**. These orders are not part of the budgeted 1,000,000 unit sales for 20X0, but there is sufficient capacity for possibly one order to be accepted. Orders received and their terms are as follows:

Order from Nordstrom: 75,000 loafers at \$136.00 per unit, deluxe packaging

Order from Macy's: 90,000 loafers at \$130.00 per unit, standard packaging

Since these orders were made directly to Converse, no variable selling costs will be incurred.

1. Analyze the profitability of each of these two special orders. Which special order should be accepted?
2. What other aspects need to be considered in addition to profitability?

EXCEL APPLICATION EXERCISE

5-64 Determining Whether to Accept a Special Order

Goal: Create an Excel spreadsheet to determine which special order to accept. Use the results to answer questions about your findings.

Scenario: The Ibunez Tool Company has been offered two different special orders: (1) the production of 40,000 plain circular saws or (2) the production of 20,000 professional circular saws. The company has enough excess capacity to accept either offer, but not both. The plain saw sells for \$65 and has a variable cost of \$50. The professional saw sells for \$100 and has a variable cost of \$75.

When you have completed your spreadsheet, answer the following questions:

1. What is the contribution margin and contribution-margin ratio per unit for the plain circular saw? For the professional circular saw?
2. What is the total contribution margin for the plain circular saw if the company fills this special order? For the professional circular saw special order?
3. What general conclusion can you draw from the data illustrated by the Excel problem?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 5 Decision Guideline
Row 2: Ibunez Tool Company
Row 3: Special Order Analysis
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–E.
4. Adjust column widths as follows:
Column A: 17
Column B: 15
Column C: 10
Column D: 15
Column E: 10
5. In row 7, create the following bold-faced column heading:
Column B: Products
6. Merge and center the Products heading across columns B–E.
7. In row 8, create the following bold-faced column headings:
Column B: Plain Circular Saw
Column D: Professional Circular Saw
8. Merge and center the Plain Circular Saw heading across columns B–C.
9. Merge and center the Professional Circular Saw heading across columns D–E.
10. In column A, create the following row headings:
Row 9: Selling price
Row 10: Variable cost
Row 11: Contribution margin
Skip four rows.
Row 16: Special order units:
Skip one row.
Row 18: Total contribution margin:
11. Merge the headings in rows 16–18 across columns A and B, then right-justify.

Alignment tab: Horizontal: Right

12. Enter the selling price and variable cost for plain and professional saws in columns B and D, respectively.
13. In row 11, create formulas to calculate the contribution margin for each type of saw in columns B and D, respectively.
14. In row 11, create formulas to calculate the contribution-margin percent for each type of saw in columns C and E, respectively.
15. In row 16, enter the number of units requested in the special order for each type of saw in columns C and E, respectively.
16. In row 18, create formulas to calculate the total contribution margin for each type of saw in columns C and E, respectively.
17. Format all amounts in columns B and D as follows:

Number tab: Category: Accounting (\$ sign is left-justified)
Decimal places: 2
Symbol: \$

18. Modify the format of the variable cost amounts to exclude the dollar (\$) sign:

Number tab: Symbol: None

19. Modify the format of the contribution-margin amounts to display a top border, using the default Line Style:

Border tab: Icon: Top Border

20. Format the contribution-margin percent in columns C and E as follows:

Number tab: Category: Percentage
Decimal places: 0

Alignment tab: Horizontal: Center

21. Format the amount in row 16 as follows:

Number tab:	Category:	Number
	Decimal places:	0
	Use 1000 Separator (,):	Checked
Alignment tab:	Horizontal:	Center

22. Format total contribution-margin amounts as follows:

Number tab:	Category:	Accounting
	Decimal places:	0
	Symbol:	\$

23. Save your work, and print a copy for your files.

COLLABORATIVE LEARNING EXERCISE

5-65 Understanding Pricing Decisions

Form teams of three to six students. Each team should contact and meet with a manager responsible for pricing in a company in your area. This might be a product manager or brand manager for a large company or a vice president of marketing or sales for a smaller company.

Explore with the manager how his or her company sets prices. Among the questions you might ask are the following:

- How do costs influence your prices? Do you set prices by adding a markup to costs? If so, what measure of costs do you use? How do you determine the appropriate markup?
- How do you adjust prices to meet market competition? How do you measure the effects of price on sales level?
- Do you use target costing? That is, do you find out what a product will sell for and then try to design the product and production process to make a desired profit on the product?
- What is your goal in setting prices? Do you try to maximize revenue, market penetration, contribution margin, gross margin, or some combination of these, or do you have other goals when setting prices?

After each team has conducted its interview, it would be desirable, if time permits, to get together as a class and share your findings. How many different pricing policies did the groups find? Can you explain why policies differ across companies? Are there characteristics of different industries or different management philosophies that explain the different pricing policies?

INTERNET EXERCISE

5-66 Marketing Decisions at Colgate-Palmolive

Managers need information of all types in order to make decisions. Many marketing decisions are strategic, such as setting pricing policies. Managers rely on multiple sources to help locate relevant information to support these decisions. Managers must know how to use the information that is available and what weight to assign to the information that is deemed to be useful.

A firm is not going to give us detailed information about its marketing strategy on its Web site. However, we can view a firm's Web site to look at some of the relevant information that managers might use to help make marketing decisions. Let's look at the **Colgate-Palmolive Company** to see what information on its site would be relevant for some marketing decisions.

1. Go to Colgate-Palmolive's home page at www.colgatepalmolive.com. Move your cursor to the heading "Investors" at the top of the page. Click on "Investors," then on "Annual Reports & AGM," and then on the "Message to shareholders" in the most recent annual report. In this section, Colgate shares its worldwide strategy. What types of pricing decisions that are discussed in this chapter are part of Colgate's strategy? What does this strategy reveal about the need for relevant information?
2. Many companies place a high priority on ethics. Examine the section "Living Our Values" under the "Our Culture" heading back on the home page. Give two examples that show Colgate's commitment to ethical behavior.

3. One area that many companies identify as a key component to strategy is new product development. Locate where Colgate highlights its new products (you may want to use the search option on the Web site). Based on the information, what was a recent new product release? Is this a “new” product or is it simply a variation of an existing product?
4. Now, look at the products that the firm manufactures. What format is offered for learning about these products? Look at the fabric conditioner products. How many fabric conditioners does the firm offer? From looking at the information provided, can you tell what differentiates the products? Does the Web site provide any information on how or when to use the products? Would you want to make a decision about the “best” fabric conditioner for a specific type of laundry based on the information found on the Web site? Why or why not?
5. Let’s look at the most recent annual report again. Is there evidence in the financial statements that Colgate is achieving its worldwide strategy? Is the company improving profitability?

Relevant Information for Decision Making with a Focus on Operational Decisions

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Use a differential analysis to examine income effects across alternatives and show that an opportunity-cost analysis yields identical results.
2. Decide whether to make or buy certain parts or products.
3. Choose whether to add or delete a product line using relevant information.
4. Compute the optimal product mix when production is constrained by a scarce resource.
5. Decide whether to process a joint product beyond the split-off point.
6. Decide whether to keep or replace equipment.
7. Identify irrelevant and misspecified costs.
8. Discuss how performance measures can affect decision making.

► NANTUCKET NECTARS

Starting a beverage business can be a complex maze of decisions. Tom First and Tom Scott should know. After graduating from college, they operated a two-person boat service business off Nantucket Island, provisioning and cleaning yachts during the summer. In 1989, they received the inspiration for a juice drink made with fresh peaches. After a bit of experimentation, the self-proclaimed “juice guys” began bottling and selling their nectar drink from their boat. That first summer, they sold 2,000 bottles at \$1.00 each. Today, **Nantucket Nectars**, bought by **Cadbury-Schweppes** in 2002 and now owned by **Keurig Dr Pepper**, sells millions of cases each year. Product lines include 17 flavours of Nantucket Nectars, 100% fruit juices, juice cocktails, carbonated juice drinks, and not-from-concentrate teas and lemonades.

Getting to this point, however, has been anything but smooth sailing. First and Scott’s early attempts to sell juice to retailers failed; profits were nonexistent. They sold half the business to an equity partner for \$500,000 to venture into distribution, but ended up losing \$1 million the first year. Employees stole caseloads of merchandise from the warehouse, and there were product disappointments, such as Bayberry Tea. But the juice guys were quick learners. They got out of distribution, changed their marketing approach, and stopped the flow of red ink.

As the company grew, it tackled important operational decisions. For example, should it build and operate its own bottling facilities? What criteria should be used for developing new products? What’s the best approach for tracking and analyzing the growing volume of production, distribution, and sales data?

After examining the cost of building and operating bottling plants, Nantucket Nectars chose to contract with existing beverage co-packers in Rhode Island, Nevada, Florida, Pennsylvania, and Maryland. This approach gave the company broader distribution options without the capital expenditure and overhead of multiple plants. Its managers scrutinized unit costs associated with new product ideas emerging from the test kitchen to be sure margins were on target, and they meticulously tracked every detail—from operational costs to pricing promotions—through an enterprise resource planning (ERP) information system from **Oracle**.

As with Nantucket Nectars, managers in other companies must make similar operational decisions. Should **Toyota** make the tires it mounts on its cars, or should it buy them from suppliers? Should **General Mills** sell the flour it mills, or should it use the flour to make more breakfast cereal? Should **Air France** add routes to use idle airplanes, or should it sell the planes? These decisions all require a good deal of accounting information. But what information will be relevant to each decision? In Chapter 5, we identified relevant information for pricing decisions. In this chapter, we examine relevance in the operational area. The basic framework for identifying relevant information remains the same for operations as it was for pricing. We are still looking only for future costs that differ among alternatives. However, we now expand our analysis by introducing the concepts of opportunity costs and differential costs. ■



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Analyzing Relevant Information: Focusing on the Future and Differential Attributes

Opportunity, Outlay, and Differential Costs and Analysis

Management decision making is a matter of comparing two or more alternative courses of action. Suppose a manager has only two alternatives to compare. The key to determining the financial difference between the alternatives is to identify the differential costs and revenues. **Differential cost (differential revenue)** is the difference in total cost (revenue) between two alternatives. For example, consider the decision about which of two machines to purchase. Both machines perform the same function. The differential cost is the difference in the price paid for the machines plus the difference in the costs of operating the machines. We call a decision process that compares the differential revenues and costs of alternatives a **differential analysis**.

When managers analyze the differential costs between the existing situation and a proposed alternative, they often refer to this as **incremental analysis**. They examine the incremental (additional) costs and benefits of the proposed alternative compared with the current situation. The **incremental costs** are additional costs or reduced revenues generated by the proposed alternative. **Incremental benefits** are the additional revenues or reduced costs generated by the proposed alternative. For instance, suppose **Nantucket Nectars** proposes to increase production of its NectarFizz juice drink from 1,000 bottles to 1,200 bottles per week. The incremental costs of the proposed alternative are the costs of producing the additional 200 bottles each week. The incremental benefits are the additional revenues generated by selling the extra 200 bottles.

When there are multiple alternative courses of action, managers often compare one particular action against the entire set of alternatives. Let's consider another example. Nantucket Nectars proposes introducing a new 100% juice drink, Papaya Mango, which requires the use of a machine that is currently sitting idle. Nantucket Nectars can sell the Papaya Mango produced over the remaining life of the machine for \$500,000. In addition, the company will incur **outlay costs**—costs that require a future cash disbursement to purchase needed resources—of \$400,000, producing a net financial benefit of \$100,000.

Nantucket Nectars purchased the machine for \$100,000 several years ago, but we know that the \$100,000 paid for the machine is not relevant. Why? Because, as we learned from our discussion of relevant costs in Chapter 5, it is not a future cost nor does it differ across the alternatives. But what if the machine can be used for alternatives other than producing Papaya Mango? To decide whether to use the machine to produce Papaya Mango, the company needs to compare the benefit of using the machine for Papaya Mango against the other alternative uses of the machine. Suppose there are two alternative uses, 1) selling the machine for \$50,000 and 2) using it to produce additional bottles of Original Peach juice, which would generate revenues less outlay costs of \$60,000. Using an incremental approach, we compare the revenues and outlay costs of the proposed alternative, producing Papaya Mango, to those of the other alternative uses of the machine. In this case, the revenue less outlay costs for Papaya Mango is \$100,000, for Original Peach is \$60,000, and for selling the machine is \$50,000. Thus, the result of the incremental analysis shows that producing Papaya Mango is \$40,000 better than the next best alternative use of the machine.

When you relax with a bottle of Nantucket Nectars juice, you do not consider the various costs that go into producing, selling, and distributing the bottle. But these costs are very important to the managers at Nantucket Nectars.

Objective I

Use a differential analysis to examine income effects across alternatives and show that an opportunity-cost analysis yields identical results.

differential cost

The difference in total cost between two alternatives.

differential revenue

The difference in total revenue between two alternatives.

differential analysis

A decision process that compares the differential revenues and costs of alternatives.

incremental analysis

An analysis of the incremental (additional) costs and benefits of a proposed alternative compared with the current situation.

incremental costs

The additional costs or reduced benefits generated by the proposed alternative in comparison with the current situation.

incremental benefits

The additional revenues or reduced costs generated by the proposed alternative in comparison with the current situation.

outlay cost

A cost that requires a future cash disbursement.

opportunity cost

For a resource that a company already owns or that it has already committed to purchase, the maximum available benefit forgone (or passed up) by using such a resource for a particular purpose.

If there are many alternative uses of the machine, incremental analysis can become cumbersome. In such a case, Nantucket Nectars could use an alternative approach using opportunity costs. Opportunity cost applies to a resource that a company already owns, so its use requires no additional cash disbursement. We define **opportunity cost** as the maximum available benefit forgone (or passed up) by using a resource a company already owns for a particular purpose instead of using it in the best alternative use.

In our example, there are only two alternative uses of the machine, selling it or using it to produce extra Original Peach. Using the machine to produce Papaya Mango requires Nantucket Nectars to forgo selling the machine for \$50,000 and also to forgo using it for Original Peach and generating \$60,000 of benefit. The best alternative use is producing Original Peach, so the opportunity cost of the machine is \$60,000.

Using opportunity costs, we can compute the net financial benefit of producing Papaya Mango:

Revenues	\$500,000
Costs:	
Outlay costs	400,000
Financial benefit before opportunity costs	\$100,000
Opportunity cost of machine	60,000
Net financial benefit	<u>\$ 40,000</u>

Nantucket Nectars will gain \$40,000 more financial benefit using the machine to make Papaya Mango than it would gain using it for the next most profitable alternative. This is equivalent to the result using incremental analysis.

To further illustrate this equivalence, consider Maria Morales, a certified public accountant employed by a large accounting firm for a salary of \$60,000 per year. She is considering an alternative use of her time, her most valuable resource. The alternative is to start an independent accounting practice. Maria’s practice would have revenues of \$200,000. This is \$140,000 more than she would make as an employee of the large firm. However, she would also have to pay \$120,000 to rent office space, lease equipment, buy advertising, and cover other out-of-pocket expenses.

An incremental analysis follows:

Assume Maria Opens Her Own Independent Practice	
Incremental benefits, \$200,000 – \$60,000 of increased revenues	\$140,000
Incremental costs, \$120,000 – \$0 of additional costs	120,000
Incremental income effects per year	<u>\$ 20,000</u>

If Maria opens her own practice, her income will be \$20,000 higher than it is as an employee of the large firm.

Now let’s take an opportunity-cost approach. We will look at the alternative of operating an independent practice, essentially comparing it to the alternative uses of Maria’s time (which in this case is simply the alternative of working for the large firm). To do this we must consider another cost. Had Maria remained an employee, she would have made \$60,000. By starting her own company, Maria will forgo this profit. Thus, the \$60,000 is an opportunity cost of starting her own business:

		Alternative Chosen: Independent Practice
Revenue		\$200,000
Expenses		
Outlay costs (operating expenses)	\$120,000	
Opportunity cost of employee salary	<u>60,000</u>	<u>180,000</u>
Income effects per year		<u>\$ 20,000</u>

Consider the two preceding tabulations. Each produces the correct key difference between alternatives, \$20,000 per year. The first tabulation does not mention opportunity cost because we measured the differential economic impacts—differential revenues and differential costs—compared to the alternative. The second tabulation mentions opportunity cost because we included the \$60,000 annual net economic impact of the excluded alternative as a cost of the chosen alternative. If we had failed to recognize opportunity cost in the second tabulation, we would have misstated the difference between the alternatives.

Why do we use opportunity costs when an incremental analysis produces the same result? When there is only one resource and one alternative opportunity to use that resource, the incremental analysis is more straightforward. However, suppose you were analyzing a project that uses five existing machines each with 10 alternative uses. An incremental analysis would require comparing the project with $10^5 = 100,000$ alternatives—every combination of alternative uses of the five machines. Using opportunity costs allows you to simplify the analysis. You just assess the 10 alternatives for each machine, pick the best one to use in determining each machine's opportunity cost, and add the five opportunity costs to the outlay costs of the project. The opportunity-cost approach is simpler than the incremental approach in such a situation.

This does not mean that estimating opportunity costs is easy. They depend on estimated revenues and costs for hypothetical alternatives—alternatives not taken. Furthermore, they depend on the alternatives that are available at a particular point in time. The same alternatives may not be available at a different time. For example, excess capacity in September does not mean that there will also be excess capacity in October. Finally, there is little historical information—sale or purchase prices—to help predict benefits for hypothetical alternatives.

We will next use the concepts in this section to analyze a variety of operational decisions. Just as we focused on relevant costs for pricing decisions in Chapter 5, we will focus on relevant costs for operational decisions in this chapter.

Making Managerial Decisions

Suppose you are a warehouse manager at **Mattel**, the toy company. **Ace Hardware** approaches you asking to rent warehouse space for January–April for storage of garden tools for the spring sales season. What is the likely opportunity cost to Mattel of the warehouse space? What if the request were for September–November?

Answer

At a toy company, excess warehouse space is a seasonal phenomenon. There is unlikely to be excess space late in the year as the holiday season

approaches, but Mattel may have little use for the space in January–April. You might look for other temporary alternatives, ones that use the space for only a few months. If there are no such alternatives, the opportunity cost is close to zero. If other alternatives exist, the opportunity cost is the benefit that Mattel would receive from the next best alternative use. If the request came in September, the opportunity cost would likely be high because Mattel needs the space to accommodate its own toy inventory for holiday sales.

Make-or-Buy Decisions

Managers often must decide whether to produce a product or service within the firm or purchase it from an outside supplier. If they purchase products or services from an outside supplier, we often call it **outsourcing**. Managers apply relevant-cost analysis to a variety of outsourcing decisions such as the following:

- **Boeing** must decide whether to buy or make many of the tools used in assembling 787 airplanes.
- **Wells Fargo** must decide whether to operate its own call center or buy services from a call center in India.
- **Apple** must decide whether to develop its own Internet search software for a new computer or to buy it from a software vendor.

The Business First box on p. 248 describes outsourcing and its growing popularity.

Objective 2

Decide whether to make or buy certain parts or products.

outsourcing

Purchasing products or services from an outside supplier.

An Example of Make or Buy: Outsourcing

Make-or-buy decisions (or outsourcing decisions) apply to services as well as to products. Companies are increasingly deciding to hire service firms to handle some of their internal operations. Around 54% businesses use third-party support teams to connect with customers. In 2020, an estimated 71% financial service companies offshored some of their services and 78% of those using outsourcing partners were positive about the decision. According to the Outsourcing Institute, outsourcing is “the strategic use of outside resources to perform activities traditionally handled by internal staff and resources.”

Companies use outsourcing for many business processes within various value-chain functions. The most common business functions outsourced are within the value-chain functions of corporate support (e.g., administration, human resources, finance, and IT) and marketing (e.g., sales and call centers). Additionally, some companies outsource production processes and even research and development activities. For example, **Ring**, bought by Amazon in 2018, opened a research and development center in Kyiv, Ukraine, in 2016. The office now employs over 500 people.

Although companies can outsource many processes, the Internet has driven much of the recent growth in outsourcing of computer applications. By the beginning of the twenty-first century, many companies realized that the huge investments necessitated by ERP systems may be unnecessary. They could purchase the required services over the Internet without investing in the systems' purchase and development costs. The formerly expensive process of communication using service providers had become essentially free via the Internet. A new group of computing service providers—called application service providers (ASPs)—arose to provide outsourcing opportunities for a variety of computing applications.

What are the key reasons for outsourcing? Over half of the companies in Outsourcing Institute's annual survey said

they wanted to improve the company's focus and reduce operating costs. According to Todd Kertley, then manager of **IBM's** outsourcing services, “Corporations increasingly want to focus on their core businesses, not technology.” As the complexity of data processing and especially networking has grown, companies have found it harder and harder to keep current with the technology. Instead of investing huge sums in personnel and equipment and diverting attention from the value-added activities of their own businesses, many firms have found outsourcing financially attractive. Additionally, many companies are discovering that outsourcing aids corporate growth, making better use of skilled labor, and even job creation. Such “transformational outsourcing” exploits the enormous gains in efficiency, productivity, and revenues that accrue to firms from leveraging offshore talent.

The big stumbling block to outsourcing has been subjective factors, such as control. To make outsourcing attractive, the services must be reliable, be available when needed, and be flexible enough to adapt to changing conditions. Companies that have successful outsourcing arrangements have been careful to include the subjective factors in their decisions.

Outsourcing has become common—According to Statista and GlobeNewswire, the global IT outsourcing market will be worth \$425.19 billion by 2026. Countries such as India will see the benefits of this trend; India's IT outsourcing industry will see a growth of 7.25% by 2025 according to Outsource Accelerator. However, these trends seem more focused on larger businesses. Around 66% of the larger businesses are likely to outsource activities compared to 29% of the smaller businesses.

Sources: Adapted from T. Kearney, “Why Outsourcing Is In,” *Strategic Finance*, January 2000, pp. 34–38; J. Hechinger, “IBM to Take Over Operations of Auto-Parts Maker Visteon,” *Wall Street Journal*, February 12, 2003; P. Engardio, M. Arndt, and D. Foust, “The Future of Outsourcing,” *Business Week*, January 30, 2006; and the Outsourcing Institute (www.outsourcing.com).

Basic Make-or-Buy Decisions and Idle Facilities

A basic make-or-buy question is whether a company should make its own parts that it will use in its final products or buy the parts from vendors. Sometimes the answer to this question is based on qualitative factors. For example, some manufacturers always make parts because they want to control quality. Alternatively, some companies always purchase parts to protect long-run relationships with their suppliers. These companies may deliberately buy from vendors even during slack times to avoid difficulties in obtaining needed parts during boom times when there may be shortages of materials and workers, but no shortage of sales orders.

What quantitative factors are relevant to the decision of whether to make or buy? The answer, again, depends on the situation. A key factor is whether there are idle facilities. Many companies make parts when they cannot use their facilities to better advantage.

Assume that **Nantucket Nectars** reports the following costs:

Nantucket Nectars Company Cost of Making 12-Ounce Glass Bottles		
	Total Cost for 1,000,000 Bottles	Cost per Bottle
Direct materials	\$ 60,000	\$0.06
Direct labor	20,000	0.02
Variable factory overhead	40,000	0.04
Fixed factory overhead	80,000	0.08
Total costs	<u>\$200,000</u>	<u>\$.20</u>

Another manufacturer offers to sell Nantucket Nectars the bottles for \$0.18. Should Nantucket Nectars make or buy the bottles?

Although the \$0.20/unit in-house cost seemingly indicates that the company should buy, the answer may be more complicated. The essential question is “What is the difference in expected future costs between the alternatives?” Suppose the \$0.08 fixed overhead per bottle consists of costs that will continue regardless of the decision, such as depreciation, property taxes, insurance, and foreman salaries for the plant. In that case, the entire \$0.08 becomes irrelevant.

Are the fixed costs always irrelevant? No. Suppose instead Nantucket Nectars will eliminate \$50,000 of the fixed costs if the company buys the bottles instead of making them. For example, the company may be able to release a supervisor with a \$50,000 salary. In that case, the fixed costs that the company will be able to avoid in the future are relevant.

For the moment, suppose the capacity now used to make bottles will become idle if the company purchases the bottles. Further, the \$50,000 supervisor’s salary is the only fixed cost that the company would eliminate. The relevant computations follow:

	Make		Buy	
	Total	Per Bottle	Total	Per Bottle
Purchase cost			\$180,000	\$0.18
Direct materials	\$ 60,000	\$0.06		
Direct labor	20,000	0.02		
Variable factory overhead	40,000	0.04		
Fixed factory overhead that can be avoided by not making (supervisor’s salary)	50,000*	0.05*		
Total relevant costs	<u>\$170,000</u>	<u>\$0.17</u>	<u>\$180,000</u>	<u>\$0.18</u>
Difference in favor of making	<u>\$ 10,000</u>	<u>\$0.01</u>		

*Note that unavoidable fixed costs of \$80,000 – \$50,000 = \$30,000 are irrelevant. Thus, the irrelevant costs per unit are \$0.08 – \$0.05 = \$0.03.

The key to optimal make-or-buy decisions is identifying and accurately measuring the additional costs for making (or the costs avoided by buying) a part or component. Companies with accurate cost accounting systems, such as ABC systems discussed in Chapter 4, are in a better position to perform make-or-buy analysis.

Make or Buy and the Use of Facilities

Make-or-buy decisions are rarely as simple as the one in our Nantucket Nectars example. As we said earlier, the use of facilities is a key to the make-or-buy decision. For simplicity, we assumed that the Nantucket Nectars facilities would remain idle if the company chose to buy the bottles. This implies the opportunity cost of the facilities is zero. In most cases, it is not optimal for companies to leave their facilities idle. Instead, they will often put idle facilities to some other use, and we must consider the financial outcomes of these uses when choosing to make or buy. The value received from the best of these alternative uses is an opportunity cost for the internal production of the parts or components.

Suppose Nantucket Nectars can use the released facilities in our example in some other manufacturing activity that generates additional contribution margin of \$55,000, or can rent them out for \$25,000. We now have four alternatives to consider. The following table is an incremental analysis that summarizes all the costs and revenues that differ among the four alternatives (amounts are in thousands):

	Make	Buy and Leave Facilities Idle	Buy and Rent Out Facilities	Buy and Use Facilities for Other Products
Rent revenue	\$ ____	\$ ____	\$ 25	\$ ____
Additional contribution margin from other products	____	____	____	55
Relevant cost of bottles	<u>(170)</u>	<u>(180)</u>	<u>(180)</u>	<u>(180)</u>
Net relevant costs	<u>\$ (170)</u>	<u>\$ (180)</u>	<u>\$ (155)</u>	<u>\$ (125)</u>

The final column indicates that buying the bottles and using the vacated facilities for the production of other products would yield the lowest net costs in this case, $\$170,000 - \$125,000 = \$45,000$ less than the cost of making the bottles.

Alternatively, we can analyze this choice using opportunity costs. The opportunity cost of the facilities is \$55,000 because that is the maximum benefit Nantucket Nectars could get if it did not use the facilities to make bottles. Add that to the outlay cost, and the total cost of making the bottles is \$225,000. This is \$45,000 higher than the \$180,000 cost of purchasing the bottles.

Making Managerial Decisions

Suppose a company uses its facilities, on average, 80% of the time. However, because of seasonal changes in the demand for its product, the actual demand for the facilities varies from 60% in the off-season to over 100% in the peak season when it must outsource production of some parts. Under what circumstances would the company choose to take on work for other companies during the off-season? Why might it continue to outsource production of parts during the peak season—that is, why would the company choose not to expand its capacity?

Answer

During the off-season, the company would decide to take on work for other manufacturers (on a subcontract) if it is profitable. Such work may not be profitable enough to cover the cost

of expanding the capacity of the facilities. The company will use facilities for these orders only when the opportunity cost of using the facilities is close to zero, that is, when there are no other more profitable uses for them. In contrast, during the peak season, the company meets the high volume by outsourcing the production of some parts. Again, the cost of purchased parts may be higher than the cost to make them in the company's own facilities if there were idle capacity, but purchasing the parts is less costly than expanding the facilities to produce them. Additionally, a company may increase production above demand (but below capacity) in the off-season in order to build inventory for the busy season.

Summary Problem for Your Review

PROBLEM

Exhibit 6-1 contains data for the Block Company for the year just ended. The company makes industrial power drills. Exhibit 6-1 shows the costs of the plastic housing separately from the costs of the electrical and mechanical components. Answer each of the following questions independently. (Requirement 1 reviews Chapter 5.)

	A	B	A + B
	Electrical and Mechanical Components*	Plastic Housing	Industrial Drills
Sales: 100,000 units, at \$100			\$10,000,000
Variable costs			
Direct materials	\$4,400,000	\$ 500,000	\$ 4,900,000
Direct labor	400,000	300,000	700,000
Variable factory overhead	100,000	200,000	300,000
Other variable costs	100,000	—	100,000
Sales commissions, at 10% of sales	1,000,000	—	1,000,000
Total variable costs	<u>\$6,000,000</u>	<u>\$1,000,000</u>	<u>\$ 7,000,000</u>
Contribution margin			\$ 3,000,000
Total fixed costs	<u>\$2,220,000</u>	<u>\$ 480,000</u>	<u>2,700,000</u>
Operating income			<u>\$ 300,000</u>

*Not including the costs of plastic housing (column B).

Exhibit 6-1
Block Company Cost of Industrial Drills

1. During the year, a prospective customer in an unrelated market offered \$82,000 for 1,000 drills. The drills would be manufactured in addition to the 100,000 units sold. Block Company would pay the regular sales commission rate on the 1,000 drills. The president rejected the order because “it was below our costs of \$97 per unit.” What would operating income have been if Block Company had accepted the order?
2. A supplier offered to manufacture the year’s supply of 100,000 plastic housings for \$12.00 each. What would be the effect on operating income if the Block Company purchased rather than made the housings? Assume that Block Company would avoid \$350,000 of the fixed costs assigned to housings if it purchases the housings.
3. Suppose that Block Company could purchase the housings for \$13.00 each and use the vacated space for the manufacture of a deluxe version of its drill. Assume that it could make 20,000 deluxe units (and sell them for \$130 each in addition to the sales of the 100,000 regular units) at a unit variable cost of \$90, exclusive of housings and exclusive of the 10% sales commission. The company could also purchase the 20,000 extra plastic housings for \$13.00 each. All the fixed costs pertaining to the plastic housings would continue because these costs relate primarily to the manufacturing facilities used. What would operating income have been if Block had bought the housings and made and sold the deluxe units?

SOLUTION

1. The costs of filling the special order follow:

Direct materials	\$49,000
Direct labor	7,000
Variable factory overhead	3,000
Other variable costs	1,000
Sales commission at 10% of \$82,000	<u>8,200</u>
Total variable costs	\$68,200
Selling price	<u>82,000</u>
Contribution margin	<u>\$13,800</u>

Operating income would have been $\$300,000 + \$13,800 = \$313,800$ if Block Company had accepted the order. In a sense, the decision to reject the offer implies that the Block Company is willing to forego \$13,800 in immediate gains (an opportunity cost) in order to preserve the long-run selling price structure.

2. Assuming that Block Company could have avoided \$350,000 of the fixed costs by not making the housings and that the other fixed costs would have continued, we can summarize the incremental costs and benefits of buying the housings compared with making them as follows:

Incremental cost (Purchase cost of $100,000 \times \$12$)	\$1,200,000
Incremental benefits:	
Variable costs	\$1,000,000
Avoidable fixed costs	<u>350,000</u>
Net incremental benefit	<u>\$ 150,000</u>

If the facilities used for plastic housings became idle, the Block Company would prefer to buy the housings. Operating income would increase by \$150,000.

3. The effect of purchasing the plastic housings and using the vacated facilities for the manufacture of a deluxe version of its drill follows:

Incremental Benefit:

Sales increase, 20,000 units, at \$130		\$2,600,000
Variable costs exclusive of housings increase, 20,000 units, at \$90	\$1,800,000	
Plus: sales commission, 10% of \$2,600,000	<u>260,000</u>	<u>\$2,060,000</u>
Contribution margin on 20,000 units		\$ 540,000

Incremental Cost:

Housings: 120,000 rather than 100,000 would be needed; buy 120,000 at \$13	\$1,560,000	
Versus make 100,000 at \$10 (only the variable costs are relevant)	<u>1,000,000</u>	
Incremental cost of outside purchase		560,000
Fixed costs, unchanged		<u>—</u>
Net incremental cost to buying		<u>\$ 20,000</u>

Operating income would decline to $\$300,000 - \$20,000 = \$280,000$. The deluxe units bring in a contribution margin of \$540,000, but the additional costs of buying rather than making housings is \$560,000, leading to a net disadvantage of \$20,000.

Deletion or Addition of Products, Services, or Departments

Objective 3

Choose whether to add or delete a product line using relevant information.

Relevant information also plays an important role in decisions about adding or deleting products, services, or departments.

Avoidable and Unavoidable Costs

Often, existing businesses consider expanding or contracting their operations to improve profitability. Decisions to add or to drop products or services, or to add or drop departments use the same analysis: examining all the relevant costs and revenues. For example, consider a supermarket that has three major departments: Clothing, general merchandise, and groceries. Management is considering dropping the clothing department, which has consistently shown an operating loss following the onset of the COVID-19 pandemic. The following table reports the store's annual operating income (in thousands of euros):

	Departments			
	Total	Clothing	General Merchandise	Groceries
Sales	€1,900	€1,000	€800	€100
Variable cost of goods sold and expenses*	<u>1,420</u>	<u>800</u>	<u>560</u>	<u>60</u>
Contribution margin	€ 480 (25%)	€ 200 (20%)	€240 (30%)	€ 40 (40%)
Fixed expenses (salaries, depreciation, insurance, property taxes, and so on):				
Avoidable	€ 265	€ 150	€100	€ 15
Unavoidable	<u>180</u>	<u>60</u>	<u>100</u>	<u>20</u>
Total fixed expenses	€ 445	€ 210	€200	€ 35
Operating income (loss)	<u>€ 35</u>	<u>€ (10)</u>	<u>€ 40</u>	<u>€ 5</u>

*Examples of variable expenses include product, paper shopping bags, and sales commissions.

Notice that we have divided the fixed expenses into two categories, avoidable and unavoidable. **Avoidable costs**—costs that will not continue if an ongoing operation is changed or deleted—are relevant. In our example, avoidable costs include department salaries and other costs that the store could eliminate by not operating the specific department. **Unavoidable costs**—costs that continue even if a company discontinues an operation—are not relevant in our example because a decision to delete the department does not affect them. Unavoidable costs include many **common costs**, which are those costs of facilities and services that are shared by users. For example, depreciation, heating, air conditioning, and general management expenses are costs of shared resources used by all departments. For our example, assume first that we will consider only two alternatives, dropping or continuing the clothing department, which shows a loss of €10,000. Assume further that the decision will not affect the total assets invested in the supermarket. The vacated space would be idle, and the unavoidable costs would continue. Which alternative would you recommend? An analysis (in thousands of euros) follows:

avoidable costs

Costs that will not continue if an ongoing operation is changed or deleted.

unavoidable costs

Costs that will continue even if a company discontinues an operation.

common costs

Those costs of facilities and services that are shared by users.

Store as a Whole			
Income Statements	Total Before Change (a)	Effect of Dropping Clothing (b)	Total After Change (a) – (b)
Sales	€1,900	€1,000	€ 900
Variable expenses	<u>1,420</u>	<u>800</u>	<u>620</u>
Contribution margin	€ 480	€ 200	€ 280
Avoidable fixed expenses	<u>265</u>	<u>150</u>	<u>115</u>
Profit contribution to common space and other unavoidable costs	€ 215	€ 50	€ 165
Common space and other unavoidable costs	<u>180</u>	<u>—</u>	<u>180</u>
Operating income (loss)	<u>€ 35</u>	<u>€ 50</u>	<u>€ (15)</u>

The preceding analysis shows that operating income would be worse, rather than better, if the supermarket drops the clothing department and leaves the vacated facilities idle. In short, clothing brings in a contribution margin of €200,000, which is €50,000 more than the €150,000 fixed expenses the supermarket would save by closing the clothing department. The clothing department showed a loss in the first income statement because of the unavoidable fixed costs charged (allocated) to it, and these costs will not be eliminated when the clothing department is dropped.

Most companies do not like having space left idle, so perhaps the preceding example was a bit too basic. Assume now that the supermarket could use the space made available by dropping the clothing department to expand the general merchandise department. The space would be occupied by merchandise that would increase sales by €500,000, generate a 30% contribution-margin percentage, and have additional (avoidable) fixed costs of €70,000. The €80,000 increase in operating income of general merchandise more than offsets the €50,000 decline from eliminating clothing, providing an overall increase in operating income of €65,000 – €35,000 = €30,000. The analysis is as follows:

Effects of Changes				
	Total Before Change (a)	Drop Clothing (b)	Expand General Merchandise (c)	Total After Changes (a) – (b) + (c)
(in thousands of euros)				
Sales	€1,900	€1,000	€500	€1,400
Variable expenses	<u>1,420</u>	<u>800</u>	<u>350</u>	<u>970</u>
Contribution margin	€ 480	€ 200	€150	€ 430
Avoidable fixed expenses	<u>265</u>	<u>150</u>	<u>70</u>	<u>185</u>
Contribution to common space and other unavoidable costs	€ 215	€ 50	€ 80	€ 245
Common space and other unavoidable costs*	<u>180</u>	<u>—</u>	<u>—</u>	<u>180</u>
Operating income	<u>€ 35</u>	<u>€ 50</u>	<u>€ 80</u>	<u>€ 65</u>

*Includes the €60,000 of former clothing fixed costs, which were allocations of unavoidable common costs that will continue regardless of how the space is occupied.

This example illustrates that relevant costs are not always variable. The key to decision making is not relying on a hard and fast rule about what to include and what to ignore. Rather, you need to analyze all pertinent costs and revenues to determine what is and what is not relevant in the specific context. In this case, the relevant costs included the avoidable fixed costs.

It is also important to remember that nonfinancial information can influence decisions to add or delete products or departments. For example, when deciding to delete a product or to close a plant, there are ethical considerations. What happens to the employees in the area being discontinued? What about customers who might be relying on customer support in the future? What about the community in which a discontinued operation is located? Although the nonfinancial impacts of such considerations are hard to determine, they must be considered. This may be a situation where good ethics is good business, as a stable, committed workforce and a supportive community can be important assets to a company. Additionally, negative impacts on employees, customers, or communities could create future financial problems for the company that are much larger than short-term cost savings from discontinuing a product or plant.

Making Managerial Decisions

When managers face a decision about whether to add or delete a product, service, or department, it is useful to classify the associated fixed costs as avoidable or unavoidable. Indicate whether the following fixed costs are typically avoidable or unavoidable if a company deletes a product. Assume the company produces many products in a single plant.

1. Advertising costs for the product. The company places specific ads just for this product.
2. Salary of the plant manager.
3. Rent for the plant building.

4. Insurance costs on equipment used to produce the product. The company will sell the equipment if it discontinues the product.

Answer

Numbers 1 and 4 are avoidable fixed costs. The company is unlikely to change the salary of the plant manager if it discontinues only one product. Thus, it is unavoidable. The same is true for the plant rent. Hence, it is also an unavoidable cost.

Objective 4

Compute the optimal product mix when production is constrained by a scarce resource.

limiting factor (scarce resource)

The item that restricts or constrains the production or sale of a product or service.

Optimal Use of Limited Resources: Product-Mix Decisions

Suppose a plant makes more than one product and is operating at capacity. If demand for its products exceeds the amount the company can produce, managers must decide on the product mix to produce. The product-mix decision requires a focus on each product's contribution margin and its use of capacity. Managers should emphasize the product that makes the largest contribution per unit of the limiting factor. A **limiting factor** or **scarce resource** restricts or constrains the production or sale of a product or service. Examples of limiting factors include labor hours and machine hours that limit production (and hence sales) in manufacturing firms, and square feet of floor space or cubic meters of display space that limit sales in department stores.

Managers must use the contribution margin technique wisely. They sometimes mistakenly favor those products with the biggest contribution margin or gross margin per unit or per sales dollar, without regard to scarce resources. This could lead to an incorrect product-mix decision.

Consider two different athletic shoes produced by **Nike**, the Air Court tennis shoe and the Air Max running shoe. Assume that one factory is the only facility that produces these shoes, and Nike managers must decide how many shoes of each type to produce. Suppose machine time is the measure of capacity in this factory, and there is a maximum of 10,000 hours of machine time. The factory can produce 10 pairs of Air Court shoes or 5 pairs of Air Max shoes in 1 hour of machine time. Unit data follow:

	Air Court	Air Max
Selling price per pair	\$80	\$120
Variable costs per pair	<u>60</u>	<u>84</u>
Contribution margin per pair	<u>\$20</u>	<u>\$ 36</u>
Contribution margin ratio	<u>25%</u>	<u>30%</u>

Which is more profitable, the Air Court or Air Max? On which should Nike spend its resources? The correct answer is “It depends.” Suppose the factory has excess capacity of 1,000 hours of machine time. Now a sports retailer approaches Nike and wants it to fill a special order for 1,000 pairs of shoes of either type. Which shoe would be most profitable to fill this order, the Air Court or the Air Max? Since there would still be an excess capacity of machine hours after filling the special order with either shoe, it would be better to produce and sell an Air Max pair contributing \$36 than an Air Court pair contributing \$20. In this case, Air Max shoes generate more profit per pair. Thus, if the limiting factor is demand—that is, pairs of shoes that Nike can sell—the more profitable product is the one with the higher contribution per unit.

Now suppose the demand for either shoe would exceed the factory’s capacity. Production capacity is now the limiting factor because there is only one factory in which to make either the Air Max or the Air Court. In this case, the Air Court shoe is more profitable. Why? Because it generates \$2,000,000 of contribution margin from the capacity that is available compared to \$1,800,000 for Air Max:

	Air Court	Air Max
1. Pairs of shoes from 10,000 hours	100,000	50,000
2. Contribution margin per pair	\$ 20	\$ 36
3. Contribution margin from 10,000 hours of capacity, (1) $\times$ (2)	\$2,000,000	\$1,800,000
Contribution margin per machine hour, (3) $\div$ 10,000	\$ 200	\$ 180

Each machine hour used to produce Air Court shoes generates \$200 of contribution, while an hour used to produce Air Max shoes generates only \$180.

Now suppose that neither shoe alone has enough demand to fill the entire capacity, but the combined demand will more than fill the capacity. What our analysis tells us is the Air Court shoe is a better use of the production capacity than the Air Max shoe. Nike would want to make sure there are as many pairs of Air Court shoes available as customers demand, and only after satisfying this demand is it worth producing Air Max shoes using the remaining available capacity.

This analysis depends on the relative use of capacity by the two products. Suppose the factory can produce seven instead of five Air Max shoes per hour of machine time. With this change in assumptions, the Air Max becomes the more profitable use of the capacity. It would have a \$252 contribution for each machine hour compared with Air Court’s \$200.

	Air Court	Air Max
Contribution from 10,000 machine hours	$10,000 \times 10 \times \$20 = \$2,000,000$	$10,000 \times 7 \times \$36 = \$2,520,000$
Contribution per machine hour	$\$2,000,000 \div 10,000 = \$200$	$\$2,520,000 \div 10,000 = \$252$

Air Max shoes have more contribution per unit of capacity—per hour or per 10,000 hours. Note that each of these financial measures shows that Air Max shoes are 26% more profitable than the Air Court. That is, $(\$252 - \$200) \div \$200 = 26\%$, and $(\$2,520,000 - \$2,000,000) \div \$2,000,000 = 26\%$.

This issue of optimizing the use of scarce resources is important in non-manufacturing companies as well. In retail stores, the limiting resource is often floor space. In such cases, companies focus either on products taking up less space or on using the space for shorter periods of time—greater **inventory turnover** (number of times the average inventory is sold per year). However, the product that is most profitable when one particular factor limits sales may be the least profitable if a different factor restricts sales. Consider an example of two department stores. The contribution margin percentage (contribution margin $\div$ selling price) is an insufficient clue to profitability because, as we said, profits depend on the space occupied and the inventory turnover. Discount department stores, such as **Wal-Mart**, **Target**, and **Kmart**, have succeeded in using lower contribution margins (i.e., lower markups) than traditional department stores because they have been able to increase turnover and, thus, increase the contribution per unit of space. Exhibit 6-2 illustrates the same product, taking up the same amount of space, in each of two stores. The contribution margins per unit and per sales dollar are less in the discount

inventory turnover

The number of times the average inventory is sold per year.

Exhibit 6-2
Effect of Inventory
Turnover on Profit

	Regular Department Store	Discount Department Store
Retail price	\$ 4.00	\$ 3.50
Cost of merchandise and other variable costs	<u>3.00</u>	<u>3.00</u>
Contribution to profit per unit	\$ 1.00 (25%)	\$ 0.50 (14%)
Units sold per year	10,000	22,000
Total contribution to profit, assuming the same space allotment in both stores	\$10,000	\$11,000

store, but faster turnover makes the same product a more profitable use of space in the discount store. In general, retail companies seek faster inventory turnover. A survey of retail shoe stores showed that those with above-average financial performance had an inventory turnover of 2.6 times per year compared to an industry average of 2.0.

Objective 5

Decide whether to process a joint product beyond the split-off point.

joint products

Two or more manufactured products that (1) have relatively significant sales values and (2) are not separately identifiable as individual products until their split-off point.

split-off point

The juncture of manufacturing where the joint products become individually identifiable.

separable costs

Any cost beyond the split-off point.

joint costs

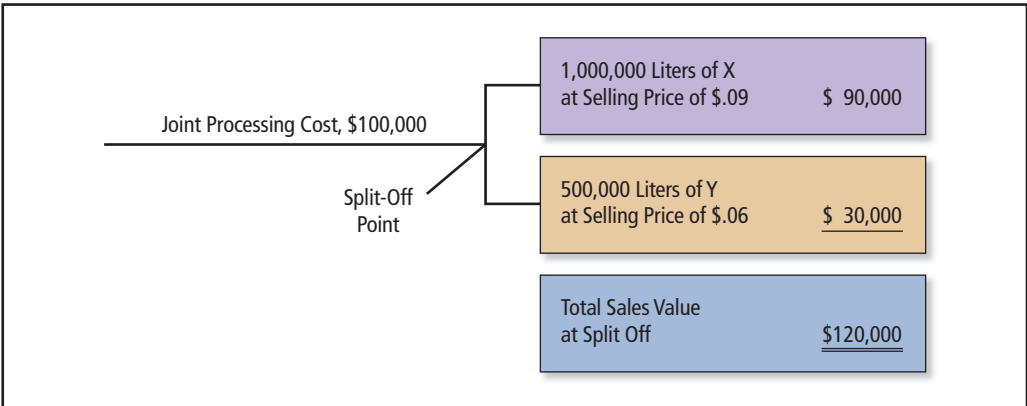
The costs of manufacturing joint products prior to the split-off point.

Joint Product Costs: Sell or Process Further Decisions

We now examine another operating decision for which relevant costs are important—decisions about whether to sell a product as is or to further process it. In this section, we will examine how joint product costs affect such decisions.

Consider **ConAgra**, which produces meat products with brand names such as Birds Eye, Healthy Choice, Reddi-wip, and Slim Jim. ConAgra cannot kill a sirloin steak; it has to purchase and slaughter a steer, which supplies various cuts of dressed meat, hides, and trimmings. So how does ConAgra determine the proper allocation of the purchase cost paid for the steer to the various meat products and other products produced from a steer? When two or more manufactured products (1) have relatively significant sales values and (2) are not separately identifiable as individual products until their split-off point, we call them **joint products**. The **split-off point** is that juncture of manufacturing where the joint products become individually identifiable. Any costs beyond that stage are **separable costs** because they are not part of the joint process and the accounting system can exclusively identify them with individual products. We call the costs of manufacturing joint products prior to the split-off point **joint costs**. Further examples of joint products include chemicals, lumber, flour, and the products of petroleum refining.

To illustrate joint costs, suppose **Dow Chemical Company** produces two chemical products, X and Y, as a result of a particular joint process. The joint processing cost is \$100,000. This includes raw material costs and the cost of processing before the joint products X and Y reach the split-off point. At the split-off point, Dow can sell X and Y to the petroleum industry, which uses them as ingredients for gasoline. The relationships follow:



Alternatively, Dow can further process Y into a different product, YA, that it sells to the plastics industry as an ingredient for plastic sheeting. Let's see how Dow's managers develop relevant information to help them decide whether to sell joint products X and Y at the split-off point or to further process Y into YA.

Sell or Process Further

Suppose Dow can further process the 500,000 liters of Y into YA, but the additional processing cost would be \$.08 per liter for manufacturing and distribution, a total of \$40,000 for 500,000 liters. The net sales price of YA would be \$.16 per liter, a total of \$80,000.

Dow cannot process product X further and will sell it at the split-off point, but management is undecided about product Y. Should the company sell Y at the split-off point, or should it process Y into YA? To answer this question, we need to find the relevant items involved. Consider first the joint costs—those before the split-off point. They are past costs that cannot affect anything beyond the split-off point. They violate both attributes of relevancy; they are neither future costs nor differential across alternatives. Therefore they are irrelevant to the question of whether to sell or process further. Relevance requires that the analysis focus on the separable costs and revenues beyond split-off, as shown in Exhibit 6-3.

This analysis shows that it would be \$10,000 more profitable to further process Y into YA than to sell Y at split-off. The rule is to extend processing on a joint product only if the additional revenue exceeds the additional costs.

Exhibit 6-4 illustrates another way to compare the alternatives of (1) selling Y at the split-off point and (2) processing Y into YA. It includes the joint costs, which are the same for each alternative and, therefore, do not affect the difference.

Because joint costs would not affect the decision (as Exhibit 6-4 demonstrates), we have not allocated the joint costs to products. However, no matter how we might allocate them, the total income effects for the firm would not change. We provide additional coverage of the allocation of joint costs and inventory valuation in Chapter 12.

	Sell at Split-Off as Y	Process Further and Sell as YA	Difference
Revenues	\$30,000	\$80,000	\$50,000
Separable costs beyond split-off at \$.08	—	40,000	40,000
Income effects	<u>\$30,000</u>	<u>\$40,000</u>	<u>\$10,000</u>

Exhibit 6-3

Illustration of Sell or Process Further

	(1) Alternative One			(2) Alternative Two			(3)
	X	Y	Total	X	YA	Total	Differential Effects
Revenues	\$90,000	\$30,000	<u>\$120,000</u>	\$90,000	\$80,000	<u>\$170,000</u>	<u>\$50,000</u>
Joint costs			\$100,000			\$100,000	—
Separable costs			—		40,000	40,000	40,000
Total costs			<u>\$100,000</u>			<u>\$140,000</u>	<u>\$40,000</u>
Income effects			<u>\$ 20,000</u>			<u>\$ 30,000</u>	<u>\$10,000</u>

Exhibit 6-4

Sell or Process Further Analysis—Firm as a Whole

Objective 6

Decide whether to keep or replace equipment.

depreciation

The periodic cost of equipment that a company spreads over the future periods in which the company will use the equipment.

book value
(net book value)

The original cost of equipment less accumulated depreciation.

accumulated depreciation

The sum of all depreciation charged to past periods.

sunk cost

A historical or past cost, that is, a cost that the company has already incurred and, therefore, is irrelevant to the decision-making process.

Keeping or Replacing Equipment

We next examine another common decision in business, the replacement of old equipment. One important aspect of such a situation is that the book value of the old equipment is not a relevant consideration in deciding whether to purchase a replacement. Why? Because it is a past cost, not a future cost. When a company purchases equipment, it spreads the cost via **depreciation** expense over the future periods in which it will use the equipment. The equipment's **book value**, or **net book value**, is the original cost less accumulated depreciation. **Accumulated depreciation** is the sum of all depreciation charged to past periods. For example, suppose a \$10,000 machine with a 10-year life span has depreciation of \$1,000 per year. At the end of 6 years, accumulated depreciation is $6 \times \$1,000 = \$6,000$, and the book value is $\$10,000 - \$6,000 = \$4,000$.

Consider the following data for a decision about whether to replace an old machine:

	Old Machine	Replacement Machine
Original cost	\$10,000	\$8,000
Useful life in years	10	4
Current age in years	6	0
Useful life remaining in years	4	4
Accumulated depreciation	\$ 6,000	0
Book value	\$ 4,000	Not acquired yet
Disposal value (in cash) now	\$ 2,500	Not acquired yet
Disposal value in 4 years	0	0
Annual cash operating costs (maintenance, power, repairs, coolants, and so on)	\$ 5,000	\$3,000

Let's prepare a comparative analysis of the two alternatives. Before proceeding, consider some important concepts. The most widely misunderstood facet of replacing equipment is the role of the book value of the old equipment in the decision. We often call the book value a **sunk cost**, which is really just another term for historical or past cost, a cost that the company has already incurred and, therefore, is irrelevant to the decision-making process. Nothing can change what has already happened. The Business First box on p. 259 illustrates this concept.

The irrelevance of past costs for decisions does not mean that knowledge of past costs is useless. Often managers use past costs to help predict future costs. In addition, past costs affect future payments for income taxes (as explained in Chapter 11). However, the past cost itself is not relevant. The only relevant cost is the predicted future cost.

In deciding whether to replace or keep existing equipment, we must consider the relevance of four commonly encountered items:

1. Book value of old equipment: irrelevant because it is a past (historical) cost. Therefore, depreciation on old equipment is also irrelevant.
2. Disposal value of old equipment: relevant because it is an expected future inflow that usually differs across alternatives.
3. Gain or loss on disposal: This is the difference between book value and disposal value. It is therefore a meaningless combination of irrelevant and relevant items. The combination form, loss (or gain) on disposal, blurs the distinction between the irrelevant book value and the relevant disposal value. Consequently, it is best to think of each separately.
4. Cost of new equipment: relevant because it is an expected future outflow that will differ across alternatives. Therefore, the initial cost of new equipment (or its allocation in subsequent depreciation charges) is relevant.

Business First

Sunk Costs and Government Contracts

It is easy to agree that—in theory—managers should ignore sunk costs when making decisions. But in practice, sunk costs often influence important decisions, especially when a decision maker doesn't want to admit that a previous decision to invest funds was a bad decision.

Consider the governmental claims made during the famous Congressional debates regarding the termination of funding for the military's B-2 aircraft. As documented in the *St. Louis Post Dispatch*, Larry O. Welch, the air force chief of staff, claimed "the B-2 already is into production; cancel it and the \$17 billion front end investment is lost." And Les Aspin, chairman of the House Armed Services Committee, stated "with \$17 billion already invested in it, the B-2 is too costly to cancel."

The \$17 billion already invested in the B-2 is a sunk cost. What matters are the future incremental costs and benefits—the costs necessary to complete production compared to the value of the completed B-2s. We want to avoid throwing good

money after bad—that is, if the value of the B-2 is not at least equal to the future investment in it, Congress should cancel funding regardless of the amount previously spent.

Failure to ignore sunk costs is not unique to the U.S. government. In 1994, **Motorola** made critical decisions to ignore digital technology, and insisted that analog communications, in which it was heavily invested, was the wave of the future. Despite intense demands from wireless providers for digital cell phones, Motorola refused to even consider switching from analog to digital technology. It refused to acknowledge that its analog investments were a sunk cost. Motorola completely lost its dominance in the cell phone market, with its U.S. market share falling from 60% to 13% within 3 years.

Sources: Adapted from J. Berg, J. Dickhaut, and C. Kanodia, "The Role of Private Information in the Sunk Cost Phenomenon," unpublished paper, November 12, 1991; and W.Y. Davis, "Return the 'Sunk Costs are Sunk' Concept to Principles of Economics Textbooks," *Journal of Business and Economic Research*, Volume 3, Number 6, 2005.

Exhibit 6-5 shows the relevance of these items in our example. Book value of old equipment is irrelevant regardless of the decision-making technique we use. The "difference" column in Exhibit 6-5 shows that the \$4,000 book value of the old equipment does not differ between alternatives. We should completely ignore it for decision-making purposes. The difference is merely one of timing. The amount written off is still \$4,000, regardless of any available alternative. The \$4,000 appears on the income statement either as a \$4,000 deduction from the \$2,500 cash proceeds received to obtain a \$1,500 loss on disposal in the first year or as \$1,000 of depreciation in each of 4 years. But how it appears is irrelevant to the replacement decision. In contrast, the \$2,000 annual depreciation on the new equipment is relevant because the total \$8,000 depreciation is a future cost that we can avoid by not replacing the equipment. The three relevant items—operating costs, disposal value, and acquisition cost—give replacement a net advantage of \$2,500.

	Four Years Together		Difference
	Keep	Replace	
Cash operating costs	\$20,000	\$12,000	\$8,000
Old equipment (book value)			
Periodic write-off as depreciation	4,000	—	—
or			
Lump-sum write-off	—	4,000*	2,500
Disposal value	—	−2,500*	
New machine			
Acquisition cost	—	8,000†	−8,000
Total costs	<u>\$24,000</u>	<u>\$21,500</u>	<u>\$2,500</u>

The advantage of replacement is \$2,500 for the 4 years together.

*In a formal income statement, these two items would be combined as "loss on disposal" of $4,000 - 2,500 = \$1,500$.

† In a formal income statement, written off as straight-line depreciation of $8,000 \div 4 = \$2,000$ for each of 4 years.

Exhibit 6-5

Cost Comparison—Replacement of Equipment Including Relevant and Irrelevant Items

Making Managerial Decisions

It is sometimes difficult to accept the proposition that past or sunk costs are irrelevant to decisions. Consider the ticket you have to a major football game in December. After getting the ticket, you learn that the game will be on TV, and you really prefer to watch the game in the comfort of your warm home. Does your decision about attending the game or watching it on TV depend on whether you were given the ticket for free or you paid \$80 for it? What does this tell you about a manager’s decision to replace a piece of equipment?

Answer

The amount paid, whether it be \$0, \$80, or \$1,000, should make no difference to the decision. You have the ticket, and you have paid for it. That cannot be changed. If you really prefer to watch the game on TV, it may have been a bad

decision to pay \$80 for a ticket. But you cannot erase that bad decision. All you can do is choose the future action that has the most value to you. You should not suffer through a less pleasant experience just because you paid \$80 for the ticket. Although the price you paid for the ticket is irrelevant, the price you could sell the ticket for now is relevant—this price is the opportunity cost of using the ticket yourself.

A manager must make the same analysis regarding the replacement of equipment. What the company spent for the old equipment is irrelevant. Keeping equipment that is no longer economical is just like using a ticket for an event that you would rather not attend. Additionally, the disposal value of the old equipment is relevant—this is the opportunity cost of keeping the equipment, corresponding to the opportunity cost of using the ticket rather than selling it to another fan.

Summary Problem for Your Review

PROBLEM

Exhibit 6-5 looks beyond 1 year. Examining the alternatives over the equipment’s entire life ensures that peculiar nonrecurring items, such as loss on disposal, will not obstruct the long-run view vital to many managerial decisions. However, Exhibit 6-5 presents both relevant and irrelevant items. Prepare an analysis that concentrates on relevant items only.

SOLUTION

Exhibit 6-6 presents the analysis with relevant items only—the cash operating costs, the disposal value of the old equipment, and the acquisition cost of the new equipment. To demonstrate that the amount of the old equipment’s book value will not affect the answer, suppose the book value of the old equipment is \$500,000 rather than \$4,000. Your final answer will not change. The cumulative advantage of replacement is still \$2,500. (If you are in doubt, rework this example, using \$500,000 as the book value.)

	Four Years Together		Difference
	Keep	Replace	
Cash operating costs	\$20,000	\$12,000	\$8,000
Disposal value of old machine	—	–2,500	2,500
New machine, acquisition cost	—	8,000	–8,000
Total relevant costs	<u>\$20,000</u>	<u>\$17,500</u>	<u>\$2,500</u>

Exhibit 6-6
Cost Comparison—Replacement of Equipment, Relevant Items Only

Objective 7

Identify irrelevant and misspecified costs.

Identify Irrelevant or Misspecified Costs

The ability to recognize irrelevant or misspecified costs is sometimes just as important to decision makers as identifying relevant costs. How do we know that past costs, although sometimes good predictors of future costs, are irrelevant in decision making? Let’s consider such past costs as obsolete inventory and see why they are irrelevant to decisions.

Suppose **General Dynamics** has 100 obsolete aircraft parts in its inventory. The original manufacturing cost of these parts was \$100,000. General Dynamics can (1) re-machine the parts for \$30,000 and then sell them for \$50,000 or (2) sell them as scrap for \$5,000. Which should it do? This is an unfortunate situation, yet the \$100,000 past cost is irrelevant to the decision to re-machine or scrap. The only relevant factors are the expected future revenues and costs:

	Re-machine	Scrap	Difference
Expected future revenue	\$ 50,000	\$ 5,000	\$45,000
Expected future costs	<u>30,000</u>	<u>—</u>	<u>30,000</u>
Relevant excess of revenue over costs	\$ 20,000	\$ 5,000	\$15,000
Accumulated historical inventory cost*	<u>100,000</u>	<u>100,000</u>	<u>—</u>
Net overall loss on project	<u><u>\$(80,000)</u></u>	<u><u>\$(95,000)</u></u>	<u><u>\$15,000</u></u>

*Irrelevant because it is unaffected by the decision.

As you can see from the fourth line of the preceding table, we can completely ignore the \$100,000 historical cost and still arrive at the \$15,000 difference, the key figure in the analysis that yields re-machining as the optimal decision.

In addition to past costs, some future costs may be irrelevant because they will be the same under all feasible alternatives. These, too, we may safely ignore for a particular decision. Top management salaries are examples of expected future costs that may be unaffected by the decision at hand.

Other irrelevant future costs include fixed costs that will be the same whether a company selects machine X or machine Y. However, it is incorrect to conclude that fixed costs are always irrelevant and variable costs are always relevant. Variable costs can be irrelevant, and fixed costs can be relevant. For instance, sales commissions are variable costs that are irrelevant to a decision on whether to produce a product in plant G or plant H. The rental cost of a warehouse is a fixed cost that is relevant if one alternative requires the warehouse while the other does not. In sum, future costs (both variable and fixed) are irrelevant whenever they do not differ among the alternatives at hand and are relevant whenever they do differ between the alternatives.

Finally, it is also critical in decision making to identify misspecified costs. The pricing illustration in Chapter 5 showed that managers should analyze unit costs with care in decision making. There are two major ways to go wrong: (1) including irrelevant costs, such as the \$0.03 allocation of unavoidable fixed costs in the **Nantucket Nectars**' make-or-buy example (pp. 244–245) that would result in a unit cost of \$0.20 instead of the relevant unit cost of \$0.17 and (2) comparing unit costs not computed on the same volume basis, as illustrated by the following example. Assume that a new \$100,000 machine with a five-year life span can produce 100,000 units a year at a variable cost of \$1 per unit, as opposed to a variable cost per unit of \$1.50 with an old machine. A sales representative claims that the new machine will reduce total cost by \$0.30 per unit after allowing \$0.20 per unit for depreciation on the new machine. Is the new machine a worthwhile acquisition?

If the customer's expected volume is 100,000 units, unit-cost comparisons are valid, provided that new depreciation is also considered. Assume that the disposal value of the old equipment is zero, so annual depreciation is $\$100,000 \div 5$ years, which equals \$20,000. Because depreciation is an allocation of historical cost, the depreciation on the old machine is irrelevant. In contrast, the depreciation on the new machine is relevant because the new machine entails a future cost that the customer can avoid by not acquiring it.

	Old Machine	New Machine
Units	<u>100,000</u>	<u>100,000</u>
Variable costs	\$150,000	\$100,000
Straight-line depreciation	<u>—</u>	<u>20,000</u>
Total relevant costs	<u><u>\$150,000</u></u>	<u><u>\$120,000</u></u>
Unit relevant costs	<u><u>\$ 1.50</u></u>	<u><u>\$ 1.20</u></u>

The preceding calculation shows that the sales representative is correct if the customer's expected volume is 100,000 units. However, sales personnel often boast about the low unit costs of using their new machines but may neglect to point out that the unit costs are based on outputs far in excess of the activity volume of their prospective customer. In this case, if the customer's expected volume is only 30,000 units per year, the unit costs change in favor of the old machine.

	Old Machine	New Machine
Units	<u>30,000</u>	<u>30,000</u>
Variable costs	\$45,000	\$30,000
Straight-line depreciation	<u>—</u>	<u>20,000</u>
Total relevant costs	<u>\$45,000</u>	<u>\$50,000</u>
Unit relevant costs	<u>\$ 1.50</u>	<u>\$1.6667</u>

Generally, be wary of unit fixed costs. When feasible, use total fixed cost in your analysis, not fixed cost per unit. Why? Because you need to calculate a new fixed cost per unit for every different volume of production—often a cumbersome task—and if you don't recalculate it, your costs will be misspecified.

Conflicts Between Decision Making and Performance Evaluation

Objective 8

Discuss how performance measures can affect decision making.

You should now know how to make good decisions based on relevant data. However, knowing how to make these decisions and actually making them are two different things. Managers might be tempted to make decisions they know are sub-optimal—not in the best interests of the company—if the performance measures in place will reward them for those decisions. To motivate managers to make firm-wide optimal decisions, methods of evaluating managers' performance should be consistent with the appropriate decision model for the company.

Let's look at an example of a conflict between the analysis for decision making and the method used to evaluate performance. Consider the replacement decision shown in Exhibit 6-6 on p. 260, where there was a \$2,500 advantage to replacing the machine rather than keeping it. To motivate managers to make the right choice, the method used to evaluate performance should be consistent with the decision model—that is, it should show better manager performance when a manager replaces rather than keeps the machine. Assume the firm uses accounting income to measure a manager's performance. The effect on accounting income in the first year after replacement compared with that in years 2, 3, and 4 follows:

	Year 1		Years 2, 3, and 4	
	Keep	Replace	Keep	Replace
Cash operating costs	\$5,000	\$3,000	\$5,000	\$3,000
Depreciation	1,000	2,000	1,000	2,000
Loss on disposal (\$4,000 – \$2,500)	<u>—</u>	<u>1,500</u>	<u>—</u>	<u>—</u>
Total cost	<u>\$6,000</u>	<u>\$6,500</u>	<u>\$6,000</u>	<u>\$5,000</u>

First-year costs will be $\$6,500 - \$6,000 = \$500$ lower, making first-year income \$500 higher, if the manager keeps the machine rather than replacing it. Because managers naturally want to make decisions that maximize the measure of their current performance, the manager may be inclined to keep the machine.

The conflict is especially severe if a company often transfers managers from one position to another. Why? Even though replacing the machine creates the \$500 first-year decrease in income, over the long run this will be offset by a \$1,000 annual increase in income in years 2 to 4. (Note that the net difference of \$2,500 in favor of replacement over the 4 years together is the same as in Exhibit 6-6.) However, a manager who moves to a new position after the first year, bears the entire loss on disposal without reaping the benefits of lower operating costs in years 2 to 4, which creates a personal incentive for him to keep the machine.

The decision to replace a machine earlier than planned also reveals a possible error in the original decision to purchase the machine. The company bought the old machine 6 years ago for \$10,000. Its expected life span was 10 years. However, if a better machine is now available, then the useful life of the old machine was really 6 years, not 10. This feedback on the actual life of the old machine has two possible effects, the first good and the second bad. First, managers might benefit by learning from the earlier mistake. If the manager overestimated the useful life of the old machine, the reliability of the predicted life for the new machine may be scrutinized. Feedback can help avoid repeating past mistakes. Second, the feedback on machine life creates incentives for a manager to make another mistake to cover up the earlier one. A “loss on disposal” could alert superiors to the incorrect economic-life prediction used in the earlier decision. By avoiding replacement, the manager avoids recognizing the loss on disposal and can spread the \$4,000 remaining book value over the future as “depreciation,” a more appealing term than “loss on disposal.” The superiors may never find out about the incorrect prediction of economic life. Using accounting income for performance evaluation mixes the financial effects of various decisions, hiding both the earlier misestimation of useful life and the current failure to replace.

Conflicts between decision making and performance evaluation goals are widespread in practice. Unfortunately, there are no easy solutions. It is difficult to match performance evaluation and decision horizons, leading to conflicts like those in our equipment example. As a result, managers sometimes have incentives to focus on the short-term effects of decisions on their performance measures, rather than the long-term effects on the company.

Here and in Chapter 5 we introduced the important topics of relevant information and decision making. Our major focus was on how to determine and use relevant information when faced with various managerial decisions such as pricing, special orders, make or buy, adding or deleting a product line, and equipment replacement. We have emphasized the importance of understanding cost behavior in each of these decision situations. Now, we shift our emphasis from decision-making techniques to planning and control techniques. One of the most important planning techniques you will use as a manager is budgeting—the major topic in Chapters 7 and 8.

Highlights to Remember

- 1. Use a differential analysis to examine income effects across alternatives and show that an opportunity-cost analysis yields identical results.** A differential analysis is a valuable tool for analyzing decisions; it focuses on the relevant items in the situation—differential revenues and differential costs. One should always consider opportunity costs when deciding on the use of limited resources. The opportunity cost of a course of action is the maximum profit forgone from other alternative actions. Decision makers may fail to consider opportunity costs because accountants do not report them in the financial accounting system.
- 2. Decide whether to make or buy certain parts or products.** One of the most important production decisions is the make-or-buy decision. Should a company make its own parts or products or should it buy them from outside sources? Both qualitative and quantitative factors affect this decision. In applying relevant cost analysis to a make-or-buy situation, a key factor to consider is often the opportunity cost of facilities.
- 3. Choose whether to add or delete a product line using relevant information.** Relevant information also plays an important role in decisions about adding or deleting products, services, or departments. Decisions on whether to delete a department or product line require analysis of the revenues forgone and the costs saved from the deletion.
- 4. Compute the optimal product mix when production is constrained by a scarce resource.** When production is constrained by a limiting resource, the key to obtaining the maximum profit from a given capacity is to obtain the greatest possible contribution to profit per unit of the limiting or scarce resource.

- 5. Decide whether to process a joint product beyond the split-off point.** Another typical production situation is deciding whether to process further a joint product or sell it at the split-off point. The relevant information for this decision includes the revenues and costs that differ beyond the split-off point. Joint costs that occur before split-off are irrelevant.
- 6. Decide whether to keep or replace equipment.** In the decision to keep or replace equipment, the book value of old equipment is irrelevant. This sunk cost is a past or historical cost that a company has already incurred. Relevant costs normally include the disposal value of old equipment, the cost of new equipment, and the difference in the annual operating costs.
- 7. Identify irrelevant and misspecified costs.** In certain production decisions, it is important to recognize and identify irrelevant costs. In the decision to dispose of obsolete inventory, the original cost of the inventory is irrelevant. In terms of misspecified costs, unit fixed costs can be misleading because of the differences in the assumed level of volume on which they are based. The more units a company makes, the lower the unit fixed cost will be. You can avoid being misled by unit costs by always using total fixed costs.
- 8. Discuss how performance measures can affect decision making.** If companies evaluate managers using performance measures that are not in line with relevant decision criteria, there could be a conflict of interest. Managers often make decisions based on how the decision affects their performance measures. Thus, performance measures work best when they are consistent with the long-term good of the company.

Accounting Vocabulary

accumulated depreciation, p. 258	incremental analysis, p. 245	opportunity cost, p. 246
avoidable costs, p. 253	incremental benefits, p. 245	outlay cost, p. 245
book value, p. 258	incremental costs, p. 245	outsourcing, p. 247
common costs, p. 253	inventory turnover, p. 255	scarce resource, p. 254
depreciation, p. 258	joint costs, p. 256	separable costs, p. 256
differential analysis, p. 245	joint products, p. 256	split-off point, p. 256
differential cost, p. 245	limiting factor, p. 254	sunk cost, p. 258
differential revenue, p. 245	net book value, p. 258	unavoidable costs, p. 253

MyLab Accounting

Fundamental Assignment Material

6-AI Make or Buy

Vineyard Fruit Company sells premium-quality oranges and other citrus fruits by mail order. Protecting the fruit during shipping is important so the company has designed and produces shipping boxes. The annual cost to make 60,000 boxes is as follows:

Materials	\$ 96,000
Labor	12,000
Indirect manufacturing costs	
Variable	9,600
Fixed	46,800
Total	<u>\$164,400</u>

Therefore, the cost per box averages \$2.74.

Suppose **Weyerhaeuser** submits a bid to supply Vineyard with boxes for \$2.24 per box. Vineyard must give Weyerhaeuser the box design specifications, and the boxes will be made according to those specs.

- How much, if any, would Vineyard save by buying the boxes from Weyerhaeuser?
- What subjective factors should affect Vineyard's decision about whether to make or buy the boxes?

- Suppose all the fixed costs represent depreciation on equipment that was purchased for \$234,000 and is just about at the end of its 5-year life. New replacement equipment will cost \$375,000 and is also expected to last 5 years. In this case, how much, if any, would Vineyard save by buying the boxes from Weyerhaeuser?

6-A2 Choice of Products

The Tipbox Tool Company has two products: a plain circular saw and a professional circular saw. The plain saw sells for \$50 and has a variable cost of \$35. The professional saw sells for \$100 and has a variable cost of \$60.

- Compute contribution margins and contribution-margin ratios for plain and professional saws.
- The demand is for more units than the company can produce. There are only 40,000 machine hours of manufacturing capacity available. Four plain saws can be produced in the same average time (1 hour) needed to produce one professional saw. Compute the total contribution margin for 40,000 hours for plain saws only and for professional saws only. Which product is the best use of machine hours?
- Use two or three sentences to state the major lesson of this problem.

6-A3 Joint Products: Sell or Process Further

The Mussina Chemical Company produced three joint products at a joint cost of \$117,000. These products were processed further and sold as follows:

Chemical Product	Sales	Additional Processing Costs
A	\$230,000	\$190,000
B	330,000	300,000
C	175,000	100,000

The company has had an opportunity to sell at split-off directly to other processors. If that alternative had been selected, sales would have been A, \$54,000; B, \$32,000; and C, \$54,000.

The company expects to operate at the same level of production and sales in the forthcoming year.

- Could the company increase operating income by altering its processing decisions? If so, what would be the expected overall operating income?
- Which products should be processed further and which should be sold at split-off?

6-A4 Role of Old Equipment Replacement

On January 2, 2013, the T. W. McCann Company installed a brand new \$108,000 special molding machine for producing a new product. The product and the machine have an expected life of 3 years. The machine's expected disposal value at the end of 3 years is zero.

On January 3, 2013, Joan Slater, a star salesperson for a machine tool manufacturer, tells Mr. McCann, "I wish I had known earlier of your purchase plans. I can supply you with a technically superior machine for \$108,000. The machine you just purchased can be sold for \$35,000. I guarantee that our machine will save \$52,000 per year in cash operating costs, although it too will have no disposal value at the end of 3 years."

McCann examines some technical data. Although he has confidence in Slater's claims, McCann contends, "I'm locked in now. My alternatives are clear: (a) Disposal will result in a loss, (b) keeping and using the 'old' equipment avoids such a loss. I have brains enough to avoid a loss when my other alternative is recognizing a loss. We've got to use that equipment until we get our money out of it."

The annual operating costs of the old machine are expected to be \$69,000, exclusive of depreciation. Sales, all in cash, will be \$850,000 per year. Other annual cash expenses will be \$740,000 regardless of this decision. Assume that the equipment in question is the company's only fixed asset.

Ignore income taxes and the time value of money.

- Prepare statements of cash receipts and disbursements as they would appear in each of the next 3 years under both alternatives. What is the total cumulative increase or decrease in cash for the 3 years?
- Prepare income statements as they would appear in each of the next 3 years under both alternatives. Assume straight-line depreciation. What is the cumulative increase or decrease in net income for the 3 years?

3. Assume that the cost of the “old” equipment was \$800,000 rather than \$108,000. Would the net difference computed in numbers 1 and 2 change? Explain.
4. As Joan Slater, reply to Mr. McCann’s contentions.
5. What are the irrelevant items in each of your presentations for numbers 1 and 2? Why are they irrelevant?

6-B1 Make or Buy

Suppose a **BMW** executive in Germany is trying to decide whether the company should continue to manufacture an engine component or purchase it from Frankfurt Corporation for €50 each. Demand for the coming year is expected to be the same as for the current year, 200,000 units. Data for the current year follow:

Direct material	€ 5,000,000
Direct labor	1,900,000
Factory overhead, variable	1,100,000
Factory overhead, fixed	<u>3,000,000</u>
Total costs	<u>€11,000,000</u>

If BMW makes the components, the unit costs of direct material will increase by 10%.

If BMW buys the components, 30% of the fixed costs will be avoided. The other 70% will continue regardless of whether the components are manufactured or purchased. Assume that variable overhead varies with output volume.

1. Prepare a schedule that compares the make-or-buy alternatives. Show totals and amounts per unit. Compute the numerical difference between making and buying. Assume that the capacity now used to make the components will become idle if the components are purchased.
2. Assume also that the BMW capacity in question can be rented to a local electronics firm for €1,150,000 for the coming year. Prepare a schedule that compares the net relevant costs of the three alternatives: make, buy and leave capacity idle, buy and rent. Which is the most favorable alternative? By how much in total?

6-B2 Unit Costs and Capacity

Courcy Manufacturing Company produces two industrial solvents for which the following data have been tabulated. Fixed manufacturing cost is applied to products at a rate of \$1.00 per machine hour.

Per Unit	XY-7	BD-4
Selling price	\$6.45	\$4.20
Variable manufacturing costs	2.70	1.70
Fixed manufacturing cost	0.70	0.20
Variable selling cost	1.80	1.75

The sales manager has had a \$215,000 increase in her budget allotment for advertising and wants to apply the money on the most profitable product. The solvents are not substitutes for one another in the eyes of the company’s customers.

1. How many machine hours does it take to produce one XY-7? To produce one BD-4? (Hint: Focus on applied fixed manufacturing cost.)
2. Suppose Courcy has only 140,000 machine hours that can be made available to produce XY-7 and BD-4. If the potential increase in sales units for either product resulting from advertising is far in excess of these production capabilities, which product should be produced and advertised, and what is the estimated increase in contribution margin earned?

6-B3 Dropping a Product Line

Hamleys Toy Store is on Regent Street in London. It has a magic department near the main door. Suppose that management is considering dropping the magic department, which has consistently shown an operating loss. The predicted income statements, in thousands of pounds (£), are (for ease of analysis, only three product lines are shown):

	Total	General Merchandise	Electronic Products	Magic Department
Sales	£6,000	£5,000	£400	£600
Variable expenses	<u>4,090</u>	<u>3,500</u>	<u>200</u>	<u>390</u>
Contribution margin	£1,910 (32%)	£1,500 (30%)	£200 (50%)	£210 (35%)
Fixed expenses (compensation, depreciation, property taxes, insurance, etc.)	<u>1,100</u>	<u>750</u>	<u>50</u>	300
Operating income (loss)	<u>£ 810</u>	<u>£ 750</u>	<u>£150</u>	<u>£(90)</u>

The £300,000 of magic department fixed expenses include the compensation of employees of £120,000. These employees will be released if the magic department is abandoned. All of the magic department's equipment is fully depreciated, so none of the £300,000 pertains to such items. Furthermore, disposal values of equipment will be exactly offset by the costs of removal and remodeling.

If the magic department is dropped, the manager will use the vacated space for either more general merchandise or more electronic products. The expansion of general merchandise would not entail hiring any additional salaried help, but more electronic products would require an additional person at an annual cost of £30,000. The manager thinks that sales of general merchandise would increase by £250,000, and electronic products by £200,000. The manager's modest predictions are partially based on the fact that she thinks the magic department has helped lure customers to the store and, thus, improved overall sales. If the magic department is closed, that lure would be gone.

Should the magic department be closed? Explain, showing computations.

6-B4 Sell or Process Further

ConAgra produces meat products with brand names such as Healthy Choice, Armour, and Butterball. Suppose one of the company's plants processes beef cattle into various products. For simplicity, assume that there are only three products: steak, hamburger, and hides, and that the average steer costs \$700. The three products emerge from a process that costs \$100 per steer to run, and output from one steer can be sold for the following net amounts:

Steak (100 pounds)	\$ 400
Hamburger (500 pounds)	600
Hide (120 pounds)	<u>100</u>
Total	<u>\$1,100</u>

Assume that each of these three products can be sold immediately or processed further in another ConAgra plant. The steak can be the main course in frozen dinners sold under the Healthy Choice label. The vegetables and desserts in the 400 dinners produced from the 100 pounds of steak would cost \$110, and production, sales, and other costs for the 400 meals would total \$330. Each meal would be sold wholesale for \$2.10.

The hamburger could be made into frozen Salisbury steak patties sold under the Armour label. The only additional cost would be a \$200 processing cost for the 500 pounds of hamburger. Frozen Salisbury steaks sell wholesale for \$1.70 per pound.

The hide can be sold before or after tanning. The cost of tanning one hide is \$80, and a tanned hide can be sold for \$170.

1. Compute the total profit if all three products are sold at the split-off point.
2. Compute the total profit if all three products are processed further before being sold.
3. Which products should be sold at the split-off point? Which should be processed further?
4. Compute the total profit if your plan in number 3 is followed.

6-B5 Replacing Old Equipment

Consider the following data regarding Orange County's photocopying requirements.

	Old Equipment	Proposed Replacement Equipment
Useful life, in years	5	3
Current age, in years	2	0
Useful life remaining, in years	3	3
Original cost	\$34,000	\$14,700
Accumulated depreciation	13,600	0
Book value	20,400	Not acquired yet
Disposal value (in cash) now	3,600	Not acquired yet
Disposal value in 3 years	0	0
Annual cash operating costs for power, maintenance, toner, and supplies	17,000	11,000

The county administrator is trying to decide whether to replace the old equipment. Because of rapid changes in technology, she expects the replacement equipment to have only a 3-year useful life. Ignore the effects of taxes.

1. Prepare a schedule that compares both relevant and irrelevant items for the next 3 years. (Hint: See Exhibit 6-5, p. 259.)
2. Prepare a schedule that compares all relevant items for the next 3 years. Which tabulation is clearer, this one or the one in requirement 1? (Hint: See Exhibit 6-6, p. 260.)
3. Prepare a simple "shortcut" or direct analysis to support your choice of alternatives.

6-B6 Decision and Performance Models

Refer to the preceding problem.

1. Suppose the "decision model" favored by top management consisted of a comparison of a 3-year accumulation of cash under each alternative. As the manager of office operations, which alternative would you choose? Why?
2. Suppose the "performance evaluation model" emphasized the minimization of overall costs of photocopying operations for the first year. Which alternative would you choose?

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Additional Assignment Material

QUESTIONS

6-1 Distinguish between an opportunity cost and an outlay cost.

6-2 "I had a chance to rent my summer home for 2 weeks for \$800. But I chose to have it idle. I didn't want strangers living in my summer house." What term in this chapter describes the \$800? Why?

6-3 "Accountants do not ordinarily record opportunity costs in the formal accounting records." Why?

6-4 Distinguish between an incremental cost and a differential cost.

6-5 "Incremental cost is the addition to costs from the manufacture of one unit." Do you agree? Explain.

6-6 "The differential costs or incremental costs of increasing production from 1,000 automobiles

to 1,200 automobiles per week would be the additional costs of producing the additional 200 automobiles." If production were reduced from 1,200 to 1,000 automobiles per week, what would the decline in costs be called?

6-7 "Qualitative factors generally favor making over buying a component." Do you agree? Explain.

6-8 "Choices are often mislabeled as simply make or buy." Do you agree? Explain.

6-9 "Nonfinancial information can influence decisions to add or delete products or departments." Do you agree? Explain.

6-10 Give four examples of limiting or scarce factors.

6-11 What are joint products? Name several examples of joint products.

6-12 What is the split-off point, and why is it important in analyzing joint costs?

6-13 “No technique used to assign the joint cost to individual products should be used for management decisions regarding whether a product should be sold at the split-off point or processed further.” Do you agree? Explain.

6-14 “Inventory that was purchased for \$5,000 should not be sold for less than \$5,000 because such a sale would result in a loss.” Do you agree? Explain.

6-15 “Recovering sunk costs is a major objective when replacing equipment.” Do you agree? Explain.

6-16 “Past costs are indeed relevant in most instances because they provide the point of departure for the entire decision process.” Do you agree? Why?

6-17 Which of the following items are relevant to replacement decisions? Explain.

1. Book value of old equipment
2. Disposal value of old equipment
3. Cost of new equipment

6-18 “It is critical in decision making to identify mis-specified costs.” Explain how costs can be mis-specified.

6-19 “Variable costs are irrelevant whenever they do not differ among the alternatives at hand.” Do you agree? Explain.

6-20 There are two major reasons why unit costs should be analyzed with care in decision making. What are they?

6-21 “Machinery sales personnel sometimes erroneously brag about the low unit costs of using their machines.” Identify one source of an error concerning the estimation of unit costs.

6-22 Give an example of a situation in which the performance evaluation model is not consistent with the decision model.

6-23 “Evaluating performance, decision by decision, is costly. Aggregate measures, such as the income statement, are frequently used.” How might the wide use of income statements affect managers’ decisions about buying equipment?

CRITICAL THINKING EXERCISES

6-24 Measurement of Opportunity Cost

“Accountants cannot measure opportunity cost. Only managers have the knowledge to measure it.” Do you agree with this statement? Why or why not?

6-25 Outsourcing Decisions

Decisions on whether to outsource services such as payroll accounting and systems development are much like make-or-buy decisions. What cost factors should influence the decision on whether to outsource payroll functions?

6-26 Unitized Costs

Suppose you are a manager in a manufacturing company. Your accountant has just presented you with a very detailed cost analysis for a decision about whether to outsource or make a component of a product. You have to use this analysis in a meeting with other managers. Since the analysis is shown in totals and your colleagues prefer simple reports and unit costs, you divide the bottom-line amounts by the total units to be made or bought (outsourced) and present just these in a simple report. Your colleagues are pleased that your report is so easy to understand and simple to use. Then they begin to predict the total cost differences for several other possible numbers of units to be made or outsourced by simply multiplying the unit costs by the volume to be outsourced. Why should you feel uncomfortable?

6-27 Historical Costs and Inventory Decisions

Explain why it is sometimes best to sell inventory for less than the amount paid for it.

EXERCISES

6-28 Opportunity Costs

Emily Adessa is an attorney employed by a large law firm at a salary of \$85,000 per year. She is considering whether to become a sole practitioner, which would probably generate annually \$410,000 in operating revenues and \$290,000 in operating expenses.

1. Present two tabulations of the annual income effects of these alternatives. The second tabulation should include the opportunity cost of Adessa’s compensation as an employee.
2. Suppose Adessa prefers less risk and chooses to stay an employee. Show a tabulation of the income effects of rejecting the opportunity of independent practice.

6-29 Opportunity Cost of Home Ownership

Ernie McNaire has just made the final payment on his mortgage. He could continue to live in the home; cash expenses for repairs and maintenance (after any tax effects) would be \$750 monthly. Alternatively, he could sell the home for \$490,000 (net of taxes), invest the proceeds in 3% municipal tax-free bonds, and rent an apartment for \$18,000 annually. The landlord would then pay for repairs and maintenance.

Prepare two analyses of McNaire's alternatives, one showing no explicit opportunity cost and the second showing the explicit opportunity cost of the decision to hold the present home.

6-30 Opportunity Cost at Nantucket Nectars

Suppose **Nantucket Nectars** has a machine for which it paid \$160,000 several years ago and is currently not being used. It can use the machine to produce 12 oz. bottles of its juice cocktails or 12 oz. bottles of its 100% juices. The contribution margin from the additional sales of 100% juices would be \$90,000. A third alternative is selling the machine for cash of \$75,000. What is the opportunity cost of the machine when we analyze the alternative to produce 12 oz. bottles of juice cocktails?

6-31 Hospitality Opportunity Cost

In a recent infrastructural upgradation, **Apollo Hospitals**, located at Dhaka, Bangladesh, has shifted its outpatient department to its newly constructed building. The hospital administrator is considering the following proposals to utilize the space profitably.

- Use the space to expand the MRI unit. Expected future annual income would be BDT2,250,000; future costs would be BDT1,850,000.
- Use the space to expand the dental department. Expected future annual income would be BDT1,150,000; future costs would be BDT950,000.
- Rent out the space to a renowned pharmacy chain who are ready to pay a yearly rental of BDT110,000. All the operating expenses will be borne by the pharmacy chain itself.

The administrator's planning horizon is unsettled. However, she has decided that the yearly data given will suffice for guiding her decision.

Tabulate the total relevant data regarding the decision alternatives. Omit the concept of opportunity cost in one tabulation, but use the concept in a second tabulation. As the administrator, which tabulation would you prefer if you could receive only one?

6-32 Make or Buy

Assume that a division of **Bose** makes an electronic component for its speakers. Its manufacturing process for the component is a highly automated part of a just-in-time production system. All labor is considered to be an overhead cost, and all overhead is regarded as fixed with respect to output volume. Production costs for 100,000 units of the component are as follows:

Direct materials		\$400,000
Factory overhead		
Indirect labor	\$80,000	
Supplies	30,000	
Allocated occupancy cost	<u>40,000</u>	<u>150,000</u>
Total cost		<u><u>\$550,000</u></u>

A small, local company has offered to supply the components at a price of \$4.20 each. If the division discontinued its production of the component, it would save two-thirds of the supplies cost and \$30,000 of indirect-labor cost. All other overhead costs would continue.

The division manager recently attended a seminar on cost behavior and learned about fixed and variable costs. He wants to continue to make the component because the variable cost of \$4.00 is below the \$4.20 bid.

- Compute the relevant cost of (a) making and (b) purchasing the component. Which alternative is less costly and by how much?
- What qualitative factors might influence the decision about whether to make or to buy the component?

6-33 Make or Buy at Nantucket Nectars

Assume that **Nantucket Nectars** reports the following costs to make 17.5 oz. bottles for its juice cocktails:

Nantucket Nectars Company Cost of Making 17.5-Ounce Bottles

	Total Cost for 1,000,000 Bottles	Cost per Bottle
Direct materials	\$ 80,000	\$0.080
Direct labor	30,000	0.030
Variable factory overhead	60,000	0.060
Fixed factory overhead	85,000	0.085
Total costs	<u>\$255,000</u>	<u>\$0.255</u>

Another manufacturer offers to sell Nantucket Nectars the bottles for \$0.25. The capacity now used to make bottles will become idle if the company purchases the bottles. Further, one supervisor with a salary of \$60,000, a fixed cost, would be eliminated if the bottles were purchased. Prepare a schedule that compares the costs to make and buy the 17.5 oz. bottles. Should Nantucket Nectars make or buy the bottles?

6-34 Make or Buy and the Use of Idle Facilities at Nantucket Nectars

Refer to the preceding exercise. Suppose **Nantucket Nectars** can use the released facilities in another manufacturing activity that makes a contribution to profits of \$75,000 or can rent them out for \$55,000. Prepare a schedule that compares the four alternative courses of action. Which alternative would yield the lowest net cost?

6-35 Profit per Unit of Space

- Several successful chains of warehouse stores such as **Costco** and **Sam's Club** have merchandising policies that differ considerably from those of traditional department stores. Name some characteristics of these warehouse stores that have contributed to their success.
- Food chains such as **Safeway** have typically regarded approximately 20% of selling price as an average target gross profit on canned goods and similar grocery items. What are the limitations of such an approach? Be specific.

6-36 Deletion of Product Line

St. Teresa's University is a well-known private university located in Kolkata, India. In addition to the regular courses, it also offers coaching classes for competitive examinations at a subsidized rate of ₹15,000 for a six-month term. The financial results for the coaching classes for the last six-month term are as follows:

Revenue @ ₹15,000 per student for 60 students	₹900,000
Less: Teachers' remuneration	₹600,000
Stationery	50,000
Depreciation	100,000
Overhead charges apportioned	<u>270,000</u>
	10,200,000
Operating income (loss)	<u>(120,000)</u>

The vice-chancellor of the university is considering discontinuing the coaching classes because it is not fair to the other students to subsidize the program. In his opinion, eliminating the program will free up ₹120,000 a month to support regular classes.

- Compute the financial impact on the University of discontinuing the coaching classes for competitive examinations.
- List three qualitative factors that would influence your decision.

6-37 Sell or Process Further

An **Exxon** petrochemical factory produces two products, L and M, as a result of a particular joint process. Both products are sold to manufacturers as ingredients for assorted chemical products.

Product L sells at split-off for \$0.25 per gallon; M sells for \$0.30 per gallon. Data for April follow:

Joint processing cost	\$1,600,000
Gallons produced and sold	
L	4,000,000
M	2,500,000

Suppose that in April the 2,500,000 gallons of M could have been processed further into Super M at an additional cost of \$165,000. The Super M output would be sold for \$.36 per gallon. Product L would be sold at split-off in any event.

Should M have been processed further in April and sold as Super M? Show your computations.

6-38 Joint Products, Multiple Choice

From a particular joint process, Demoulas company produces three products, A, B, and C. Each product may be sold at the point of split-off or processed further. Additional processing requires no special facilities, and production costs of further processing are entirely variable and traceable to the products involved. In 2012, all three products were processed beyond split-off. Joint production costs for the year were \$100,000. Sales values and costs needed to evaluate Demoulas's 2012 production policy follow:

Product	Units Produced	Net Realizable Values (Sales Values) at Split-Off	Additional Costs and Sales Values if Processed Further	
			Sales Values	Added Costs
A	9,000	\$33,000	\$50,000	\$ 18,000
B	5,000	44,000	50,000	13,000
C	6,000	28,000	35,000	6,000

Answer the following multiple-choice questions:

- For units of C, the unit production cost most relevant to a sell-or-process-further decision is (a) \$1, (b) \$9, (c) \$12, (d) \$3.
- To maximize profits, Demoulas should subject the following product(s) to additional processing: (a) C only, (b) B and C only (c) A, B, and C (d) A only.

6-39 Obsolete Inventory

In November 2019, Oxford Bookstore bought 1,000 exclusive personal diaries for the following year. Unfortunately, the sale of diaries was much lower expected. In April 2020, it was found that 440 such diaries were still in stock. The store paid £13.00 each for the diaries and normally sold them for £25.00. Since March 2020, the diaries had been on sale for £20.00 and a week ago the price dropped further to £18.00. Still, only a few diaries could be sold. The manager of the bookstore was of the opinion that it was no longer worthwhile using shelf space for the diaries.

The manager of Olympian Sports Club offered to buy all the 440 diaries for £1,100. He intended to gift the diaries to the members of the club in its annual general meeting to be held in May 2020.

The bookstore manager was not sure whether she wanted to sell the diaries at £2.50 that cost £13.00. The only alternative, however, was to scrap them because the publisher would not take them back.

- Compute the difference in profit between accepting the £1100 offer and scrapping the diaries.
- Describe how the $£13.00 \times 440 = £5,720$ paid for the diaries affects your decision.

6-40 Replacement of Old Equipment

Three years ago, the Oak Street **TCBY** bought a frozen yogurt machine for \$11,200. A salesman has just suggested to the TCBY manager that she replace the machine with a new, \$13,500 machine. The manager has gathered the following data:

	Old Machine	New Machine
Original cost	\$11,200	\$13,500
Useful life in years	8	5
Current age in years	3	0
Useful life remaining in years	5	5
Accumulated depreciation	\$ 4,200	Not acquired yet
Book value	\$ 7,000	Not acquired yet
Disposal value (in cash) now	\$ 2,500	Not acquired yet
Disposal value in 5 years	0	0
Annual cash operating cost	\$ 5,300	\$ 2,700

1. Compute the difference in total costs over the next 5 years under both alternatives, that is, keeping the original machine or replacing it with the new machine. Ignore taxes.
2. Suppose the Oak Street TCBY manager replaces the original machine. Compute the “loss on disposal” of the original machine. How does this amount affect your computation in number 1? Explain.

6-41 Unit Costs

United Electricals produces and sells tail lights for cars. The product has variable costs of £9 per unit and fixed costs of £240,000 per year.

1. Compute the unit cost at a production and sales level of 15,000 units per year.
2. Compute the unit cost at a production and sales level of 25,000 units per year.
3. Which of these unit costs is most accurate? Explain.

6-42 Relevant Investment

Charles Neumann owns and operates a fleet of buses. He wants to replace one of the old buses. The dealer has given him an offer to buy a bus with similar capacity but with the latest technology at a list price of €45,000 along with a “generous trade-in-allowance” of €8,000 on the old bus that has a wholesale price of €4,500. Sales tax is €1,450.

The annual cash operating costs of the old bus were €6,400. The new bus is expected to reduce costs by one-fourth, to €4,800 per year.

Compute the amount of the original investment in the new bus. Explain your reasoning.

6-43 Weak Division

Lake Forest Electronics Company paid \$7 million in cash 4 years ago to acquire a company that manufactures CD-ROM drives. This company has been operated as a division of Lake Forest and has lost \$500,000 each year since its acquisition.

The minimum desired return for this division is that, when a new product is fully developed, it should return a net profit of \$500,000 per year for the foreseeable future.

Recently, **IBM Corporation** offered to purchase the division from Lake Forest for \$5 million. The president of Lake Forest commented, “I’ve got an investment of \$9 million to recoup (\$7 million plus losses of \$500,000 for each of 4 years). I have finally got this situation turned around, so I oppose selling the division now.”

Prepare a response to the president’s remarks. Indicate how to make this decision. Be as specific as possible.

6-44 Opportunity Cost

Marnie McKay, MD, is a psychiatrist who is in heavy demand. Even though she has raised her fees considerably during the past 5 years, Dr. McKay still cannot accommodate all the patients who wish to see her.

McKay has conducted 7 hours of appointments a day, 6 days a week, for 46 weeks a year. Her fee averages \$225 per hour.

Her variable costs are negligible and may be ignored for decision purposes. Ignore income taxes.

1. McKay is weary of working a 6-day week. She is considering taking every other Saturday off. What would be her annual income (a) if she worked every Saturday and (b) if she worked every other Saturday?
2. What would be her opportunity cost for the year of not working every other Saturday?
3. Assume that Dr. McKay has definitely decided to take every other Saturday off. She loves to repair her sports car by doing the work herself. If she works on her car during half a Saturday when she otherwise would not see patients, what is her opportunity cost?

PROBLEMS

6-45 Hotel Rooms and Opportunity Costs

The **Marriott Corporation** operates many hotels throughout the world. Suppose one of its Chicago hotels is facing difficult times because of the opening of several new competing hotels.

To accommodate its flight personnel, **American Airlines** has offered Marriott a contract for the coming year that provides a rate of \$70 per night per room for a minimum of 50 rooms for 365 nights. This contract would assure that Marriott rents 50 rooms per night, even if some of the rooms are vacant on some nights. Assume zero variable costs.

The Marriott manager has mixed feelings about the contract. On several peak nights during the year, the hotel could sell the same space for \$150 per room.

1. Suppose the Marriott manager signs the contract. What is the opportunity cost of the 50 rooms on October 20, the night of a big convention of retailers when every nearby hotel room is occupied? What is the opportunity cost on December 28, when only 10 of these rooms would be expected to be rented at an average rate of \$100?
2. If the year-round rate per room averaged \$110, what percentage of occupancy of the 50 rooms in question would have to be rented to make Marriott indifferent about accepting the offer?

6-46 Extension of Preceding Problem

Assume the same facts as in the preceding problem. However, also assume that the variable costs per room, per day are \$10.

1. Suppose the best estimate is a 62% general occupancy rate for the 50 rooms at an average \$110 room rate for the next year. Should Marriott accept the contract?
2. What percentage of occupancy of the 50 rooms in question would make Marriott indifferent about accepting the offer?

6-47 Make or Buy

TISCON Inc., based in Detroit, Michigan, is the producer and seller of bearings that serve industrial and vehicle production as well as replacement markets. Due to a large order volume, it often subcontracts work to other small bearing producers when its capacity is full. The general manager of TISCON is preparing its budget for the coming year and he has to make some final decisions regarding the use of its manufacturing facilities.

The following are the costs of making product number EM101 to be used in a particular machine for industrial use.

	Total cost for 130,000 Units	Cost per Unit
Direct materials	\$1,170,000	\$ 9
Direct labor	1,430,000	11
Variable factory overhead	1,300,000	10
Fixed factory overhead	390,000	3
Total manufacturing costs	<u>\$4,290,000</u>	<u>\$33</u>

A manufacturer of EM101 has offered to sell the bearing to TISCON at \$28 each. The fixed factory overhead consists of depreciation, repair and maintenance, rent, insurance, and supervisory salaries. If TISCON buys the bearing from the external supplier, all the fixed overhead would continue except the supervisory salaries of \$260,000.

1. Assume that the capacity now used to make parts will become idle if the parts are purchased. Should TISCON make or buy the bearings? Show computations.
2. Assume that the capacity now used to make parts will either (a) be leased to a nearby manufacturer for \$50,000 for the coming year or (b) be used to make gears that will yield a profit contribution of \$30,000. Should TISCON buy or make EM101? Show computations.

6-48 Relevant-Cost Analysis

Following are the unit costs of making and selling a single product at a normal level of 5,000 units per month and a current unit selling price of \$90:

Manufacturing costs	
Direct materials	\$35
Direct labor	12
Variable overhead	8
Fixed overhead (total for the year, \$300,000)	5
Selling and administrative expenses	
Variable	15
Fixed (total for the year, \$480,000)	8

Consider each requirement separately. Label all computations, and present your solutions in a form that will be comprehensible to the company president.

1. This product is usually sold at a rate of 60,000 units per year. It is predicted that a rise in price to \$98 will decrease volume by 10%. How much may advertising be increased under this plan without having annual operating income fall below the current level?
2. The company has received a proposal from an outside supplier to make and ship this item directly to the company's customers as sales orders are forwarded. Variable selling and administrative costs would fall 40%. If the supplier's proposal is accepted, the company will use its own plant to produce a new product. The new product would be sold through manufacturer's agents at a 10% commission based on a selling price of \$40 each. The cost characteristics of this product, based on predicted yearly normal volume, are as follows.

	Per Unit
Direct materials	\$ 6
Direct labor	12
Variable overhead	8
Fixed overhead	6
Manufacturing costs	<u>\$32</u>
Selling and administrative expenses	
Variable (commission)	10% of selling price
Fixed	\$ 2

What is the maximum price per unit that the company can afford to pay to the supplier for sub-contracting production of the entire old product? Assume the following:

- Total fixed factory overhead and total fixed selling expenses will not change if the new product line is added.

- The supplier's proposal will not be considered unless the present annual net income can be maintained.
- Selling price of the old product will remain unchanged at \$90.
- All \$300,000 of fixed manufacturing overhead will be assigned to the new product.

6-49 Hotel Pricing and Use of Capacity

A growing corporation in a large city has offered a 200-room **Holiday Inn** a 1-year contract to rent 40 rooms at a reduced rate of \$50 per room instead of the regular rate of \$86 per room. The corporation will sign the contract for 365-day occupancy because its visiting manufacturing and marketing personnel are virtually certain to use all the space each night.

Each room occupied has a variable cost of \$12 per night (for cleaning, laundry, lost linens, and extra electricity).

The hotel manager expects an 85% occupancy rate for the year so she is reluctant to sign the contract. If the contract is signed, the occupancy rate on the remaining 160 rooms will be 95%.

1. Compute the total contribution margin for the year with and without the contract. Is the contract profitable to Holiday Inn?
2. Compute the lowest room rate that the hotel should accept on the contract so that the total contribution margin would be the same with or without the contract.

6-50 Special Air Fares

Denver-based **Frontier Airlines** provides service to 39 cities in the United States and Mexico. Frontier operates a fleet of 37 aircraft including sixteen 134-passenger **Boeing** 737-300 jets. The manager of operations of Frontier Airlines is trying to decide whether to adopt a new discount fare. Focus on one 134-seat 737 airplane now operating at a 56% load factor. That is, on average the airplane has $0.56 \times 134 = 75$ passengers. The regular fares produce an average revenue of \$.12 per passenger mile.

Suppose an average 40% fare discount (which is subject to restrictions regarding time of departure and length of stay) will produce three new additional passengers. Also suppose that three of the previously committed passengers accept the restrictions and switch to the discount fare from the regular fare.

1. Compute the total revenue per airplane-mile with and without the discount fares.
2. Suppose the maximum allowed allocation to new discount fares is 50 seats. These will be filled. As before, some previously committed passengers will accept the restrictions and switch to the discount fare from the regular fare. How many will have to switch so that the total revenue per mile will be the same either with or without the discount plan?

6-51 Choice of Products

Gulf Coast Fashions sells both designer and moderately priced women's wear in Tampa. Profits have been volatile. Top management is trying to decide which product line to drop. Accountants have reported the following data:

	Per Item	
	Designer	Moderately Priced
Average selling price	\$240	\$150
Average variable expenses	120	85
Average contribution margin	<u>\$120</u>	<u>\$ 65</u>
Average contribution-margin percentage	50%	43%

The store has 8,000 square feet of floor space. If moderately priced goods are sold exclusively, 400 items can be displayed. If designer goods are sold exclusively, only 300 items can be displayed. Moreover, the rate of sale (turnover) of the designer items will be two-thirds the rate of moderately priced goods.

1. Prepare an analysis to show which product to drop.
2. What other considerations might affect your decision in number 1?

6-52 Analysis of Unit Costs

Circuit Booster Company manufactures small appliances, such as electric can openers, toasters, food mixers, and irons. The peak manufacturing season is at hand, and the president is trying to

decide whether to produce more of the company's standard line of can openers or its premium line that includes a built-in knife sharpener, a better finish, and a higher-quality motor. The unit data follow:

	Product	
	Standard	Premium
Selling price	\$60	\$70
Direct material	\$ 9	\$14
Direct labor	6	3
Variable factory overhead	6	8
Fixed factory overhead	14	21
Total cost of goods sold	\$35	\$46
Gross profit per unit	\$25	\$24

The sales outlook is very encouraging. The plant could operate at full capacity by producing either product or both products. Both the standard and the premium products are processed through the same departments. Selling and administrative costs will not be affected by this decision so they may be ignored.

Many of the parts are produced on automatic machinery. The factory overhead is allocated to products by developing separate rates per machine hour for variable and fixed overhead. For example, the total fixed overhead is divided by the total machine hours to get a rate per hour. Thus, the amount of overhead allocated to products is dependent on the number of machine hours used by the product. It takes 1 hour of machine time to produce one unit of the standard product.

Direct labor may not be proportionate with overhead because many workers operate two or more machines simultaneously.

Which product should be produced? If more than one should be produced, indicate the proportions of each. Show computations. Explain your answers briefly.

6-53 Use of Available Facilities

The Oahu Audio Company manufactures electronic subcomponents that can be sold as is or can be processed further into "plug-in" assemblies for a variety of intricate electronic equipment. The entire output of subcomponents can be sold at a market price of \$2.20 per unit. The plug-in assemblies have been generating a sales price of \$5.70 for 3 years, but the price has recently fallen to \$5.30 on assorted orders.

Janet Oh, the vice president of marketing, has analyzed the markets and the costs. She thinks that production of plug-in assemblies should be dropped whenever the price falls below \$4.70 per unit. However, at the current price of \$5.30, the total available capacity should currently be devoted to producing plug-in assemblies. She has cited the data in Exhibit 6-7.

Exhibit 6-7

Oahu Audio Company
Product Profitability Data

Subcomponents		
Selling price, after deducting relevant selling costs		\$2.20
Direct materials	\$1.10	
Direct labor	0.30	
Manufacturing overhead	0.60	
Cost per unit		2.00
Operating profit		\$0.20
Plug-In Assemblies		
Selling price, after deducting relevant selling costs		\$5.30
Transferred-in variable cost for subcomponents	\$1.40	
Additional direct materials	1.45	
Direct labor	0.45	
Manufacturing overhead	1.20*	
Cost per unit		4.50
Operating profit		\$0.80

*For additional processing to make and test plug-in assemblies.

Direct-materials and direct-labor costs are variable. The total overhead is fixed; it is allocated to units produced by predicting the total overhead for the coming year and dividing this total by the total hours of capacity available.

The total hours of capacity available are 600,000. It takes 1 hour to make 60 subcomponents and 2 hours of additional processing and testing to make 60 plug-in assemblies.

1. If the price of plug-in assemblies for the coming year is to be \$5.30, should sales of subcomponents be dropped and all facilities devoted to the production of plug-in assemblies? Show your computations.
2. Prepare a report for the vice president of marketing to show the lowest possible price for plug-in assemblies that would be acceptable.
3. Suppose 40% of the manufacturing overhead is variable with respect to processing and testing time. Repeat numbers 1 and 2. Do your answers change? If so, how?

6-54 Joint Costs and Incremental Analysis

Jacque de Paris, a high-fashion women's dress manufacturer, is planning to market a new cocktail dress for the coming season. Jacque de Paris supplies retailers in Europe and the United States.

Four yards of material are required to lay out the dress pattern. Some material remains after cutting, which can be sold as remnants. The leftover material could also be used to manufacture a matching cape and handbag. However, if the leftover material is to be used for the cape and handbag, more care will be required in the cutting, which will increase the cutting costs.

The company expects to sell 1,000 dresses if no matching cape or handbag is available. Market research reveals that dress sales will be 15% higher if a matching cape and handbag are available. The market research indicates that the cape and handbag will not be sold individually, but only as accessories with the dress. The various combinations of dresses, capes, and handbags that are expected to be sold by retailers are as follows:

Percent of Total	
Complete sets of dress, cape, and handbag	72%
Dress and cape	10%
Dress and handbag	12%
Dress only	6%
Total	<u>100%</u>

The material used in the dress costs €90 a yard, or €360 for each dress. The cost of cutting the dress if the cape and handbag are not manufactured is estimated at €105 a dress, and the resulting remnants can be sold for €24 for each dress cut out. If the cape and handbag are to be manufactured, the cutting costs will be increased by €34 per dress. There will be no salable remnants if the capes and handbags are manufactured in the quantities estimated. The selling prices and the costs to complete the three items once they are cut are as follows:

	Selling Price per Unit	Unit Cost to Complete (Excludes Cost of Material and Cutting Operation)
Dress	€1,100	€600
Cape	120	70
Handbag	40	30

1. Calculate the incremental profit or loss to Jacque de Paris from manufacturing the capes and handbags in conjunction with the dresses.
2. Identify any non-quantitative factors that could influence the company's management in its decision to manufacture the capes and handbags that match the dress.

6-55 Joint Products: Sell or Process Further

Western, Corp., produces two products, cigars and chewing tobacco, from a joint process involving the processing of tobacco leaves. Joint costs are \$60,000 for this process, and yield 2,000 pounds of cigars and 4,000 pounds of chewing tobacco. Cigars sell for \$80 per pound, and chewing tobacco sells for \$20 per pound. Cigars require \$80,000 in separable costs, while chewing tobacco requires \$50,000

in separable costs. Chewing tobacco can be processed further (for \$30,000 in additional separable costs) into a mint-flavored premium chewing tobacco that would sell for \$30 per pound.

1. Should Western process chewing tobacco into premium chewing tobacco?
2. What is the maximum amount that joint costs can increase before (a) it would not be better to process chewing tobacco further into premium chewing tobacco, and (b) it would be better to cease processing tobacco leaves to produce cigars and premium chewing tobacco?

6-56 Relevant Cost

Infinity Inc., headquartered in Yokohama, Japan, produces and sells brakes for cars. Infinity's unit cost of manufacturing and selling a given type of brakes at the planned capacity of 20,000 units per month is as follows:

Manufacturing costs:	
Direct materials	¥451.50
Direct labor	99.75
Variable overhead	115.50
Fixed overhead	110.25
Selling expenses	
Variable	304.50
Fixed	110.25

1. Compute the planned annual operating income as a selling price of ¥1995 per unit.
2. If the selling price is reduced to ¥1,680 per unit, sales volume can be increased by 12%. Assuming that the implied cost behavior pattern remains unaltered, compute the expected annual operating income.
3. The company has received an offer of selling 6,800 units from a foreign customer. The variable selling expenses for the order will be 30% less than usual but the fixed cost of obtaining the order will be ¥856,800. Domestic sales of the company will not be affected if the offer is accepted. Compute the minimum break-even price per unit to be considered.
4. The company has an inventory of 8,000 units of its item left over from last year's model. These must be sold to the replacement market through regular channels at reduced prices. The inventory will be valueless unless sold this way. What unit cost is relevant for establishing the minimum selling price of the 8,000 units.

6-57 New Machine

A new \$300,000 machine is expected to have a 5-year life and a terminal value of zero. It can produce 40,000 units a year at a variable cost of \$4 per unit. The variable cost is \$6.50 per unit with an old machine, which has a book value of \$100,000. It is being depreciated on a straight-line basis at \$20,000 per year. It too is expected to have a terminal value of zero. Its current disposal value is also zero because it is highly specialized equipment.

The salesperson of the new machine prepared the following comparison:

	New Machine	Old Machine
Units	40,000	40,000
Variable costs	\$160,000	\$260,000
Straight-line depreciation	60,000	20,000
Total cost	\$220,000	\$280,000
Unit cost	\$ 5.50	\$ 7.00

He said, "The new machine is obviously a worthwhile acquisition. You will save \$1.50 for every unit you produce."

1. Do you agree with the salesperson's analysis? If not, how would you change it? Be specific. Ignore taxes.
2. Prepare an analysis of total and unit differential costs if the annual volume is 20,000 units.
3. At what annual volume would both the old and new machines have the same total relevant costs?

6-58 Conceptual Approach

A large automobile-parts plant was constructed 4 years ago in a Pennsylvania city served by two railroads. The PC Railroad purchased 40 specialized 60-foot freight cars as a direct result of the additional traffic generated by the new plant. The investment was based on an estimated useful life of 20 years.

Now the competing railroad has offered to service the plant with new 86-foot freight cars that would enable more efficient shipping operations at the plant. The automobile-parts company has threatened to switch carriers unless PC Railroad buys 10 new 86-foot freight cars.

The PC marketing management wants to buy the new cars, but PC operating management says, “The new investment is undesirable. It really consists of the new outlay plus the loss on the old freight cars. The old cars must be written down to a low salvage value if they cannot be used as originally intended.”

Evaluate the comments. What is the correct conceptual approach to the quantitative analysis in this decision?

6-59 Book Value of Old Truck

Consider the following information concerning the replacement of an old truck by a new truck.

	Old Equipment	Proposed New Equipment
Original cost	\$ 45,600	\$22,950
Useful life (in km)	800,000	300,000
Current distance travelled (in km)	500,000	0
Useful life remaining (in km)	300,000	300,000
Accumulated depreciation	\$ 28,500	0
Book value	\$ 17,100	*
Disposal value (in cash) now	\$ 5,250	*
Cash operating costs (maintenance, fuel, repairs, lubricants, etc.) per 100,000 km	\$ 17,700	\$ 9,300

*Not acquired yet.

1. Prepare a cost comparison of all relevant items for the next 300,000 km together. Ignore taxes.
2. Prepare a cost comparison that includes both relevant and irrelevant items.
3. Prepare a comparative statement of the total charges against revenue for 300,000 km. Would the manager be inclined to buy the new truck? Explain.

6-60 Decision and Performance Models

Refer to Problem 6-A4.

1. Suppose the “decision model” favored by top management consisted of a comparison of a 3-year accumulation of wealth under each alternative. Which alternative would you choose? Why? (Accumulation of wealth means cumulative increase in cash.)
2. Suppose the “performance evaluation model” emphasized the net income of a subunit, such as a division, each year rather than considering each project, one by one. Which alternative would you expect a manager to choose? Why?
3. Suppose the same quantitative data existed, but the “enterprise” was a city and the “machine” was a computer in the treasurer’s department. Would your answers to the first two parts change? Why?

6-61 Review of Relevant Costs

Since the early 1960s, Neil Simon has been one of Broadway’s most successful playwrights. The *New York Times* reported that Neil Simon planned to open his play, *London Suite*, off Broadway. Why? For financial reasons. Producer Emanuel Azenberg predicted the following costs before the play even opened:

	On Broadway	Off Broadway
Sets, costumes, lights	\$ 357,000	\$ 87,000
Loading in (building set, etc.)	175,000	8,000
Rehearsal salaries	102,000	63,000
Director and designer fees	126,000	61,000
Advertising	300,000	121,000
Administration	235,000	100,000
Total	<u>\$1,295,000</u>	<u>\$440,000</u>

Broadway ticket prices average \$60, and theaters can seat about 1,000 persons per show. Off-Broadway prices average only \$40, and the theaters seat only 500. Normally, plays run eight times a week, both on and off Broadway. Weekly operating expenses off Broadway average \$102,000; they average an extra \$150,000 on Broadway for a weekly total of \$252,000.

1. Suppose 400 persons attended each show, whether on or off Broadway. Compare the weekly financial results from a Broadway production to one produced off Broadway.
2. Suppose attendance averaged 75% of capacity, whether on or off Broadway. Compare the weekly financial results from a Broadway production to one produced off Broadway.
3. Compute the attendance per show required just to cover weekly expenses (a) on Broadway and (b) off Broadway.
4. Suppose average attendance on Broadway was 600 per show and off Broadway was 400. Compute the total net profit for a 26-week run (a) on Broadway and (b) off Broadway. Be sure to include the pre-opening costs.
5. Repeat requirement 4 for a 100-week run.
6. Using attendance figures from numbers 4 and 5, compute (a) the number of weeks a Broadway production must run before it breaks even, and (b) the number of weeks an off-Broadway production must run before it breaks even.
7. Using attendance figures from numbers 4 and 5, determine how long a play must run before the profit from a Broadway production exceeds that from an off-Broadway production.
8. If you were Neil Simon, would you prefer *London Suite* to play on Broadway or off Broadway? Explain.

6-62 Make or Buy

Excel Corp. currently produces a component part, X-505, in-house. The internal capacity permits for a maximum of 20,000 units of X-505. The production manager has provided the following information concerning the internal manufacture of 20,000 units of X-505.

	Per unit
Direct materials	€14.00
Direct labor	18.00
Variable overhead	6.00
Fixed overhead	10.00
Total cost	€48.00

The fixed overhead includes €3.40 per unit allocation for the salary of the supervisor to oversee the production of the part. If the part is outsourced, the supervisor will be terminated. No other fixed costs will be reduced by such a decision. The company needs 10,000 of X-505. Assume that if the company outsources, the parts can be purchased at €36.00 per unit.

1. Should Excel Corp. outsource X-505?
2. Excel has just received special order for 6,000 units of X-505 from a company. The company is ready to pay €56.00 per part but will buy the product only if it is manufactured by Excel. Hence, in order to accept the offer, Excel must drop the idea of outsourcing it. Should Excel accept the special order?

6-63 Make or Buy, Opportunity Costs, and Ethics

Parle Agro Pvt. Ltd. is one of the best food processing companies in India. The company produces a wide variety of processed food products, including tomato sauce, potato chips, and ready-to-cook food mixes. The company's potato chips manufacturing operation relies partly on potatoes grown on its own farms and partly on those bought from other farmers. Parle's potato farm produces 8 million kilograms of potatoes a year and employs 110 persons. The annual costs of potatoes grown on this farm are as follows:

	₹ (million)
Variable production costs	60.00
Fixed production costs	24.00
Shipping costs (all variable)	6.00
Total costs	90.00

Fix production costs include depreciation on machinery and equipment but not on land as land should not be depreciated. Parle purchased the land for ₹12 million many years ago. A recent appraisal revalued the land at ₹36 million as it is a prime site for an industry park. Parle could purchase all the potatoes it needs from the market for ₹8 per kg and have them delivered to its factory. If it did this, it would sell the farmland and shut down the operations. If the farm is sold out, ₹6,000,000 of the annual fixed costs would be saved. The company could invest the excess cash and earn an annual rate of 10%.

1. How much does it cost Parle annually for the land used by the potato farm?
2. How much would Parle save annually if it closed the potato farm? Is this more or less than would be paid to purchase the potatoes from the market?
3. What ethical issues are involved with the decision to shut down the potato farm?

6-64 Irrelevance of Past Costs at Starbucks

Starbucks purchases and roasts high-quality, whole-bean coffees, its hallmark, and sells them along with other coffee-related products primarily through its company-operated retail stores.

Suppose that the quality-control manager at Starbucks discovered a 1,200-pound batch of roasted beans that did not meet the company's quality standards. Company policy would not allow such beans to be sold with the Starbucks name on them. However, they could be reprocessed, at which time they could be sold by Starbucks' retail stores, or they could be sold as is on the wholesale coffee bean market.

Assume that the beans were initially purchased for \$800, and the total cost of roasting the batch was \$2,520, including \$420 of variable costs and \$2,100 of fixed costs (primarily depreciation on the equipment).

The wholesale price at which Starbucks could sell the beans was \$3.80 per pound. Purchasers would pay the shipping costs from the Starbucks plant to their individual warehouses.

If the beans were reprocessed, the processing cost would be \$900 because the beans would not require as much processing as new beans. All \$900 would be additional costs, that is, costs that would not be incurred without the reprocessing. The beans would be sold to the retail stores for \$4.90 per pound, and Starbucks would have to pay an average of \$.45 per pound to ship the beans to the stores.

1. Should Starbucks sell the beans on the market as is for \$3.80 per pound, or should the company reprocess the beans and sell them through its own retail stores? Why?
2. Compute the amount of extra profit Starbucks earns from the alternative you selected in number 1 compared to what it would earn from the other alternative.
3. What cost numbers in the problem were irrelevant to your analysis? Explain why they were irrelevant.

CASES

6-65 Make or Buy

The Minnetonka Corporation, which produces and sells to wholesalers a highly successful line of water skis, has decided to diversify to stabilize sales throughout the year. The company is considering the production of cross-country skis.

After considerable research, a cross-country ski line has been developed. Because of the conservative nature of the company management, however, Minnetonka's president has decided to introduce only one type of the new skis for this coming winter. If the product is a success, further expansion in future years will be initiated.

The ski selected is a mass-market ski with a special binding. It will be sold to wholesalers for \$80 per pair. Because of available capacity, no additional fixed charges will be incurred to produce the skis. A \$125,000 fixed charge will be absorbed by the skis, however, to allocate a fair share of the company's present fixed costs to the new product.

Using the estimated sales and production of 10,000 pair of skis as the expected volume, the accounting department has developed the following costs per pair of skis and bindings:

Direct labor	\$35
Direct materials	30
Total overhead	15
Total cost	<u>\$80</u>

Minnetonka has approached a subcontractor to discuss the possibility of purchasing the bindings. The purchase price of the bindings from the subcontractor would be \$5.25 per binding, or \$10.50 per

pair. If the Minnetonka Corporation accepts the purchase proposal, it is predicted that direct-labor and variable-overhead costs would be reduced by 10% and direct-materials costs would be reduced by 20%.

1. Should the Minnetonka Corporation make or buy the bindings? Show calculations to support your answer.
2. What would be the maximum purchase price acceptable to the Minnetonka Corporation for the bindings? Support your answer with an appropriate explanation.
3. Instead of sales of 10,000 pairs of skis, revised estimates show sales volume at 12,500 pairs. At this new volume, additional equipment, at an annual rental of \$10,000, must be acquired to manufacture the bindings. This incremental cost would be the only additional fixed cost required, even if sales increased to 30,000 pairs. (The 30,000 level is the goal for the third year of production.) Under these circumstances, should the Minnetonka Corporation make or buy the bindings? Show calculations to support your answer.
4. The company has the option of making and buying at the same time. What would be your answer to number 3 if this alternative were considered? Show calculations to support your answer.
5. What nonquantifiable factors should the Minnetonka Corporation consider in determining whether it should make or buy the bindings?

6-66 Make or Buy

The Rohr Company's old equipment for making subassemblies is worn out. The company is considering two courses of action: (a) completely replacing the old equipment with new equipment or (b) buying subassemblies from a reliable outside supplier, who has quoted a unit price of \$1 on a 7-year contract for a minimum of 50,000 units per year.

Production was 60,000 units in each of the past 2 years. Future needs for the next 7 years are not expected to fluctuate beyond 50,000 to 70,000 units per year. Cost records for the past 2 years reveal the following unit costs of manufacturing the subassembly:

Direct materials	\$0.30
Direct labor	0.35
Variable overhead	0.10
Fixed overhead (including \$.10 depreciation and \$.10 for direct departmental fixed overhead)	<u>0.25</u>
	<u>\$1.00</u>

The new equipment will cost \$188,000 cash, will last 7 years, and will have a disposal value of \$20,000. The current disposal value of the old equipment is \$10,000.

The sales representative for the new equipment has summarized her position as follows: The increase in machine speeds will reduce direct labor and variable overhead by \$0.35 per unit. Consider last year's experience of one of your major competitors with identical equipment. It produced 100,000 units under operating conditions very comparable to yours and showed the following unit costs.

Direct materials	\$0.30
Direct labor	0.05
Variable overhead	0.05
Fixed overhead, including depreciation of \$.24	<u>0.40</u>
Total	<u>\$0.80</u>

For purposes of this case, assume that any idle facilities cannot be put to alternative use. Also assume that \$.05 of the old Rohr unit cost is allocated fixed overhead that will be unaffected by the decision.

1. The president asks you to compare the alternatives on a total-annual-cost basis and on a per-unit basis for annual needs of 60,000 units. Which alternative seems more attractive?
2. Would your answer to number 1 change if the needs were 50,000 units? 70,000 units? At what volume level would Rohr be indifferent between making and buying subassemblies? Show your computations.
3. What factors, other than the preceding ones, should the accountant bring to the attention of management to assist it in making its decision? Include the considerations that might be applied to the outside supplier.

6-67 Make or Buy

Levoy, Corp., estimates it will produce 25,000 units of an electronic sensor part that goes into one of its final products, called a Fluctotron. It currently produces this sensor internally but is considering outsourcing this activity. Current internal capacity permits the production of a maximum of 40,000 sensors. The production manager has prepared the following information concerning the internal manufacture of 40,000 sensors:

	Per Sensor
Direct materials	\$15.00
Direct labor	8.00
Variable overhead	10.00
Fixed overhead	<u>11.00</u>
Total cost	<u>\$44.00</u>

The fixed overhead of \$11 per unit includes a \$2 per unit allocation for salary paid to a supervisor to oversee production of sensors. The fixed costs would not be reduced by outsourcing, except the supervisor would be fired (the company would terminate his contract). Assume that if Levoy outsources, its purchase price from the outsourcer is \$38 per unit.

1. Should Levoy outsource? Why or why not?
2. Assume that if Levoy outsourced, it would create sufficient excess capacity such that it would retain the supervisor and have him oversee production of a new optical reading product, called a Scanmeister. If each Scanmeister generates a contribution margin of \$15 and the company produces 10,000 Scanmeisters, what is the maximum price Levoy would accept for outsourcing the sensors?

NIKE 10-K PROBLEM**6-68 Make or Buy**

As described in Item 1 of Nike's 10-K, virtually all of its products are produced by independent contractors. Suppose that in one of those contracted production facilities where Nike golf clubs are produced, Nike estimates the need for 20,000 specialized head casings per year over the next 5 years for a custom driver club it manufactures. It can either make the casings internally or purchase them from an outside supplier for \$29.75 per unit. If it makes the casings, it will have to purchase equipment costing \$300,000 that has a 5-year life and no salvage value (assume straight line depreciation). The machine can produce up to 40,000 casings per year. The production manager thinks the company should purchase the casings based on the following information he has prepared concerning the internal manufacture of 20,000 casings per year:

	Per unit
Direct materials	\$12.00
Direct labor	8.00
Variable overhead	4.50
Depreciation	3.00
Supervision	1.50
Rent	<u>3.00</u>
Total cost	<u>\$32.00</u>

A supervisor would have to be hired and paid a salary of \$30,000 to oversee production of the casings. The rent charge is based on the space utilized in the plant, but there is excess plant space available to manufacture the casings. Total rent on the plant is \$250,000 per period.

1. If the casings are made internally, will the company be better off or worse off, and by how much?
2. If it is estimated that only 15,000 casings per year were required, should Nike make or buy them?

EXCEL APPLICATION EXERCISE

6-69 Identifying Relevant Revenue, Costs, and Income Effects

Goal: Create an Excel spreadsheet to assist with sell-or-process-further decisions by identifying the relevant revenue, costs, and income effects. Use the results to answer questions about your findings.

Scenario: Mussina Chemical Company has asked you to prepare an analysis to help it make decisions about whether to sell joint products at the split-off point or process them further. The background data for the analysis appears in the Fundamental Assignment Material 6-A3. Prepare the analysis report using a format similar to Exhibit 6-3 on p. 257.

When you have completed your spreadsheet, answer the following questions:

1. How should the \$117,000 be allocated to the three products?
2. Is the company currently making the right processing decisions? Explain.
3. If the company alters its processing decisions, what would be the expected combined operating income from the three products?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 6 Decision Guideline
Row 2: Mussina Chemical Company
Row 3: Sell-or-Process-Further Analysis
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–J.
4. In row 7, create the following bold-faced column headings:
Column B: Chemical Product A
Skip two columns.
Column E: Chemical Product B
Skip two columns.
Column H: Chemical Product C
5. Merge and center the heading in row 7, column B across columns B–D.
Merge and center the heading in row 7, column E across columns E–G.
Merge and center the heading in row 7, column H across columns H–J.
6. In row 8, create the following center-justified column headings:
Column B: Sell at Split-Off
Column C: Process Further
Column D: Difference
Column E: Sell at Split-Off
Column F: Process Further
Column G: Difference
Column H: Sell at Split-Off
Column I: Process Further
Column J: Difference
7. Change the format of the column headings in row 8 to permit the titles to be displayed on multiple lines within a single cell.

Alignment tab: Wrap Text: Checked

8. In column A, create the following bold-faced row headings:
Row 9: Revenues
Row 10: Costs Beyond Split-Off
Skip a row.
Row 11: Income Effects
Note: Adjust the width of column A to accommodate row headings.
9. Use the scenario data to fill in revenues and costs beyond split-off amounts for each of the products.

10. Use appropriate formulas to calculate the difference and income effects columns for each product as absolute values.
5ABS(formula)
11. Format all amounts as follows:

Number:	Category:	Accounting
	Decimal places:	0
	Symbol:	\$

12. Change the format of the costs beyond split-off amounts to not display a dollar symbol.
13. Change the format of the income effects amounts to display as bold.
14. Change the format of the revenues amounts to display a top border, using the default line style.

Border tab:	Icon:	Top Border

15. Change the format of the costs beyond split-off amounts to display a bottom border, using the default line style.

Border tab:	Icon:	Bottom Border

16. Change the format of row 7, column B to display an outline border, using the default line style.

Border tab:	Presets:	Outline

Repeat this step for column E.
Repeat this step for column H.

17. Save your work to disk, and print a copy for your files.

Note: Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

6-70 Outsourcing

A popular term for make-or-buy decisions is *outsourcing decisions*. There are many examples of outsourcing, from **Nike**'s outsourcing of nearly all its production activities to small firms' outsourcing of their payroll activities. Especially popular outsourcing activities are warehousing and computer systems.

The purpose of this exercise is to share information on different types of outsourcing decisions. It can be done in small groups or as an entire class. Each student should pick an article from the literature that tells about a particular company's outsourcing decision. There are many such articles: A recent electronic search of the business literature turned up more than 4,000 articles. An easy way to find such an article is to search an electronic database of business literature. Magazines that have published outsourcing articles include *Fortune*, *Forbes*, *Business Week*, and *Strategic Finance*. Many business sections of newspapers also include such articles. The *Wall Street Journal* usually has a couple of articles on outsourcing each month.

1. List as many details about the outsourcing decision as you can. Include the type of activity that is being outsourced, the size of the outsourcing, and the type of company providing the outsourcing service.
2. Explain why the company decided to outsource the activity. If reasons are not given in the article, prepare a list of reasons that you think influenced the decision.
3. What disadvantages are there to outsourcing the activity?
4. Be prepared to make a 3- to 5-minute presentation to the rest of the group or to the class, covering your answers to numbers 1, 2, and 3.

INTERNET EXERCISE

6-7I Green Mountain Coffee Company

How do firms determine what type of information is useful for a given decision? Is it possible for firms to have too much information? While a look at a firm's Web site provides us with lots of information, not all of it is necessarily useful for a particular decision. Let's look at the **Green Mountain Coffee Company** and see what information on the site would be useful for some specific decisions.

1. Go to the home page of Green Mountain Coffee at www.greenmountaincoffee.com. What are the major topics on which a user can click to be taken to a page with more detailed information? Would you likely find the same type of information if you clicked on the links to any one of these? Why do you suppose Green Mountain Coffee chose those particular subtopics for its home page?
2. Where would you look on the site if you wanted to know more about Green Mountain Coffee's financial information? Locate the most recent annual report posted on this section of the Web site, and answer the following questions. Did the company make a profit for the year? What was the major expense that the firm encountered? Did the firm pay any dividends? If you were interested in an income-producing stock, would you want to invest in Green Mountain Coffee Roasters?
3. Which link would you want to use if you wanted to gain knowledge concerning the story of coffee? Click on this link now. This page has additional links about coffee. Which one(s) are likely to provide information to help you learn about the different coffees? Click on one of the links you just identified. What type of information about coffee differences does it provide? Did your link provide any information concerning prices as being a difference? Do you think that this would be a difference between coffees?
4. The site provides extensive information about social and environmental initiatives. What areas in particular does the firm highlight? Is this information useful in helping determine if the company's coffee products taste good? What about the quality of the product? Would this information be useful to a potential investor in Green Mountain Coffee's common stock?

Introduction to Budgets and Preparing the Master Budget

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Explain how budgets facilitate planning and coordination.
2. Anticipate possible human relations problems caused by budgets.
3. Explain potentially dysfunctional incentives in the budget process.
4. Explain the difficulties of sales forecasting.
5. Explain the major features and advantages of a master budget.
6. Follow the principal steps in preparing a master budget.
7. Prepare the operating budget and the supporting schedules.
8. Prepare the financial budget.
9. Use a spreadsheet to develop a budget (Appendix 7).

► RITZ-CARLTON

If you have ever traveled, you know that there is a big difference between staying in a cheap motel and staying in a five-star, world-class hotel. The cheap motel takes care of your basic needs, but the five-star hotel surrounds you in comfort and luxury, catering to your every whim. No one understands the difference better than the managers of the **Ritz-Carlton** chain of hotels. After all, the word *ritzy*, which means elegant and luxurious, is derived from the name of the Ritz Hotel. Thanks to fierce competition in the industry, though, Ritz-Carlton managers have their share of challenges in maintaining standards that keep their hotels successful.

What does it take to run a world-class hotel successfully? Good location, exquisite food, luxury, personalized service, and quality are all essential ingredients. But you might be surprised to learn that the budgeting process is also a key to success. According to Ralph Vick, former general manager of the Phoenix Ritz-Carlton, “Budgets are crucial to the ultimate financial success of our hotels.” Why are budgets so important? Mainly because they serve as a road map to help managers understand, plan, and control operations. Ritz-Carlton wants to give its managers the best tools possible. As a result, the company takes the budgeting process very seriously.

At the Ritz-Carlton hotels, all employees, from the hotel manager, to the controller, to the newest housekeeper, are involved in the budgeting process. Working in teams, managers set budget targets for the expenses they can control. These target figures help not only in planning, but also in controlling and evaluating employee performance. Managers compare actual results with budgeted target figures, and they evaluate performance based on the differences. In addition to financial reports, Ritz-Carlton managers also use nonfinancial measures, such as quality and customer satisfaction, to evaluate and reward employees.

Planning is the key to good management. This statement is certainly true for Ritz-Carlton, and it is also true for other types of organizations—small, family-owned companies; large corporations; government agencies; and nonprofit organizations. All organizations need budgets to make the best and most profitable use of their resources. Budgeting can cover such diverse issues as how much time to spend inspecting a product and how much money the company will allot to research and development in the coming year. In this chapter, we look at the benefits (and costs) of budgets and illustrate the construction of a comprehensive, detailed budget. ■

Budgets and the Organization

Many people associate the word *budget* primarily with limitations on spending. For example, management often gives each unit in an organization a spending budget and then expects them to stay within the limits prescribed by the budget. However, budgeting can play a much more important role than simply limiting spending. Budgeting moves planning to the forefront of the manager's mind. Well-managed organizations make budgeting an integral part of the formulation and execution of their strategy.

In Chapter 1, we defined a budget as a quantitative expression of a plan of action. Sometimes plans are informal, perhaps even unwritten, and informal plans sometimes work in a small organization. However, as an organization grows, seat-of-the-pants planning is not enough. Budgets impose the formal structure—a budgetary system—that is needed for all but the smallest organizations. There are numerous examples of seemingly healthy businesses that failed because managers did not bother to construct budgets that would have identified problems in advance or they failed to monitor and adjust budgets to changing conditions. While there will always be debate about the costs and benefits of budgeting, as indicated in the Business First box on p. 290, the vast majority of managers continue to use budgeting as an effective cost-management tool.

Advantages of Budgeting

Budgeting is the process of formulating an organization's plans. We will discuss four major advantages of effective budgeting:

1. Budgeting compels managers to think ahead by formalizing their responsibilities for planning.
2. Budgeting provides an opportunity for managers to reevaluate existing activities and evaluate possible new activities.
3. Budgeting aids managers in communicating objectives and coordinating actions across the organization.
4. Budgeting provides benchmarks to evaluate subsequent performance.

Let's look more closely at each of these benefits.

FORMALIZATION OF PLANNING Budgeting forces managers to devote time to planning. On a day-to-day basis, managers often move from extinguishing one business brush fire to another, leaving no time for thinking beyond the next day's problems. As a result, planning takes a backseat to, or is obliterated by, daily pressures. The budgeting process formalizes the need to anticipate and prepare for changing conditions.

To prepare a budget, a manager should set objectives and establish policies to aid their achievement. The objectives are the destination points, and budgets are the road maps guiding us to those destinations. In the absence of goals and objectives, results are difficult to interpret, managers do not foresee problems, and company operations lack direction.

EVALUATION OF ACTIVITIES Budgeting typically uses the current activities of the organization as a starting point for planning, but how managers use this starting point varies widely. At one extreme, in some organizations the budget process automatically assumes that activities for the new budget period will be the same as the activities for the previous period. At the other extreme, some organizations use a form of **zero-base budget**, which starts with the assumption that current activities will not automatically be continued. The term zero-base comes from the fundamental



© Holger Burmeister/Alamy Stock Photo

A Ritz-Carlton hotel projects an image of quality. High quality is expensive so during the master budgeting process Ritz-Carlton managers must assess the planned expenditures for quality-enhancing features versus the added revenues these features will bring.

Objective I

Explain how budgets facilitate planning and coordination.

zero-base budget

A budget that requires justification of expenditures for every activity, including continuing activities.

Budgeting: Value Driver or Value Buster?

There is an ongoing debate about the costs and benefits of budgeting, focusing on four issues: (1) The budgeting process is time-consuming and expensive; (2) even the best-prepared budgets become inaccurate because marketplace change is frequent and unpredictable; (3) evaluating performance against a budget causes managers to bias their budgets, resulting in inaccurate planning; and (4) budget targets create incentives for individuals to take actions to meet targets even when the actions make the firm as a whole worse off.

Some studies suggest that the annual budgeting process can take up to 30% of management's time. For example, in 2000, estimates placed **Ford Motor Company's** cost of budgeting at \$1.2 billion a year. Companies can justify such large budgeting costs only when there are corresponding large benefits. Companies that either fail to incorporate budgeting in their planning activities or react to changing economic conditions by ignoring the budget rather than adapting the budget to the changes will not reap some of the major benefits of budgeting. Consequently, these companies may find that large costs of budgeting are not justified.

Skeptical managers sometimes claim, "I face too many uncertainties and complications to make budgeting worthwhile for me." While it is true that budgeting is more difficult in uncertain or complicated environments, it is also true that these are the environments where the potential benefits are largest. When conditions are changing rapidly, a budget provides a framework for systematic response rather than chaotic reaction.

When managers anticipate that budget information will be used to set targets used in their subsequent performance evaluations, they have an incentive to provide budget information that is biased to make it easier to meet the targets. Biases severely limit the usefulness of budget information for planning and coordination. Moreover, widespread understanding and acceptance of built-in biases can create a pernicious "culture of lying" within the organization.

When managers realize that meeting budget targets affects their rewards, either explicitly through bonus plans or implicitly through promotion and recognition, they have incentives to take actions to meet the targets. This can be a positive motivation, but it can also lead to unethical behavior, such as "cooking the books" or putting pressure on employees to meet targets using whatever means possible. For example, the director of the Office of Federal Housing Enterprise Oversight (OFHEO) denounced "an arrogant and unethical culture" at **Fannie Mae**, the giant mortgage finance company. An OFHEO report cited a corporate culture that allowed managers to disregard accounting standards when they got in the way of achieving

earnings targets that were tied to bonuses. In other cases, managers have taken actions to ship faulty or incomplete products to meet budgeted sales targets, despite clear adverse effects on customer relations and the reputation of the firm.

In 2020, McKinsey surveyed 127 chief financial officers (CFOs) about their budgeting approach coming out of the COVID-19 pandemic. Most admitted that during 2020, they had had to improvise to survive. For 2021 and onwards, the recognition by 43% of them was that budgeting needed to be quicker and more streamlined. Around 65% stated they would be using rolling forecasts in the future. This means that the budgets are continually updated in order to add a new budget period as soon as the most recent period is completed.

McKinsey recognized that CFOs would need to pressure test budget scenarios and assumptions in order to address any potential uncertainty about their budgeting decisions. During the pandemic, some businesses had to make unforeseen investments in e-commerce and retailers re-opened stores in regions where they had closed previously. Many CFOs were looking at zero-based budgeting with each and every expense having to be justified. Examples of this were hospitals shifting their conference and travel budgets to telemedicine and improving work from home technologies. Setting aside a reserve fund of 10–15% of the total budget was another key trend. These funds could then be quickly deployed to deal with a serious and immediate problem such as a drop in sales, an increase in returns, or extra marketing to ward off a newcomer to the market. Another issue was the pressure placed on key finance staff and the decision to assign them to the highest priority areas of the business so their budgeting skills could have more of an immediate effect. The final key change was to link budgeting closely with key performance indicators. To do this, they would need to gain the support and cooperation of senior management across the organization. Part of this process was to look at the future budgeting needs rather than analyze past performance, which often raised more questions than it answered.

Sources: Adapted from R. Banham, "Better Budgets," *Journal of Accountancy*, February 2000, pp. 37–40; J. Hope and R. Fraser, "Who Needs Budgets?" *Harvard Business Review*, February 2003, pp. 108–115; P. Smith, C. Goranson, and M. Astley, "Intranet Budgeting," *Strategic Finance*, May 2003, pp. 30–33; T. Hatch and W. Stratton, "Scorecarding in North America: Who is Doing What?" Paper presented at the CAM-I/CMS 3rd quarter meeting, Portland, Oregon, September 10, 2002; M. Jensen, "Corporate Budgeting Is Broken, Let's Fix It," *Harvard Business Review*, November 2001, pp. 94–101; M. Jensen, "Paying People to Lie: the Truth About the Budgeting Process," *European Financial Management*, Vol. 9 No. 3, (2003), pp. 379–406; and "Fannie Mae Ex-Officials May Face Legal Action over Accounting," *Wall Street Journal*, May 24, 2006, p. A1; The Global Strategy & Corporate Finance Practice, "Memo to the CFO: A New Approach to 2021 Budgeting Starts Now," McKinsey & Company, September 10, 2020.

assumption that the budget for every activity starts at zero. The advantage of a zero-base system is that managers reevaluate all activities (including whether existing activities should be continued) in each new budget.

In practice, budgeting for most organizations falls somewhere between these two extremes. An effective budget process encourages managers to think carefully about whether to continue current activities and methods, whether there are opportunities to modify activities, and whether to add new activities to help the organization better achieve its goals in response to

changing conditions. Used in this way, budgeting encourages managers to review whether a particular plan allocates resources optimally among the firm's various activities.

COMMUNICATION AND COORDINATION The most effective budget processes facilitate communication both from the top down and from the bottom up. Top management communicates the strategic goals and objectives of the organization in its budgetary directives. Lower-level managers and employees contribute their own ideas and provide feedback on the goals and objectives. The result is two-way communication about opportunities and challenges that lie ahead.

Budgets also help managers coordinate activities across the organization. For example, a budget allows purchasing personnel to integrate their plans with production requirements, while production managers use the sales budget and delivery schedule to help them anticipate and plan for the employees and physical facilities they will need. Similarly, financial officers use the sales budget, purchasing requirements, and other planned expenditures to anticipate the company's need for cash. Thus, budgeting forces managers to communicate and coordinate their department's activities with those of other departments and the company as a whole.

PERFORMANCE EVALUATION Budgeted performance goals generally provide a better basis for evaluating actual results than would a simple comparison with past performance. Relying only on historical results for judging current performance may allow inefficiencies in past performance to continue undetected. Changes in economic conditions, technology, personnel, competition, and other factors also limit the usefulness of comparisons with the past. For example, sales of \$100 million this year, for a company that had sales of \$80 million the previous year, may or may not indicate that company objectives have been met—perhaps conditions imply that the sales goal for this year should have been \$110 million.

Making Managerial Decisions

Level 3 Communications is “a facilities-based provider of a broad range of communications services.” The company has had losses for a number of years, which it attributes to a difficult competitive environment. For example, the 2022 annual report states, “Although the pricing for data services is currently relatively stable, the IP market is generally characterized by price compression and high unit growth rates depending upon the type of service. The Company experienced price compression in the high-speed IP market in 2022 and expects that aggressive pricing for its highspeed IP services will continue.” The company has had a steady stream of large losses, \$1,114 million in 2018, \$318 million in 2019, \$618 million in 2020, and \$622 million in 2022.

Level 3's loss for 2022 was \$756 million. Suppose the company budgeted to break even for 2022. Evaluate operating performance for 2022.

Answer

Level 3's performance in 2022 is consistent with what might be expected based on the losses that have occurred over the previous 4 years. However, if the company budgeted for break even in 2022, then performance is much worse than budgeted. This situation illustrates that a comparison to past results can provide a very different conclusion than a comparison to budget.

Potential Problems in Implementing Budgets

In this section, we discuss three problems that can limit, in some cases severely, the advantages of budgeting:

1. Low levels of participation in the budget process and lack of acceptance of responsibility for the final budget
2. Incentives to lie and cheat in the budget process
3. Difficulties in obtaining accurate sales forecasts

BUDGET PARTICIPATION AND ACCEPTANCE OF THE BUDGET The advantages of budgeting are fully realized only when employees throughout the organization accept and take responsibility for the final budget. The main factors affecting budget acceptance are as follows:

1. The perceived attitude of top management.
2. The level of participation in the budget process.
3. The degree of alignment between the budget and other performance goals.

Objective 2

Anticipate possible human relations problems caused by budgets.

The attitude of top management will heavily influence lower-level managers' and employees' attitudes toward budgets. If top management does not use budgets effectively in controlling operations and adapting to change, others in the organization may come to view budgeting as irrelevant. Even with the support of top management, however, budgets—and the managers who implement them—can run into opposition.

participative budgeting

Budgets formulated with the active participation of all affected employees.

Lower-level managers sometimes have negative attitudes toward budgets because they believe the primary purpose of the budget is to limit spending. These negative attitudes are reinforced when companies evaluate managerial performance by comparing actual expenditures against amounts budgeted without substantive input from the managers. Ensuring that managers at all levels participate in setting budgets is one way to reduce negative attitudes and improve the quality of planning decisions. Budgets created with the active participation of all affected employees—called **participative budgeting**—are generally more effective than budgets imposed on subordinates. For example, Ritz-Carlton's budgeting system involves all hotel employees and is thus a participative system. Employee "buy-in" to the budget is so important at Ritz-Carlton that self-directed employee teams at all levels of the company have the authority to change operations based on budgets as they see fit.

Misalignment between the performance goals stressed in budgets versus the performance measures the company uses to reward employees and managers can also limit the advantages of budgeting. For example, suppose a company rewards managers based on actual profit compared to budgeted profit and also on quality (defect rate) and timely delivery to customers (percent on time). Increased quality and more timely deliveries typically require higher costs, so the message conveyed by the budget system (minimize cost) may be misaligned with the incentives provided by the compensation system (maximize quality and timely delivery). Companies can manage the apparent misalignment by clearly specifying and communicating the tradeoff between costs and quality measures. This is particularly important for performance goals where the short-term impact on current performance relative to budget is negative but the long-term impact due to improved customer satisfaction is positive. We explore these issues in more detail in Chapter 9.

There is often too much concern with the mechanics of budgets and too little attention paid to the fact that the effectiveness of any budgeting system depends directly on whether the affected managers and employees understand and accept the budget. Management should seek to create an environment where there is a true two-way flow of information in the budget process so that lower level managers and employees perceive that their input has a real effect on budget outcomes. Top management must emphasize the importance of budgets in planning and communication and demonstrate how budgets can help each manager and employee achieve better results. Only then will the budgets become a positive aid in motivating employees at all levels to work toward goals, set objectives, measure results accurately, and direct attention to the areas that need investigation.

Objective 3

Explain potentially dysfunctional incentives in the budget process.

INCENTIVES TO LIE AND CHEAT Effective budgets provide targets for managers and motivate them to achieve the organization's objectives. However, misuse of budgets can lead to undesirable incentives—what Professor Michael Jensen calls incentives to lie and cheat. Not only do such incentives lead managers to make poor decisions, they undercut attempts to maintain high ethical standards in the organization.

Let's first consider lying. What incentives might cause managers to create biased budgets—essentially to lie about their plans? Managers may want to increase the resources allocated to their department—resources such as space, equipment, and personnel—and larger budgets may justify such allocations. Why do managers want more resources? Day-to-day managing is easier when the department has more resources to achieve its output targets. Further, it is common for managers of larger units with more resources to have higher pay, higher status, and greater prospects for promotion. Recognizing these incentives allows organizations to implement budgets in a way that minimizes bias. For example, when employees understand, accept, and participate in the budget process, they are less likely to introduce biased information. Also, decision makers can be aware of expected bias when they make decisions based on budget information.

budgetary slack (budget padding)

Overstatement of budgeted cost or understatement of budgeted revenue to create a budget goal that is easier to achieve.

When organizations use budgets as a target for performance evaluations, managers have additional incentives to lie. Managers have incentives to create **budgetary slack** or **budget padding**—that is, overstate their budgeted costs or understate their budgeted revenues to create a budget target that is easier to achieve. Budgetary slack also helps buffer managers from budget cuts imposed by higher-level management and provides protection against cost increases or revenue shortfalls due to unforeseen events.

These incentives can lead to the following cycle that destroys the value of budget information: Lower-level managers bias their budgets to create budgetary slack. Knowing that lower-level managers face these incentives, upper-level managers correct for this bias in their inputs to the budget process. Lower-level managers, recognizing that upper-level managers are making this correction, then incorporate additional bias to compensate. Upper-level managers then introduce larger corrections to compensate for the increased bias. This cycle of increasing bias and increasing bias corrections causes increasing distortion in budget information. Inputs from both upper-level and lower-level managers become increasingly meaningless, and the budget process spirals out of control.

Now let's add one more complication—managerial bonuses based on making budget. Suppose a manager with a \$100,000 annual salary will receive a bonus ranging from 80% to 120% of a target bonus of \$50,000 if her division achieves between 80% and 120% of its budgeted profit target, as shown in Exhibit 7-1. In this example, representative of bonus plans commonly encountered in practice, there is a minimum level of division profit below which no bonus is paid (the bonus drops from a \$40,000 bonus at 80% of budgeted profit to zero bonus at any profit level below 80% of budgeted profit) and a maximum level of division profit above which the maximum bonus is capped (above 120% of budgeted profit, the bonus is capped at \$60,000).

We should first recognize that within the relevant range of 80%–120% of profits this system creates appropriate incentives to work harder, more efficiently, and more effectively to achieve desired results. But suppose, despite a manager's best efforts, it appears that reported profit will fall below 80% of the target profit in Exhibit 7-1. What inappropriate incentives does this bonus system provide for the manager? There are incentives to “cheat,” to make results appear better than they actually are. The incentive to cheat is particularly strong when the division is in danger of falling just short of 80% of the profit target, so that a small increase in reported profit would lead to a large jump in the amount of the bonus.

An extreme form of cheating is to “cook the books,” that is, report false profit numbers. The division manager may accomplish this by recording fictitious sales or omitting costs. For example, a few years ago **Enron** and other energy companies recorded questionable sales of energy contracts, and **WorldCom** increased reported income by treating expenses as capital investments. Such actions have serious ethical and legal consequences, but sometimes the pressure to meet profit targets has been great enough to motivate managers to go to such extremes.

Managers may instead choose less extreme actions to increase reported profits. They may increase current sales by offering customers discounts that cause them to accelerate purchases from future periods to the current period, or offer better credit terms that are costly to the company through increased financing costs or increased credit risk. Managers may cut discretionary expenditures, such as research and development (R&D) and advertising, trading future sales for current profits. These short-term actions allow managers to achieve their current bonus, but cheat the company and its shareholders whenever the actions are not in the company's best long-run interests.

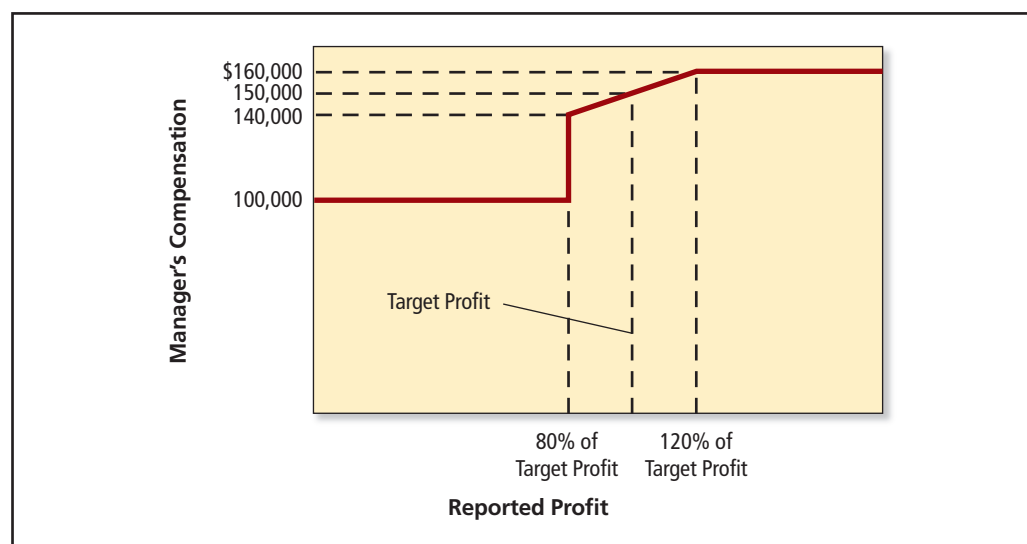


Exhibit 7-1

Bonus Payments Tied to Profit Levels

This compensation system can also create incentives to *decrease* profits when the manager sees actual profits exceeding 120% of the profit target in Exhibit 7-1 or when profits fall so far short of the 80% profit target that there is no hope of achieving a bonus. In these cases, managers may move current sales into the next year by encouraging customers to defer purchases until the next year, thus effectively transferring current income to the future. They might also speed up actual expenditures (for example, moving maintenance planned for future years into the current year) or accelerate recognition of expenses (for example, writing off costs of equipment that remains in use), taking as current period expenses some costs that rightly belong to future periods.

Why would managers take actions to decrease current reported profit? First, moving this year's sales into next year or moving next year's expenses into this year increases next year's income, ensuring a higher level of reported profit (and probably a higher bonus) next year. Second, by decreasing this year's income, the manager may avoid increasing performance expectations for the next year—and thus may avoid a higher budgeted profit target for next year.

To minimize the incentives to cheat, performance-linked payment plans should avoid “discontinuities” in payments. Note that in Exhibit 7-1 the manager's payment jumps up (that is, it is discontinuous) at 80% of the target profit level and the payment levels off (is discontinuous again) at the maximum bonus level. To minimize incentives to transfer income between periods, we can make bonuses and total payments increase continuously over the entire range of possible performance so that there is no point at which a small change in profit has a large effect on pay.

Perhaps the most serious concern raised by these inappropriate incentives for lying and cheating is that they foster cynicism about the budget process and create a culture of unethical behavior in the organization. When managers know that the budget and evaluation processes encourage employees to provide biased information and make questionable decisions, not only does information quality suffer, but a lack of trust begins to pervade the organization.

How can organizations avoid unwanted incentives in budgetary systems? The main way to avoid lying in preparing the budget is to reward good budget forecasts as well as good performance against the budget. It is also important to motivate managers to take personal responsibility for their budgets and motivate their superiors to take the budgeting process seriously.

Objective 4

Explain the difficulties of sales forecasting.

sales forecast

A prediction of sales under a given set of conditions.

sales budget

The sales forecast that is the result of decisions to create conditions that will generate a desired level of sales.

DIFFICULTIES OF OBTAINING ACCURATE SALES FORECASTS The third problem that limits the advantages of budgets is the difficulty of obtaining accurate sales forecasts. The sales budget is the foundation of budgeting. Why? Because the accuracy of all components of the budget depends on the accuracy of budgeted sales, as illustrated later in the chapter. At the **Ritz-Carlton** hotels, the process of developing the sales budget involves forecasting levels of room occupancy, group events, banquets, and other activities. Upper management initially sets the sales targets. Then, employee teams in each department provide their inputs. Once everyone agrees on a sales forecast, managers prepare monthly departmental budgets based on the sales forecast.

The sales budget is conceptually distinct from sales forecasts. A **sales forecast** is a prediction of sales under a given set of conditions. The **sales budget** is the specific sales forecast that is the result of decisions to create the conditions that will generate a desired level of sales. For example, you may have various forecasts of sales corresponding to various levels of advertising. The sales forecast for the one level of advertising you decide to implement becomes the sales budget.

The top sales executive usually directs the preparation of sales forecasts. Important factors considered by sales forecasters include the following:

1. Past patterns of sales: Past experience combined with detailed past sales by product line, geographic region, and type of customer can help predict future sales.
2. Estimates made by the sales force: A company's sales force is often the best source of information about the desires and plans of customers.
3. General economic conditions: The financial press regularly publishes predictions for many economic indicators, such as gross domestic product and industrial production indexes (local and foreign). Knowledge of how sales relate to these indicators can aid sales forecasting.
4. Competitors' actions: Sales depend on the strength and actions of competitors. To forecast sales, a company should consider the likely strategies and reactions of competitors, such as changes in their prices, product quality, or services.
5. Changes in the firm's prices: A company should consider the effects of planned price changes on customer demand (see Chapter 5). Normally, lower prices increase unit sales while higher prices decrease unit sales.

6. Changes in product mix: Changing the mix of products often can affect not only sales levels but also overall contribution margin. Identifying the most profitable products and devising methods to increase their sales is a key part of successful management.
7. Market research studies: Some companies hire marketing experts to gather information about market conditions and customer preferences. Such information is useful to managers making sales forecasts and product-mix decisions.
8. Advertising and sales promotion plans: Advertising and other promotional costs affect sales levels. A sales forecast should be based on anticipated effects of promotional activities.

Sales forecasting usually combines various techniques. In addition to the opinions of the sales staff, statistical analysis of correlations between sales and economic indicators (prepared by economists and members of the market research staff) provide valuable help. The opinions of line management also heavily influence the final sales forecasts. No matter how many technical experts a company uses in forecasting, the sales budget should ultimately be the responsibility of line management. Line managers who participate fully in setting the sales budget will be more committed to achieving the budget goals.

Governments and other nonprofit organizations face a similar problem in forecasting revenues from taxes, contributions, or other sources. For example, city revenues may depend on a variety of factors, such as property taxes, traffic fines, parking fees, license fees, and city income taxes. In turn, property taxes depend on the extent of new construction and general increases in real estate values. Thus, forecasting revenues for a government or nonprofit organization may require just as much sophistication as sales forecasts of a for-profit firm.

Types of Budgets

Businesses use several different types of budgets. The most forward-looking and least detailed budget is the **strategic plan**, which sets the overall goals and objectives of the organization. While the strategic plan does not deal with a specific time frame and does not produce forecasted financial statements, it provides the overall framework for the **long-range plan**. Long-range plans typically produce forecasted financial statements for 5- to 10-year periods. Decisions made during long-range planning include addition or deletion of product lines, design and location of new plants, acquisitions of buildings and equipment, and other long-term commitments. Companies coordinate their long-range plan with their **capital budget**, which details the planned expenditures for facilities, equipment, new products, and other long-term investments. Short-term plans and budgets guide day-to-day operations.

The **master budget** is a detailed and comprehensive analysis of the first year of the long-range plan. It quantifies targets for sales, purchases, production, distribution, and financing in the form of forecasted financial statements and supporting operating schedules. These schedules provide detailed information beyond what appears in the forecasted financial statements. Thus, the master budget includes forecasts of sales, expenses, balance sheets, and cash receipts and disbursements.

Many companies break their annual budgets into 4 quarterly or even 12 monthly budgets. A **continuous budget** or **rolling budget** is a master budget that simply adds a month (or quarter) in the future as the month (or quarter) just ended is dropped. Continuous budgets force managers to always think about the next full year, not just the remainder of the current fiscal year, so budgeting becomes an ongoing process instead of a once-a-year exercise.

Components of the Master Budget

The two major parts of a master budget are the operating budget and the financial budget. The **operating budget**—sometimes called the **profit plan**—focuses on the income statement and its supporting schedules or, in an organization with no sales revenues, on budgeted expenses and supporting schedules. In contrast, the **financial budget** focuses on the effects that the operating budget and other plans (such as capital expenditures and repayments of debt) will have on cash balances. The distinction between the operating budget and the financial budget is important because of the distinction between profitability and financial position. There are many examples of firms with strong profits where a weak cash position placed them in bankruptcy. There are also many examples of firms whose strong financial position allowed them to survive periods of temporary unprofitability.

strategic plan

A plan that sets the overall goals and objectives of the organization.

long-range plan

Forecasted financial statements for 5- to 10-year periods.

capital budget

A budget that details the planned expenditures for facilities, equipment, new products, and other long-term investments.

Objective 5

Explain the major features and advantages of a master budget.

master budget

An extensive analysis of the first year of the long-range plan. It summarizes the planned activities of all subunits of an organization.

continuous budget (rolling budget)

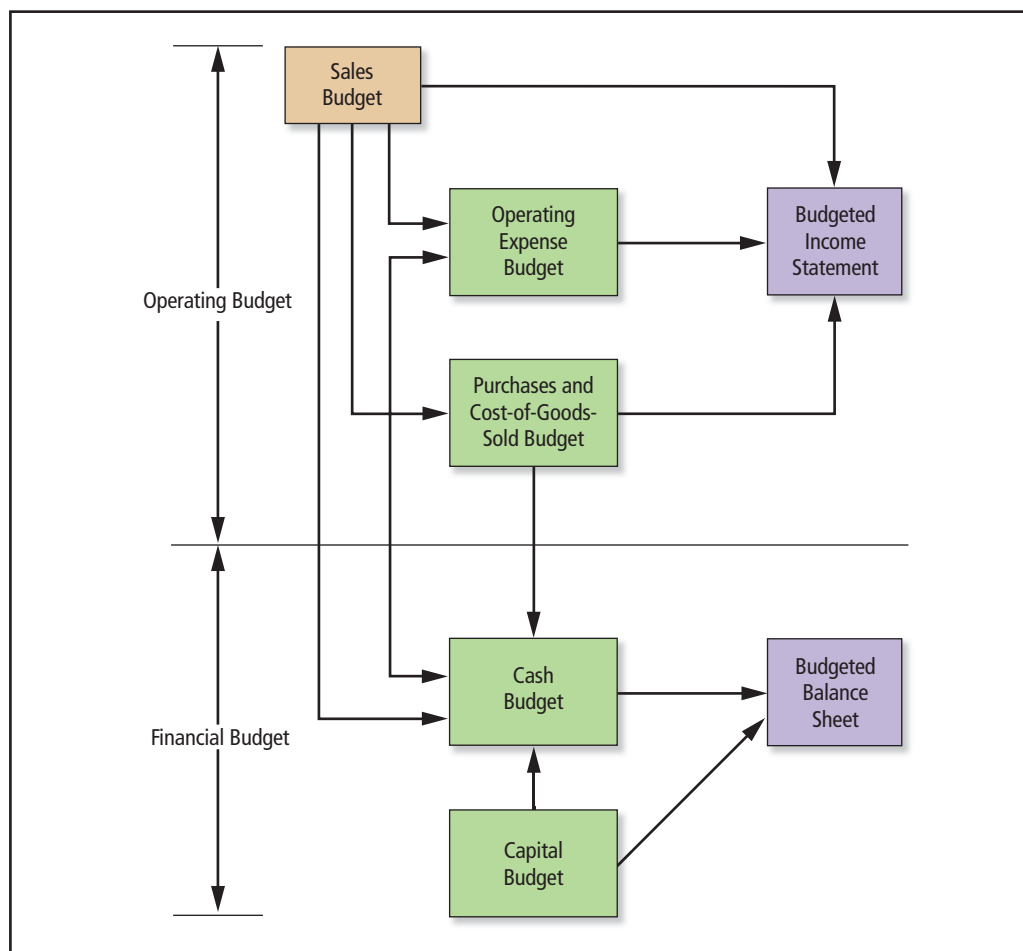
A common form of master budget that adds a month in the future as the month just ended is dropped.

operating budget (profit plan)

A major part of a master budget that focuses on the income statement and its supporting schedules.

financial budget

The part of a master budget that focuses on the effects that the operating budget and other plans (such as capital budgets and repayments of debt) have on cash balances.

**Exhibit 7-2**

Preparation of the Master Budget for a Merchandising Company

The terms used to describe specific budget schedules vary from organization to organization. However, most master budgets share common elements. The usual master budget for a merchandising company has the following components as shown in Exhibit 7-2:

- A. Operating budget
 - 1. Sales budget
 - 2. Operating expense budget
 - 3. Purchases and cost-of-goods-sold budget
 - 4. Budgeted income statement
- B. Financial budget
 - 1. Cash budget
 - 2. Capital budget
 - 3. Budgeted balance sheet

Other companies add to or adapt these categories depending on the nature of their operations. For example, manufacturing companies add budgets for raw material, work-in-process, and finished good inventories, and budgets for each type of resource activity, such as labor, materials, and factory overhead. Similarly, a consulting company might adapt the operating expense budget to focus on its major cost—consultant salaries. In addition to the master budget, there are countless forms of special budgets and related reports. For example, a report might detail goals and objectives for improvements in quality or customer satisfaction during the budget period.

Preparing the Master Budget

Let's return to Exhibit 7-2 and trace the preparation of the master budget components. Although the process involves a large number of detailed calculations, always keep the big picture in mind. Remember that the master budgeting process provides an opportunity to review key decisions regarding all aspects of the company's value chain. Early drafts of the budget often lead to decisions that, in turn, lead to revisions in subsequent budget drafts. This cycle may be repeated several times before the budget is finalized.

The Cooking Hut

We illustrate the budgeting process using the Cooking Hut Company (CHC), a retailer of a wide variety of kitchen and dining room items, such as coffeemakers, silverware, and table linens. Although master budgets normally cover a full year, for the sake of brevity this illustration shows only the first 3 months of CHC's fiscal year, April–June. Exhibit 7-3 is the closing balance sheet for the previous fiscal year ending March 31, 20X1.

SALES BUDGET Preparation of the master budget for the first 3 months of the new fiscal year requires a sales budget for 1 month beyond the 3 months because CHC bases its budgeted inventory purchases on the following month's sales. The sales budget for the next 4 months is as follows:

April	\$50,000
May	\$80,000
June	\$60,000
July	\$50,000

The master budget also requires information about actual sales in the previous month because CHC collects cash for the credit sales in the month following the sale. On average, 60% of sales are cash sales and the remaining 40% are credit sales. Sales in March were \$40,000 and the \$16,000 of accounts receivable on March 31 represents credit sales made in March (40% of \$40,000). Uncollectible accounts are negligible and thus ignored. For simplicity's sake, we also ignore all local, state, and federal taxes for this illustration.

PLANNED INVENTORY LEVELS Because deliveries from suppliers and customer demands are uncertain, at the end of each month CHC wants to have on hand a base inventory of \$20,000 plus additional inventory equal to 80% of the expected cost of goods sold for the following month. The cost of goods sold averages 70% of sales. Therefore, the inventory on March 31 is \$20,000 + $(0.8 \times 0.7 \times \text{April sales of } \$50,000) = \$20,000 + \$28,000 = \$48,000$. On average, CHC

Assets			
Current assets			
Cash	\$10,000		
Accounts receivable, net ($0.4 \times \text{March sales of } \$40,000$)	16,000		
Merchandise inventory, $\$20,000 + 0.8 \times (0.7 \times \text{April sales of } \$50,000)$	48,000		
Unexpired insurance (for April–December 20X1)	1,800		
			\$ 75,800
Plant assets			
Equipment, fixtures, and other	\$37,000		
Accumulated depreciation	12,800		24,200
Total assets			<u>\$100,000</u>
Liabilities and Owners' Equity			
Current liabilities			
Accounts payable ($0.5 \times \text{March purchases of } \$33,600$)	\$16,800		
Accrued wages and commissions payable ($\$1,250 + \$3,000$)	4,250		
			\$ 21,050
Owners' equity			78,950
Total liabilities and owners' equity			<u>\$100,000</u>

Exhibit 7-3

The Cooking Hut Company
Balance Sheet March 31, 20X1

pays for 50% of each month's purchases during the month of purchase and 50% during the next month. Therefore, the accounts payable balance on March 31 is 50% of March purchases, or $0.5 \times \$33,600 = \$16,800$.

WAGES AND COMMISSIONS CHC pays wages and commissions twice each month, with payments lagged half a month after they are earned. Each payment consists of two components: (i) one-half of monthly fixed wages of \$2,500, and (ii) commissions equal to 15% of sales, which we assume are uniform throughout each month. To illustrate the wage and commission payments, the March 31 balance of accrued wages and commissions payable is $(0.5 \times \$2,500) + 0.5 \times (0.15 \times \$40,000) = \$1,250 + \$3,000 = \$4,250$. Because of the half-month lag, CHC will pay this \$4,250 balance on April 15.

CAPITAL EXPENDITURES AND OPERATING EXPENDITURES CHC's only planned capital expenditure is the purchase of new fixtures for \$3,000 cash in April. CHC has monthly operating expenses as follows:

Miscellaneous expenses	5% of sales, paid as incurred
Rent	\$2,000, paid as incurred
Insurance	\$200 expiration per month
Depreciation, including new fixtures	\$500 per month

CASH BALANCES Because collections lag credit sales, CHC often struggles to come up with the cash to pay for purchases, employee wages, and other outlays. To meet cash needs, CHC uses short-term loans from local banks, paying them back when excess cash is available. CHC maintains a minimum \$10,000 cash balance at the end of each month for operating purposes and can borrow or repay loans only in multiples of \$1,000. Assume that borrowing occurs at the beginning and repayments occur at the end of the month. Also assume that interest of 1% per month is paid in cash at the end of each month.

Steps in Preparing the Master Budget

The principal steps in preparing the master budget are as follows:

Supporting Budgets and Schedules

- Using the data given, prepare the following budgets and schedules for each of the months of the planning horizon:
 - Sales budget
 - Cash collections from customers
 - Purchases and cost-of-goods-sold budget
 - Cash disbursements for purchases
 - Operating expense budget
 - Cash disbursements for operating expenses

Operating Budget

- Using the supporting budgets and schedules, prepare a budgeted income statement for the 3 months ending June 30, 20X1.

Financial Budget

- Prepare the following budgets and forecasted financial statements:
 - Capital budget
 - Cash budget, including details of borrowings, repayments, and interest for each month of the planning horizon
 - Budgeted balance sheet as of June 30, 20X1

Organizations with effective budget systems have specific guidelines for the steps and timing of budget preparation. Although the details differ, the guidelines invariably include the preceding steps. As we follow these steps to prepare CHC's master budget, be sure that you understand the source of each figure in each schedule and budget.

Objective 6

Follow the principal steps in preparing a master budget.

Step 1: Preparing Basic Data

STEP 1A: SALES BUDGET The sales budget is the starting point for budgeting because planned inventory levels, purchases, and operating expenses all depend on the expected level of sales. Schedule a includes information about actual March sales because March credit sales affect cash collections in April.

Schedule a: Sales Budget

	March	April	May	June	April–June Total
Total Sales	\$40,000	\$50,000	\$80,000	\$60,000	\$190,000

STEP 1B: CASH COLLECTIONS FROM CUSTOMERS Schedule b uses the sales budget to plan when CHC will collect cash. In turn, we will use Schedule b to prepare the cash budget in step 3. Cash collections from customers include the current month's cash sales plus collection of the previous month's credit sales.

Schedule b: Cash Collections from Customers

	April	May	June
Cash sales (60% of current month sales)	\$30,000	\$48,000	\$36,000
Collection of last month's credit sales (40% of previous month sales)	16,000	20,000	32,000
Total collections	\$46,000	\$68,000	\$68,000

STEP 1C: PURCHASES BUDGET The elements of the purchases budget are tied together by a simple intuitive identity that ignores minor complications such as returns and defects but relates the fundamental uses of inventory to the sources: Inventory is either sold or else carried over to the next period as ending inventory. Inventory comes from either beginning inventory or purchases. Therefore, cost of goods sold plus ending inventory equals beginning inventory plus purchases.

We budget cost of goods sold by multiplying the cost of merchandise sold percentage (70%) by budgeted sales. The total merchandise needed is the sum of budgeted cost of goods sold plus the desired ending inventory. Finally, we compute required purchases by subtracting beginning inventory from the total merchandise needed:

Schedule c: Purchases Budget

	March	April	May	June	April–June Total
Budgeted cost of goods sold [†]		\$35,000	\$ 56,000	\$42,000	\$133,000
Plus: Desired ending inventory ^{**}		64,800	53,600	48,000	
Total merchandise needed		\$99,800	\$109,600	\$90,000	
Less: Beginning inventory		48,000 [‡]	64,800	53,600	
Purchases	\$33,600*	\$51,800	\$ 44,800	\$36,400	

[†] $0.7 \times \text{April sales of } \$50,000 = \$35,000$; $0.7 \times \text{May sales of } \$80,000 = \$56,000$; $0.7 \times \text{June sales of } \$60,000 = \$42,000$

^{**} $\$20,000 + (0.80 \times \text{next month cost of goods sold})$

[‡]Ending inventory from March was \$48,000 as shown in Exhibit 7-3.

* Purchases for March were ending inventory (\$48,000 as shown in Exhibit 7-3) plus cost of goods sold ($0.7 \times \text{March sales of } \$40,000$) less beginning inventory ($\$42,400 = \$20,000 + [0.8 \times \text{March cost of goods sold of } \$28,000]$).

STEP 1D: DISBURSEMENTS FOR PURCHASES We use the purchases budget to develop Schedule d. In our example, disbursements are 50% of the current month's purchases and 50% of the previous month's purchases.

Schedule d: Cash Disbursements for Purchases

	April	May	June
50% of last month's purchases	\$16,800	\$25,900	\$22,400
Plus 50% of this month's purchases	25,900	22,400	18,200
Disbursements for purchases	\$42,700	\$48,300	\$40,600

STEP 1E: OPERATING EXPENSE BUDGET Month-to-month changes in sales volume and other cost-driver activities directly influence many operating expenses. Examples of expenses driven

Objective 7

Prepare the operating budget and the supporting schedules.

by sales volume include sales commissions and delivery expenses—these are included in miscellaneous expenses for CHC. Other expenses, such as rent, insurance, depreciation, and wages, are not influenced by sales (within appropriate relevant ranges), and we regard them as fixed. Schedule e summarizes operating expenses for CHC.

Schedule e: Operating Expense Budget

	March	April	May	June	April–June Total
Wages (fixed)	\$2,500	\$ 2,500	\$ 2,500	\$ 2,500	
Commissions (15% of current month's sales)	<u>6,000</u>	<u>7,500</u>	<u>12,000</u>	<u>9,000</u>	
Total wages and commissions	<u>\$8,500</u>	\$10,000	\$14,500	\$11,500	\$36,000
Miscellaneous expenses (5% of current sales)		2,500	4,000	3,000	9,500
Rent (fixed)		2,000	2,000	2,000	6,000
Insurance (fixed)		200	200	200	600
Depreciation (fixed)		<u>500</u>	<u>500</u>	<u>500</u>	<u>1,500</u>
Total operating expenses		<u>\$15,200</u>	<u>\$21,200</u>	<u>\$17,200</u>	<u>\$53,600</u>

STEP 1F: DISBURSEMENTS FOR OPERATING EXPENSES Disbursements for operating expenses are based on the operating expense budget. Disbursements include 50% of last month's wages and commissions, 50% of this month's wages and commissions, and miscellaneous and rent expenses. There is no monthly cash disbursement for Insurance (which is paid annually at the beginning of the year) nor for depreciation (which does not involve any periodic cash disbursement). We will use the total of these disbursements for each month in preparing the cash budget.

Schedule f: Disbursements for Operating Expenses

	April	May	June
Wages and commissions			
50% of last month's expenses	\$ 4,250	\$ 5,000	\$ 7,250
50% of this month's expenses	<u>5,000</u>	<u>7,250</u>	<u>5,750</u>
Total wages and commissions	\$ 9,250	\$12,250	\$13,000
Miscellaneous expenses	2,500	4,000	3,000
Rent	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>
Total disbursements	<u>\$13,750</u>	<u>\$18,250</u>	<u>\$18,000</u>

Step 2: Preparing the Operating Budget

Steps 1a, 1c, and 1e, along with interest expense from the cash budget (which we will construct in step 2), provide information to construct the budgeted income statement in Exhibit 7-4. Budgeted income from operations is often a benchmark for judging management performance.

Exhibit 7-4

The Cooking Hut Company
Budgeted Income Statement
for Three Months Ending
June 30, 20X1

	Data	Source of Data
Sales	\$190,000	Schedule a
Cost of goods sold	<u>133,000</u>	Schedule c
Gross margin	\$ 57,000	
Operating expenses:		
Wages and commissions	\$36,000	Schedule e
Rent	6,000	Schedule e
Miscellaneous	9,500	Schedule e
Insurance	600	Schedule e
Depreciation	<u>1,500</u>	Schedule e
Income from operations	\$ 3,400	
Interest expense	<u>410</u>	Cash budget
Net income	<u>\$ 2,990</u>	

Step 3: Preparation of Financial Budget

The second major part of the master budget is the financial budget, which consists of the capital budget, cash budget, and ending balance sheet.

STEP 3A: CAPITAL BUDGET In our illustration, the \$3,000 planned purchase of new fixtures in April is the only item in the capital budget. More complex capital budgets are illustrated in Chapter 11.

STEP 3B: CASH BUDGET The **cash budget** is a statement of planned cash receipts and disbursements. Cash budgets help management avoid either unnecessary idle cash or unnecessary cash deficiencies. The cash budget is heavily affected by the level of operations summarized in the budgeted income statement.

The cash budget in Exhibit 7-5 has the following major sections, where the letters *x*, *y*, and *z* refer to the lines that summarize the effects of that section:

- The available cash balance (*x*) is the amount by which the beginning cash balance exceeds CHC's \$10,000 minimum cash balance. Companies maintain a minimum cash balance to allow for fluctuations in the level of cash during the month—daily balances during the month typically fluctuate relative to the beginning and ending cash balances—and also to provide for unexpected cash needs.
- Net cash receipts and disbursements (*y*):
 1. Cash receipts depend on collections from customers' accounts receivable, cash sales, and on other operating cash income sources, such as interest received on notes receivable. Trace total collections from Schedule b to Exhibit 7-5.
 2. Disbursements for purchases depend on the credit terms extended by suppliers and the bill-paying habits of the buyer. Trace disbursements for merchandise from Schedule d to Exhibit 7-5.

Objective 8

Prepare the financial budget.

cash budget

A statement of planned cash receipts and disbursements.

	April	May	June
Beginning cash balance	\$ 10,000	\$ 10,410	\$ 10,720
Minimum cash balance desired	<u>10,000</u>	<u>10,000</u>	<u>10,000</u>
Available cash balance (<i>x</i>)	\$ 0	\$ 410	\$ 720
Cash receipts and disbursements			
Collections from customers (Schedule b*)	\$ 46,000	\$ 68,000	\$ 68,000
Payments for merchandise (Schedule d)	(42,700)	(48,300)	(40,600)
Payments for operating expenses (Schedule f)	(13,750)	(18,250)	(18,000)
Purchase of new fixtures (Step 3a)	<u>(3,000)</u>		
Net cash receipts and disbursements (<i>y</i>)	\$ (13,450)	\$ 1,450	\$ 9,400
Excess (deficiency) of cash before financing (<i>x</i> + <i>y</i>)	<u>(13,450)</u>	<u>\$ 1,860</u>	<u>\$ 10,120</u>
Borrowing (at beginning of month)	\$ 14,000 [†]		
Repayments (at end of month)		\$ (1,000)	\$ (9,000)
Interest payments (1% per month, end of month [‡])	<u>(140)</u>	<u>(140)</u>	<u>(130)</u>
Total cash increase (decrease) from financing (<i>z</i>)	\$ 13,860	\$ (1,140)	\$ (9,130)
Ending cash balance (beginning + <i>y</i> + <i>z</i>)	<u>\$ 10,410</u>	<u>\$ 10,720</u>	<u>\$ 10,990</u>

Exhibit 7-5

The Cooking Hut Company
Cash Budget for Three Months
Ending June 30, 20X1

*Letters *x*, *y*, and *z* are keyed to the explanation in the text.

[†]Borrowing and repayment of principal are made in multiples of \$1,000, at an interest rate of 1% per month.

[‡]Interest computations: $\$14,000 \times 0.01 = \$140$; $\$14,000 \times 0.01 = \$140$; $\$13,000 \times 0.01 = \$130$.

3. Payroll depends on wages and commission terms and on payroll dates. Some costs and expenses depend on contractual terms for installment payments, mortgage payments, rents, leases, and miscellaneous items. Trace disbursements for operating expenses from Schedule f to Exhibit 7-5.
 4. Other disbursements include outlays for fixed assets, long-term investments, dividends, and the like. An example is the \$3,000 expenditure for new fixtures.
- The total cash increase (decrease) from financing (z) depends on the total available cash balance (x) and the net cash receipts and disbursements (y). If cash available plus net cash receipts less disbursements is negative, borrowing is necessary—Exhibit 7-5 shows that CHC will borrow \$14,000 in April to cover the planned deficiency. If cash available plus net cash receipts less disbursements is sufficiently positive, CHC can repay loans—it repays \$1,000 and \$9,000 in May and June, respectively. This section of the cash budget also generally contains the outlays for interest expense. Trace the calculated interest expense, which in our example is the same as the cash interest payments for the 3 months, to Exhibit 7-4, which then will be complete.
 - The ending cash balance is the beginning cash balance + y + z. Financing, z, has either a positive (borrowing) or a negative (repayment) effect on the cash balance. The illustrative cash budget shows the pattern of short-term, “self-liquidating” financing. Seasonal peaks often result in heavy drains on cash—for merchandise purchases and operating expenses—before the company makes sales and collects cash from customers. The resulting loan is “self-liquidating”—that is, the company uses borrowed money to acquire merchandise for sale, and uses the proceeds from sales to repay the loan. This “working capital cycle” moves from cash to inventory to receivables and back to cash.

STEP 3C: BUDGETED BALANCE SHEET The final step in preparing the master budget is to construct the budgeted balance sheet (Exhibit 7-6) that projects each balance sheet item in accordance with the business plan as expressed in the previous schedules. Specifically, the

Exhibit 7-6

The Cooking Hut Company
Budgeted Balance Sheet
June 30, 20X1

Assets			
Current Assets			
Cash (Exhibit 7-5)	\$10,990		
Accounts receivable, net (.4 × June sales of \$60,000)	24,000		
Inventory (Schedule c)	48,000		
Unexpired insurance (for July–December)	1,200	\$ 84,190	
Plant Assets			
Equipment, fixtures, and other (\$37,000 + \$3,000)	\$40,000		
Accumulated Depreciation (\$12,800 + \$1,500)	(14,300)	25,700	
Total assets			<u>\$109,890</u>
Liabilities and Owners' Equity			
Current liabilities			
Accounts payable (.5 × June purchases of \$36,400)	\$18,200		
Short-term bank loan	4,000		
Accrued wages and commissions payable (.5 × 11,500)	5,750	\$ 27,950	
Owners' equity (78,950 × 2,990 net income)			81,940
Total liabilities and owners' equity			<u>\$109,890</u>

Note: March 31, 20X1 beginning balances are used for computations of unexpired insurance, plant assets, and owners' equity.

Business First

Business Plans and Budgets

Start-up companies in a variety of industries have mushroomed into multibillion-dollar companies. How do these companies get started? An essential component in securing initial funding for a start-up is the development of a business plan. The federal government's Small Business Administration recommends a business plan with three sections:

1. The Business—includes a description of the business, a marketing plan, an assessment of the competition, a list of operating procedures, and a roster of personnel
2. Financial Data—includes the following items:
 - Loan applications
 - Capital equipment and supply list
 - Pro forma balance sheet
 - Break-even analysis
 - Pro forma income projections (income statements):
 - Three-year summary
 - Detail by month, first year
 - Detail by quarters, second and third years
 - Assumptions upon which projections were based
 - Pro forma cash flow statements
3. Supporting Documents—includes a variety of legal documents and information about the principals involved, suppliers, customers, etc.

Financial data are an important part of a business plan, the centerpiece of which is the master budget. The budgeted

income statement and budgeted cash flow statement are essential to predicting the future prospects of any business. They are especially critical to assessing the prospects of a new company that has little history to analyze.

The importance of a budget to a start-up company was emphasized by Jim Rowan, former senior vice president of **SunAmerica**, who left to form a new company, **EncrypTix**. He raised \$36 million in investment funding to spin EncrypTix off from **Stamps.com**. The company focuses on Internet delivery and storage of tickets, coupons, and vouchers. Rowan stated, "The key thing for a start-up is to develop a budget and put it like a stake in the ground, so you can measure against it. It's not a ceiling, it's not carved in stone, but you have to have something that's a benchmark."

Budgeting is often not the most exciting task for entrepreneurs. However, lack of a credible budget is one of the main reasons venture capitalists cite when they refuse funding for a start-up. Further, a cash shortage is one of the main causes of failure among start-up companies. Anyone wanting to be an entrepreneur would be well-advised to study budgeting and learn how it can be a powerful tool both for managing the company and for promoting the company to potential investors.

Sources: Adapted from Small Business Administration, *The Business Plan: Roadmap to Success* (www.sba.gov/startup/indexbusplans.html); and K. Klein, "Budgeting Helps Secure Longevity," *Los Angeles Times*, August 2, 2000, p. C6.

beginning balances at March 31 would be increased or decreased in light of the expected cash receipts and cash disbursements in Exhibit 7-5 and in light of the effects of noncash items appearing on the income statement in Exhibit 7-4. For example, unexpired insurance is a noncash item that would decrease from its balance of \$1,800 on March 31 to \$1,200 on June 30.

Strategy and the Master Budget

The master budget is an important management tool for evaluating and revising strategy. For example, the initial formulation of the budgeted financial statements may prompt management to consider new sales strategies to generate more demand. Alternatively, management may explore the effects of various adjustments in the timing of cash receipts and disbursements. The large cash deficiency in April, for example, may lead to an emphasis on cash sales or an attempt to speed up collection of accounts receivable. In any event, the first draft of the master budget is rarely the final draft. As managers revise strategy, the budgeting process becomes an integral part of the management process itself—budgeting is planning and communicating. The Business First box above describes the important role of budgets in start-up companies.

Making Managerial Decisions

Some managers focus on the operating budget, while others are more concerned with the financial budget. How does the operating budget differ from the financial budget?

Answer

The operating budget focuses on the income statement, which uses accrual accounting. It measures revenues and expenses. Line operating managers usually prepare and use the operating budget. In contrast, the financial budget focuses primarily

on cash flow. It measures the receipts and disbursements of cash. Financial managers, such as controllers and treasurers, focus on the financial budget. The operating budget is a better measure of long-run performance, but the financial budget is essential to plan for short-term cash needs and manage cash balances. A shortage of cash can get a company into financial trouble even when operating performance appears to be okay. Thus, both operating and financial budgets are important to an organization.

Summary Problem for Your Review

Be sure you understand every step of the CHC example before you tackle this review problem.

PROBLEM

The Country Store is a retail outlet for a variety of hardware and housewares. The owner is eager to prepare a budget and is especially concerned with her cash position. The company will have to borrow in order to finance purchases made in preparation for high expected sales during the busy last quarter of the year. When the company needs cash, borrowing occurs at the end of a month. When cash is available for repayments, the repayment occurs at the end of a month. The company pays interest in cash at the end of every month at a monthly rate of 1% on the amount outstanding during that month.

Review the structure of the example in the chapter and then prepare the Country Store's master budget for the months of October, November, and December. The owner has gathered the data shown in Exhibit 7-7 to prepare the simplified budget. In addition, she will purchase equipment in October for \$19,750 cash and pay dividends of \$4,000 in December.

Balance Sheet as of September 30, 20X1		Budgeted sales:	
Assets		September (actual)	\$60,000
Cash	\$ 9,000	October	70,000
Accounts receivable	48,000	November	85,000
Inventory	12,600	December	90,000
Plant and equipment (net)	200,000	January 20X2	50,000
Total assets	<u>\$269,600</u>		
Liabilities and stockholders' equity		Other data:	
Interest payable	0	Required minimum cash balance	\$ 8,000
Note payable	0	Sales mix, cash/credit	
Accounts payable	18,300	Cash sales	20%
Capital stock	180,000	Credit sales (collected the following month)	80%
Retained earnings	71,300	Gross profit rate	40%
Total liabilities and stockholders' equity	<u>\$269,600</u>	Loan interest rate (interest paid in cash monthly)	12%
Budgeted expenses (per month):		Inventory paid for in	
Salaries and wages	\$ 7,500	Month purchased	50%
Freight out as a percent of sales	6%	Month after purchase	50%
Advertising	\$ 6,000	Salaries and wages, freight-out, advertising,	
Depreciation	\$ 2,000	and other expenses are paid in cash in the	
Other expense as a percent of sales	4%	month incurred.	
Minimum inventory policy as a percent			
of next month's cost of goods sold	30%		

Exhibit 7-7

The Country Store
Budget Data

SOLUTION**Schedule a: Sales budget**

	October	November	December	Total
Credit sales, 80%	\$56,000	\$68,000	\$72,000	\$196,000
Cash sales, 20%	<u>14,000</u>	<u>17,000</u>	<u>18,000</u>	<u>49,000</u>
Total sales	<u>\$70,000</u>	<u>\$85,000</u>	<u>\$90,000</u>	<u>\$245,000</u>

Schedule b: Cash collections from customers

	October	November	December	Total
Cash sales	\$14,000	\$17,000	\$18,000	\$ 49,000
Collections from prior month	<u>48,000</u>	<u>56,000</u>	<u>68,000</u>	<u>172,000</u>
Total collections	<u>\$62,000</u>	<u>\$73,000</u>	<u>\$86,000</u>	<u>\$221,000</u>

Schedule c: Purchases budget

	October	November	December	Total
Desired ending inventory	\$15,300	\$16,200	\$ 9,000	\$ 40,500
Plus cost of goods sold	<u>42,000</u>	<u>51,000</u>	<u>54,000</u>	<u>147,000</u>
Total needed	\$57,300	\$67,200	\$63,000	\$187,500
Less: Beginning inventory	<u>12,600</u>	<u>15,300</u>	<u>16,200</u>	<u>44,100</u>
Total purchases	<u>\$44,700</u>	<u>\$51,900</u>	<u>\$46,800</u>	<u>\$143,400</u>

Schedule d: Cash disbursements for purchases

	October	November	December	Total
For September*	\$18,300			\$ 18,300
For October	<u>22,350</u>	\$22,350		44,700
For November		<u>25,950</u>	\$25,950	51,900
For December			<u>23,400</u>	<u>23,400</u>
Total disbursements	<u>\$40,650</u>	<u>\$48,300</u>	<u>\$49,350</u>	<u>\$138,300</u>

*The amount payable on the September 30, 20X1, balance sheet.

Schedules e and f: Operating expenses and disbursements for expenses (except interest)

	October	November	December	Total
Cash expenses:				
Salaries and wages	\$ 7,500	\$ 7,500	\$ 7,500	\$22,500
Freight-out	4,200	5,100	5,400	14,700
Advertising	6,000	6,000	6,000	18,000
Other expenses	<u>2,800</u>	<u>3,400</u>	<u>3,600</u>	<u>9,800</u>
Total disbursements for expenses	<u>\$20,500</u>	<u>\$22,000</u>	<u>\$22,500</u>	<u>\$65,000</u>
Noncash expenses:				
Depreciation	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>	<u>6,000</u>
Total expenses	<u>\$22,500</u>	<u>\$24,000</u>	<u>\$24,500</u>	<u>\$71,000</u>

The Country Store

Cash Budget for the Months of October–December, 20X1

	October	November	December
Beginning cash balance	\$ 9,000	\$ 8,000	\$ 8,000
Minimum cash balance desired	<u>8,000</u>	<u>8,000</u>	<u>8,000</u>
Available cash balance	<u>1,000</u>	<u>0</u>	<u>0</u>
Cash receipts and disbursements:			
Collections from customers	62,000	73,000	86,000
Payments for merchandise	(40,650)	(48,300)	(49,350)
Operating expenses	(20,500)	(22,000)	(22,500)
Equipment purchases	(19,750)	0	0
Dividends	0	0	(4,000)
Interest*	<u>0</u>	<u>(179)</u>	<u>(154)</u>
Net cash receipts and disbursements	<u>(18,900)</u>	<u>2,521</u>	<u>9,996</u>
Excess (deficiency) of cash before financing	<u>\$ (17,900)</u>	<u>\$ 2,521</u>	<u>\$ 9,996</u>
Financing:			
Borrowing†	\$ 17,900	\$ 0	\$ 0
Repayments	<u>0</u>	<u>(2,521)</u>	<u>(9,996)</u>
Total cash from financing	<u>17,900</u>	<u>(2,521)</u>	<u>(9,996)</u>
Ending cash balance	<u>\$ 8,000</u>	<u>\$ 8,000</u>	<u>\$ 8,000</u>

*Interest is paid on the loan amounts outstanding during the month. November: $(.01) \times (\$17,900) = \$179$; December: $(.01) \times (\$17,900 - \$2,521) = \$154$.

†Borrowings are at the end of the month in the amounts needed. Repayments also are made at the end of the month in the amount that excess cash permits.

The Country Store

Budgeted Income Statement for October–December, 20X1

	October	November	December	October–December Total
Sales	\$70,000	\$85,000	\$90,000	\$245,000
Cost of goods sold	<u>42,000</u>	<u>51,000</u>	<u>54,000</u>	<u>147,000</u>
Gross margin	<u>28,000</u>	<u>34,000</u>	<u>36,000</u>	<u>98,000</u>
Operating expenses				
Salaries and wages	7,500	7,500	7,500	22,500
Freight-out	4,200	5,100	5,400	14,700
Advertising	6,000	6,000	6,000	18,000
Other	2,800	3,400	3,600	9,800
Interest*	—	179	154	333
Depreciation	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>	<u>6,000</u>
Total operating expense	<u>\$22,500</u>	<u>\$24,179</u>	<u>\$24,654</u>	<u>\$ 71,333</u>
Net operating income	<u>\$ 5,500</u>	<u>\$ 9,821</u>	<u>\$11,346</u>	<u>\$ 26,667</u>

*Interest expense is the monthly interest rate times the borrowed amount held for the month. November: $(.01) \times \$17,900 = \$179$; December: $(.01) \times \$15,379 = \$154$.

The Country Store

Budgeted Balance Sheets as of the Ends of October–December, 20X1

Assets	October	November	December*
Current assets			
Cash	\$ 8,000	\$ 8,000	\$ 8,000
Accounts receivable	56,000	68,000	72,000
Inventory	15,300	16,200	9,000
Total current assets	79,300	92,200	89,000
Plant, less accumulated depreciation†	217,750	215,750	213,750
Total assets	<u>\$297,050</u>	<u>\$307,950</u>	<u>\$302,750</u>
Liabilities and Stockholders' Equities			
Liabilities			
Accounts payable	\$ 22,350	\$ 25,950	\$ 23,400
Notes payable	17,900	15,379	5,383
Total liabilities	40,250	41,329	28,783
Stockholders' equity			
Capital stock	180,000	180,000	180,000
Retained earnings	76,800	86,621	93,967
Total stockholders' equities	256,800	266,621	273,967
Total liabilities and stockholders' equities	<u>\$297,050</u>	<u>\$307,950</u>	<u>\$302,750</u>

*The December 30, 20X1, balance sheet is the ending balance sheet for the quarter.

†October ending balance in Plant = beginning balance + equipment purchases – depreciation = \$200,000 + \$19,750 – \$2,000 = \$217,750.

Activity-Based Master Budgets

The budget process we have described thus far in this chapter can be called **functional budgeting** because the focus is on preparing budgets by function, such as production, selling, and administrative support. Organizations that have implemented activity-based cost accounting systems often use these systems as a vehicle to prepare an **activity-based budget (ABB)**—a budget that focuses on the budgeted cost of activities required to produce and sell products and services.

An activity-based budgetary system emphasizes the planning and control purpose of cost management. Our discussion of activity-based costing (ABC) in Chapter 4 focused on designing cost accounting and cost allocation systems that provided more accurate product and service costs. However, once a company has designed and implemented an ABC system, it can use the same framework for its budgetary system. Exhibit 7-8 highlights the main concepts and differences between ABC allocation of resource costs to activities and products, and ABB.

Just as in functional budgeting (see Exhibit 7-2), ABB begins with the forecasted demand for products or services—the sales budget. In functional budgeting, the next steps are to determine the ending-inventory budget, the material purchases budget, and the cost-of-goods-sold budget. In ABB, the focus is on estimating the demand for each activity's output as measured by its cost driver. Then, we use the rate at which activities consume resources to estimate or budget the resources needed. As we can see from comparing Exhibits 7-2 and 7-8, functional budgeting determines the resources needed directly from the predicted sales of products or services, while ABB uses the sales predictions to estimate the activities required, which in turn determines the resources needed. Because of the emphasis on activities and their consumption of resources, some managers believe that ABB is more useful for controlling waste and improving efficiency—a primary objective of budgeting.

functional budgeting

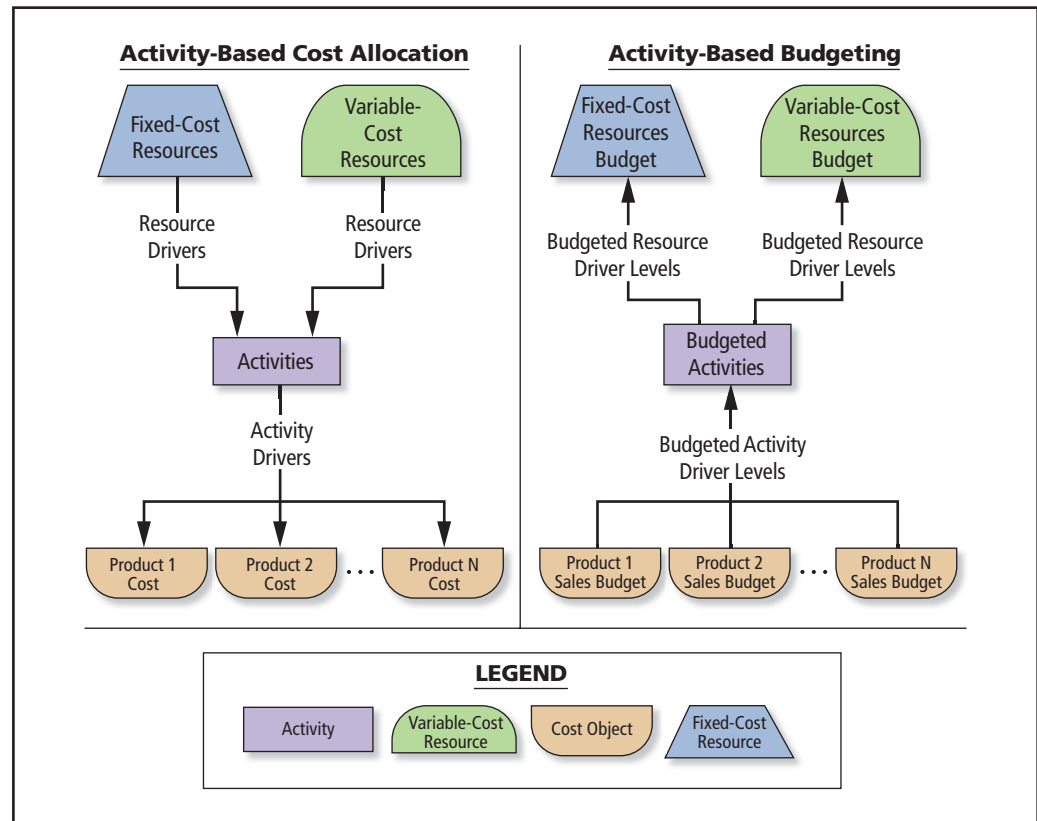
Budgeting process that focuses on preparing budgets for various functions, such as production, selling, and administrative support.

activity-based budget (ABB)

A budget that focuses on the budgeted cost of activities required to produce and sell products and services.

Exhibit 7-8

ABC and ABB Compared



Most companies do not realize the full benefits of ABC until they also integrate it into their budgeting system. Often accountants “own” the costing system of a company, but the budgeting system “belongs” to managers. ABB requires managers to focus on managing activities as they prepare their budgets using the same framework used by the ABC system. For example, when **Dow Chemical** integrated its new ABC system with its budgeting process, it undertook a massive training effort for “controllers, accountants, work process subject matter experts, cost center owners, business manufacturing leaders, and site general managers.” By creating budgets consistent with cost reports, Dow gained much greater benefit from its ABB system.

Government organizations such as the U.S. Small Business Administration (SBA) also use ABB. The SBA is one of the five largest federal credit agencies with over \$50 billion in loans. An article published by the SBA touted its use of ABB:

Our goal is to clearly identify the activities that must be performed to produce critical outputs and then determine the level of resources that must be committed to successfully complete the activity. Once this is done, we can determine how various funding levels affect the outputs produced by the SBA. The ABB process provides SBA management the quality information necessary for sound decision making.

Budgets as Financial Planning Models

financial planning model

A mathematical model of the master budget that can incorporate any set of assumptions about sales, costs, or product mix.

A well-made master budget that considers all aspects of the company (the entire value chain) provides the basis for an effective **financial planning model**, a mathematical model that can incorporate the effects of alternative assumptions about sales, costs, or product mix. Today, many large companies have developed large-scale financial planning models based on the master budget to predict how various decisions might affect the company. For example, a manager might want to predict the consequences of changing the mix of products offered for sale to emphasize several products with the highest prospects for growth. A financial planning model would provide operational and financial budgets under alternative assumptions about the product mix, sales levels, production constraints, quality levels, scheduling, and so on. Most importantly, managers can get answers to what-if questions, such as “What if sales are 10% below forecasts? What if

material prices increase 8% instead of 4% as expected? What if the new union contract grants a 6% raise in consideration for productivity improvements?”

Using the master budget in this way is a step-by-step process in which managers revise their tentative plans as they exchange views on various aspects of expected activities. Typically, they are used for the following calendar year or fiscal year. A master budget can be prepared quarterly or annually and the format varies with the nature and size of the business. By mathematically describing the relationships among all the operating and financial activities and among the other major internal and external factors that affect the results of management decisions, financial planning models allow managers to assess the predicted impacts of various alternatives before they make final decisions.

Financial planning models have shortened managers' reaction times dramatically. We can prepare in minutes (or even seconds) a revised plan for a large company that once took many accountants many days to prepare by hand. For example, **Public Service Enterprise Group**, a New Jersey utility company, can revise its total master budget several times a day, if necessary.

Spreadsheet software has put financial planning models within reach of even the smallest organizations. Appendix 7 illustrates how to use a spreadsheet model for planning. Ready access to powerful modeling, however, does not guarantee plausible or reliable results. Financial planning models are only as good as the assumptions and the inputs used to build and manipulate them—what computer specialists call GIGO (garbage in, garbage out). Nearly every CFO has a horror story to tell about following the bad advice generated from a financial planning model with accurate calculations but faulty assumptions or inputs.

Highlights to Remember

1. **Explain how budgets facilitate planning and coordination.** A budget expresses, in quantitative terms, an organization's objectives and possible steps for achieving them. Thus, a budget is a tool that helps managers in both their planning and control functions. Budgets provide a mechanism for communication between units and across levels of the organization. In an environment that encourages open communication of the opportunities and challenges facing the organization, the budget process allows managers to coordinate ongoing activities and plan for the future.
2. **Anticipate possible human relations problems caused by budgets.** The success of a budget depends heavily on employee reaction to it. Negative attitudes toward budgets often prevent realization of many of the potential benefits. Such attitudes are usually caused by managers who use budgets only to limit spending or to punish employees. Budgets generally are more useful when all affected parties participate in their preparation.
3. **Explain potentially dysfunctional incentives in the budget process.** When managers want to increase the resources allocated to their unit or when managers are evaluated based on performance relative to budgeted amounts, there are incentives to bias the information that goes into their budgets, making budget information less useful. When managers are compensated using typical bonus schemes, there may be pressure to report inflated results and incentives to make short-run decisions that are not in the best long-run interests of the organization. Not only do such incentives lead managers to make poor decisions, they undercut efforts to maintain high ethical standards in the organization.
4. **Explain the difficulties of sales forecasting.** Sales forecasting combines various techniques as well as opinions of sales staff and management. Sales forecasters must consider many factors, such as past patterns of sales, economic conditions, and competitors' actions. Sales forecasting is difficult because of its complexity and the rapid changes in the business environment in which most companies operate.
5. **Explain the major features and advantages of a master budget.** The two major parts of a master budget are the operating budget and the financial budget. Advantages of budgets include formalization of planning, providing a framework for judging performance, and aiding managers in communicating and coordinating their efforts.
6. **Follow the principal steps in preparing a master budget.** Master budgets typically cover relatively short periods—usually 1 month to 1 year. The steps involved in preparing the master budget vary across organizations but follow the general outline given on pp. 299–303. Invariably, the first step is to forecast sales or service levels. The next step should be to forecast cost-driver activity levels, given expected sales and service. Using these forecasts and knowledge of cost behavior, collection patterns, and so on, managers can prepare the operating and financing budgets.

- 7. **Prepare the operating budget and the supporting schedules.** The operating budget includes the income statement for the budget period. Managers prepare it using the following supporting schedules: sales budget, purchases budget, and operating expense budget.
- 8. **Prepare the financial budget.** The second major part of the master budget is the financial budget. The financial budget consists of a cash budget, capital budget, and a budgeted balance sheet. Managers prepare the cash budget from the following supporting schedules: cash collections, disbursements for purchases, disbursements for operating expenses, and other disbursements.

Appendix 7: Use of Spreadsheet Models for Sensitivity Analysis

Objective 9

Use a spreadsheet to develop a budget.

Spreadsheet software is a powerful and flexible tool for budgeting. An obvious advantage of a spreadsheet is that arithmetic errors are virtually nonexistent. More importantly, managers can use spreadsheets to make a mathematical model (a financial planning model) of the organization. At very low cost, they can apply this model with a variety of assumptions that reflect possible changes in expected sales, cost drivers, cost functions, and so on. The objective of this appendix is to illustrate how to use a spreadsheet model for sensitivity analysis.

Recall the chapter’s Cooking Hut Company (CHC) example. Suppose CHC has prepared its master budget using spreadsheet software. To simplify making changes to the budget, we have placed the relevant forecasts and other budgeting details in Exhibit 7-9. Note that for simplification, we have included only the data necessary for the purchases budget. The full master budget would require a larger table that includes all the data given in the chapter.

Each cell of the spreadsheet is referenced by its column (a letter) and its row (a number). For example, the beginning inventory for the budget period is in “D4,” which is shown as \$48,000. By referencing the budget data’s cell addresses, you can generate the purchases budget (Exhibit 7-11) within the same spreadsheet by entering formulas instead of numbers into the schedule. Consider Exhibit 7-10. Instead of retyping \$48,000, April’s beginning inventory in the purchases budget, in cell D17, type a formula with the cell address for the April beginning inventory from the preceding table, =D4 (the cell address preceded by an “=” sign—the common spreadsheet indicator for a formula). Likewise, all the cells of the purchases budget will contain formulas that include cell addresses instead of numbers. The total inventory needed in April (cell D16) is =D13 + D14, and budgeted purchases in April (cell D19) are =D16 – D17. We can compute the figures for May and June similarly within the respective columns. This approach gives the spreadsheet the most flexibility because you can change any number in the budget data in Exhibit 7-9 (for example, a sales forecast), and the software automatically recalculates the numbers in the entire purchases budget. Exhibit 7-10 shows the formulas used for the purchases budget. Exhibit 7-11 is the purchases budget displaying the numbers generated by the formulas in Exhibit 7-10 using the input data in Exhibit 7-9.

Exhibit 7-9
The Cooking Hut Company
Budget Data (Column and
row labels are given by the
spreadsheet.)

	A	B	C	D	E	F
1	Budgeted data					
2	Sales forecasts		Other information			
3						
4	March (actual)	\$40,000	Beginning inventory	\$48,000		
5	April	50,000	Desired ending inventory: Base amount	\$20,000		
6	May	80,000	Plus percent of next			
7	June	60,000	month’s cost of			
8	July	50,000	goods sold	80%		
9			Cost of goods sold			
10			as percent of sales	70%		

	A	B	C	D	E	F
11	Schedule c					
12	Purchases budget			April	May	June
13	Desired ending inventory			= D5 + D8* (D10*B6)	= D5 + D8* (D10*B7)	= D5 + D8* (D10*B8)
14	Plus cost of goods sold			= D10*B5	= D10*B6	= D10*B7
15						
16	Total needed			= D13 + D14	= E13 + E14	= F13 + F14
17	Less beginning inventory			= D4	= D13	= E13
18						
19	Purchases			= D16 – D17	= E16 – E17	= F16 – F17

Exhibit 7-10

The Cooking Hut Company
Purchases Budget Formulas

Now, what if you want to know the effect on budgeted purchases if the sales forecast is revised upward by 10%? By changing the sales forecasts in spreadsheet Exhibit 7-9, you obtain a nearly instantaneous revision of the purchases budget. Exhibit 7-12 shows the revised budget based on these alternative sales forecasts. The revised sales forecasts are shown in red type and the revised purchases budget is shown in blue type. We can alter any piece of budget data in the table, and easily view or print out the effects on purchases. This sort of analysis, assessing the effects of varying one of the budget inputs, up or down, is an example of **sensitivity analysis**—the systematic varying of decision input assumptions to examine the effect on the decision. This is one of the most powerful uses of spreadsheets for financial planning models. Note that while you can vary more than one type of budget input at a time, it becomes more difficult to isolate the effects of individual changes once you start making multiple changes simultaneously.

We can prepare every schedule, operating budget, and financial budget of the master budget on a spreadsheet, linking the various schedules using the appropriate cell addresses just as we linked the budget input data (Exhibit 7-9) to the purchases budget (Exhibits 7-10 and 7-11). As in the purchases budget, ideally all cells in the master budget are formulas, not numbers. That way, every budget input can be the subject of sensitivity analysis by simply changing the budget data in Exhibit 7-9.

Preparing the master budget on a spreadsheet is time-consuming the first time. However, once the spreadsheet is prepared, relatively little additional time is required to update the budget in subsequent periods, and the benefits from increased planning and sensitivity analysis capabilities are enormous. In order to obtain these benefits, it is essential for the master budget model to be well documented, with all assumptions described either within the spreadsheet or in a separate document that is readily available to subsequent users.

sensitivity analysis

The systematic varying of decision input assumptions to examine the effect on a decision.

	A	B	C	D	E	F
11	Schedule c					
12	Purchases budget			April	May	June
13	Desired ending inventory			\$64,800	\$53,600	\$48,000
14	Plus cost of goods sold			<u>35,000</u>	<u>56,000</u>	<u>42,000</u>
15						
16	Total needed			99,800	109,600	90,000
17	Less beginning inventory			<u>48,000</u>	<u>64,800</u>	<u>53,600</u>
18						
19	Purchases			<u>\$51,800</u>	<u>\$44,800</u>	<u>\$36,400</u>

Exhibit 7-11

The Cooking Hut Company
Purchases Budget

	A	B	C	D	E	F
1	Budgeted data					
2	Sales forecasts		Other information			
3						
4	March (actual)	\$40,000	Beginning inventory	\$48,000		
5	April	55,000	Desired ending inventory:			
			Base amount	\$20,000		
6	May	88,000	Plus percent of next			
7	June	66,000	month's cost of			
8	July	55,000	goods sold	80%		
9			Cost of goods sold			
10			as percent of sales	70%		
11	Schedule c					
12	Purchases budget			April	May	June
13	Desired ending inventory			\$ 69,280	\$ 56,960	\$50,800
14	Plus cost of goods sold			<u>38,500</u>	<u>61,600</u>	<u>46,200</u>
15						
16	Total needed			107,780	118,560	97,000
17	Less beginning inventory			<u>48,000</u>	<u>69,280</u>	<u>56,960</u>
18						
19	Purchases			<u>\$ 59,780</u>	<u>\$ 49,280</u>	<u>\$40,040</u>

Exhibit 7-12

The Cooking Hut Company

Purchases Budget

Accounting Vocabulary

activity-based budget (ABB), p. 307
 budget padding, p. 292
 budgetary slack, p. 292
 capital budget, p. 295
 cash budget, p. 301
 continuous budget, p. 295

financial budget, p. 295
 financial planning model, p. 308
 functional budgeting, p. 307
 long-range plan, p. 295
 master budget, p. 295
 operating budget, p. 295
 participative budgeting, p. 292

profit plan, p. 295
 rolling budget, p. 295
 sales budget, p. 294
 sales forecast, p. 294
 sensitivity analysis, p. 311
 strategic plan, p. 295
 zero-base budget, p. 289

MyLab Accounting

Fundamental Assignment Material

Special note: Problems 7-A1 and Problems 7-B1 provide single-problem reviews of most of the chapter topics. Those readers who prefer to concentrate on the fundamentals in smaller chunks should consider any of the other problems.

7-A1 Prepare Master Budget

You are the new manager of the local GreatBuy Electronics store. Top management of GreatBuy Electronics is convinced that management training should include the active participation of store managers in the budgeting process. You have been asked to prepare a complete master budget for your store for June, July, and August. All accounting is done centrally so you have no expert help on the premises. In addition, tomorrow the branch manager and the assistant controller will be here to examine your work; at that time, they will assist you in formulating the final budget document. The idea is to have you prepare the initial budget on your own so that you gain more confidence about accounting matters. You want to make a favorable impression on your superiors, so you gather the financial statement and sales data as of May 31, 20X8, on the top of the next page.

Credit sales are 70% of total sales. Seventy percent of each credit account is collected in the month following the sale and the remaining 30% is collected in the subsequent month. Assume that bad debts are negligible and can be ignored. The accounts receivable on May 31 are the result of the credit sales for April and May:

$$(0.30 \times 0.70 \times \$130,000) + (1.0 \times 0.70 \times \$130,000) = \$118,300.$$

Cash	\$ 6,600	Recent and Projected Sales	
Inventory	151,200	April	\$130,000
Accounts receivable	118,300	May	130,000
Net furniture and fixtures	52,000	June	240,000
Total assets	<u>\$328,100</u>	July	170,000
Accounts payable	\$156,200	August	170,000
Owners' equity	171,900	September	120,000
Total liabilities and owners' equities	<u>\$328,100</u>		

The policy is to acquire enough inventory each month to equal the following month's projected cost of goods sold. All purchases are paid for in the month following purchase.

The average gross profit on sales is 37%. Salaries, wages, and commissions average 24% of sales; all other variable expenses are 3% of sales. Fixed expenses for rent, property taxes, and miscellaneous payroll and other items are \$9,000 monthly. Assume that these variable and fixed expenses require cash disbursements each month. Depreciation is \$1,000 monthly.

In June, \$5,000 is going to be disbursed for fixtures acquired and recorded in furniture and fixtures in May. The May 31 balance of accounts payable includes this amount.

Assume that a minimum cash balance of \$4,000 is to be maintained. Also assume that all borrowings are effective at the beginning of the month and all repayments are made at the end of the month of repayment. Interest is compounded and added to the outstanding balance each month, but interest is paid only at the ends of months when principal is repaid. The interest rate is 9% per year; round interest computations and interest payments to the nearest dollar. Interest payments may be any dollar amount, but all borrowing and repayments of principal are made in multiples of \$1,000.

1. Prepare a budgeted income statement for the coming June–August quarter, a cash budget for each of the 3 months, and a budgeted balance sheet for August 31, 20X8. All operations are evaluated on a before-income-tax basis, so income taxes may be ignored here.
2. Explain why there is a need for a bank loan and what operating sources supply cash for repaying the bank loan.

7-BI Prepare Master Budget

Flying Fish Kite Company, a small Woy Woy, Australia, firm that sells kites on the Web, wants a master budget for the 3 months beginning January 1, 20X2. It desires an ending minimum cash balance of \$15,000 each month. Sales are forecasted at an average wholesale selling price of \$14 per kite. Merchandise costs average \$5 per kite. All sales are on credit, payable within 30 days, but experience has shown that 40% of current sales are collected in the current month, 10% in the next month, and 50% in the month thereafter. Bad debts are negligible.

In January, Flying Fish Kite is beginning just-in-time (JIT) deliveries from suppliers, which means that purchases will equal expected sales. On January 1, purchases will cease until inventory decreases to \$22,000, after which time purchases will equal sales. Purchases during any given month are paid in full during the following month.

Monthly operating expenses are as follows:

Wages and salaries	\$80,000
Insurance expired	450
Depreciation	900
Miscellaneous	4,000
Rent	\$500/month + 5% of quarterly sales over \$50,000

Cash dividends of \$2,400 are to be paid quarterly, beginning January 15, and are declared on the fifteenth of the previous month. All operating expenses are paid as incurred, except insurance, depreciation, and rent. Rent of \$500 is paid at the beginning of each month, and the additional 5% of sales is settled quarterly on the tenth of the month following the end of the quarter. The next rent settlement date is January 10.

The company plans to buy some new fixtures for \$4,000 cash in March.

Money can be borrowed and repaid in multiples of \$2,000. Management wants to minimize borrowing and repay rapidly. Simple interest of 9% per annum is computed monthly but paid when the principal is repaid. Assume that borrowing occurs at the beginning, and repayments at the end, of the months in question. Compute interest to the nearest dollar.

Assets as of December 31, 20X1		Liabilities and Owners' Equities as of December 31, 20X1	
Cash	\$ 30,000	Accounts payable	\$151,500
Accounts receivable	180,600	(merchandise)	
Inventory*	153,000	Dividends payable	2,400
Unexpired insurance	5,400	Rent payable	27,950
Fixed assets, net	62,000	Owners' equity	249,150
	<u>\$431,000</u>		<u>\$431,000</u>

*November 30 inventory balance = \$59,000.

Recent and forecasted sales:

October	\$280,000	December	\$161,000	February	\$413,000	April	\$280,000
November	168,000	January	378,000	March	273,000		

1. Prepare a master budget including a budgeted income statement, balance sheet, cash budget, and supporting schedules for the months January–March 20X2.
2. Explain why there is a need for a bank loan and what operating sources provide the cash for the repayment of the bank loan.

MyLab Accounting

Additional Assignment Material

QUESTIONS

7-1 What are the major benefits of budgeting?

7-2 Is budgeting used primarily for scorekeeping, attention directing, or problem solving?

7-3 How do strategic planning, long-range planning, and budgeting differ?

7-4 How is a continuous budget helpful for managers?

7-5 Why is it important to align performance goals of the company and the system used to evaluate and reward employees?

7-6 Explain the cycle of bias by lower-level managers and bias-adjustment by upper-level managers that can spiral out of control and result in meaningless budgets.

7-7 What are the incentives for inappropriate behaviors to *increase* reported profit when it appears that profits are likely to fall just short of a manager's bonus target?

7-8 Why is there an incentive for a manager to inappropriately *reduce* reported profit when it appears that profits are likely to be above the upper limit of a manager's bonus range?

7-9 Why is budgeted performance better than past performance as a basis for judging actual results?

7-10 "Budgets are okay in relatively certain environments. But everything changes so quickly

in the electronics industry that budgeting is a waste of time." Comment on this statement.

7-11 "Budgeting is an unnecessary burden on many managers. It takes time away from important day-to-day problems." Do you agree? Explain.

7-12 Why is the sales forecast the starting point for budgeting?

7-13 What factors influence the sales forecast?

7-14 Differentiate between an operating budget and a financial budget.

7-15 Distinguish between operating expenses and disbursements for operating expenses.

7-16 What is the principal objective of a cash budget?

7-17 What is the importance of participative budgeting?

7-18 What are the main differences between functional and activity-based budgets?

7-19 "Nearly every CFO has a horror story to tell about following bad advice generated from a financial planning model." Do you agree?

7-20 Study Appendix 7. "I cannot be bothered with setting up my monthly budget on a spreadsheet. It just takes too long to be worth the effort." Comment.

7-21 Study Appendix 7. How do spreadsheets aid the application of sensitivity analysis?

CRITICAL THINKING EXERCISES

7-22 Budgets as Limitations on Spending

Many nonprofit organizations use budgets primarily to limit spending. Why does this limit the effectiveness of budgets?

7-23 Sales Personnel and Budgeting

The sales budget is the foundation of the entire master budget. How do sales personnel help formulate the budget? Compare the role of sales personnel to that of a central staff function, such as market research.

7-24 Master Budgets for Research and Development

The text focuses on budgets for organizations that have revenues and expenses. Suppose you were the manager of a research and development division of a biotech company that has no revenue. How would budgets be helpful to you?

7-25 Production Budgets and Performance Evaluation

The Akron plant of American Tire Company prepares an annual master budget each November for the following year. At the end of each year, it compares the actual costs incurred to the budgeted costs. How can American Tire get employees to accept the budget and strive to meet or beat the budgeted costs?

EXERCISES

7-26 Fill In the Blanks

Enter the word or phrase that best completes each sentence.

- The financial budget process includes the following budgets:
 - _____
 - _____
 - _____
- The master budget process usually begins with the _____ budget.
- A(n) _____ budget is a plan that is revised monthly or quarterly, dropping one period and adding another.
- Strategic planning sets the _____.

7-27 Cash Budgeting

Brooke Dawson is planning to launch an online gaming start-up under the name “Connect2Win.” The start-up will require considerable initial investment in year 1 and will start generating revenue only in year 2. As a result, Brooke is planning to submit a business plan to a venture capitalist to fund the business. Brooke plans to spend £760,000 on equipment and other infrastructure in 2021. Operating expenses of the business will be £70,000 per month (paid as incurred) starting from January 2021 and will continue at that level thereafter. The company will receive its first revenue in January 2022 with average cash collections of £60,000 per month throughout 2022. In January 2023, cash collections are expected to increase to £200,000 per month and continue at that level thereafter.

The company needs enough funding to cover all its cash needs until cash collections start exceeding cash disbursements. How much venture capital funding should Brooke seek?

7-28 Purchases and Cost of Goods Sold

Popeil Products, a wholesaler of fishing equipment, budgeted the following sales for the indicated months:

	June 20X8	July 20X8	August 20X8
Sales on account	\$1,850,000	\$1,920,000	\$1,910,000
Cash sales	<u>130,000</u>	<u>156,000</u>	<u>274,000</u>
Total sales	<u>\$1,980,000</u>	<u>\$2,076,000</u>	<u>\$2,184,000</u>

All merchandise is marked up to sell at its invoice cost plus 20%. Target merchandise inventories at the beginning of each month are 25% of that month's projected cost of goods sold.

- Compute the budgeted cost of goods sold for the month of June 20X8.
- Compute the budgeted merchandise purchases for July 20X8.

7-29 Purchases and Sales Budgets

All sales of Tracy's Jeans and Uniforms (TJU) are made on credit. Sales are billed twice monthly, on the fifth of the month for the last half of the prior month's sales and on the twentieth of the month for the first half of the current month's sales. For accounts paid within the first 10 days after the billing

date, TJU gives customers a 2% discount; otherwise the full amount is due within 30 days of the billing date, and customers that do not pay within the 10-day discount period generally wait the full 30 days before making payment. Based on past experience, the collection experience of accounts receivable is as follows:

Within the 10-day discount period	70%
At 30 days after billing	28%
Uncollectible	2%

Sales for May 20X8 were \$790,000. The forecast sales for the next 4 months are as follows:

June	\$810,000
July	990,000
August	940,000
September	660,000

TJU's average markup on its products is 40% of the sales price.

TJU purchases merchandise for resale to meet the current month's sales demand and to maintain a desired monthly ending inventory of 25% of the next month's cost of goods sold. All purchases are on credit. TJU pays for one-half of a month's purchases in the month of purchase and the other half in the month following the purchase.

All sales and purchases occur uniformly throughout the month.

1. How much cash can TJU plan to collect from accounts receivable collections during July 20X8?
2. Compute the budgeted dollar value of TJU inventory on May 31, 20X8.
3. How much merchandise should TJU plan to purchase during June 20X8?
4. How much should TJU budget in August 20X8 for cash payments for merchandise purchased?

7-30 Sales Budget

Suppose a garment company has the following data:

- Accounts receivable, August 31: $(0.3 \times \text{August sales of } \$400,000) = \$120,000$
- Monthly forecasted sales: September, \$510,000; October, \$535,000; November, \$620,000, December, \$670,000

Sales consist of 70% cash and 30% credit. All credit accounts are collected in the month following the sales. Uncollectible accounts are negligible and may be ignored.

Prepare a sales budget schedule and cash collections budget schedule for September, October, and November.

7-31 Sales Budget

Akihiko, a wholesaler in auto spare parts, was preparing his sales budget for the third quarter of 2020. Forecast sales are as follows (all values are in thousands of yen):

July	¥406,000
August	¥454,000
September	¥496,000

Sales are 30% cash and 70% on credit. Sixty percent of the credit accounts are collected in the month of sale, 30% in the month following the sale, and 10% in the following month. No uncollectible accounts are anticipated. Accounts receivable at the beginning of July 2020 are ¥150,800 (10% of May credit sales of ¥300,000 and 40% of June credit sales of ¥302,000).

Prepare a schedule showing sales and cash collections for July, August, and September 2020.

7-32 Cash Collection Budget

Northwest Equipment offers a 3% discount to customers who pay cash at the time of sale and a 2% discount to customers who pay within the first 10 days of the month after sale. Past experience shows that cash collections from customers tend to occur in the following pattern:

Cash collected at time of sale	55%
Collected within cash discount period in first 10 days of month after sale	15
Collected after cash discount period in first month after month of sale	10
Collected after cash discount period in second month after month of sale	15
Never collected	5

Compute the total cash budgeted to be collected in March if sales forecasts are \$370,000 for January, \$420,000 for February, and \$460,000 for March.

7-33 Purchases Budget

Green Star Inc. is a leading manufacturer and seller of air purifiers. The company plans inventory levels (at cost) at the end each month as follows: March, \$433,600; April, \$361,600; May, \$334,400; and June, \$385,600.

Sales are expected to be April, \$718,400; May, \$574,400; and June, 489,600. Cost of goods sold is 60% of sales.

Purchases in February were \$412,800 and in March they were \$300,800. Payments for each month's purchases are made as follows: 20% during the month, 60% the next month, and the final 20% the next month.

Prepare budget schedule for April, May, and June for purchases and for disbursements of purchases.

7-34 Purchases Budget

Erika Dillinger is a dealer in computers. She has adopted the following policies regarding merchandise purchase and inventory. At the end of any month, the inventory should be €30,000 plus 80% of cost of goods to be sold during the following month. The cost of merchandise sold averages 70% of sales. Purchase terms are generally net, 30 days. Purchase of a given month is paid as follows: 30% during the month and 70% during the following month.

Purchases in June had been €300,000 and the inventory on June 30 was higher than planned at €460,000. Erika was upset because the inventory was too high. Sales are expected to be July, €600,000; August, €580,000; September, €680,000; and October, €800,000.

1. Compute the amount by which the inventory on June 30 exceeded the company's policies.
2. Prepare budget schedules for July, August, and September for purchases and for disbursements for purchases.

7-35 Cash Budget

Consider the budgeted income statement for Carlson Company for June 20X4 in Exhibit 7-13.

The cash balance, May 31, 20X4, is \$15,000.

Sales proceeds are collected as follows: 80% the month of sale, 10% the second month, and 10% the third month.

Accounts receivable are \$44,000 on May 31, 20X4, consisting of \$20,000 from April sales and \$24,000 from May sales.

Accounts payable on May 31, 20X4, are \$145,000.

Carlson Company pays 25% of purchases during the month of purchase and the remainder during the following month.

All operating expenses requiring cash are paid during the month of recognition, except that insurance and property taxes are paid annually in December for the forthcoming year.

Prepare a cash budget for June. Confine your analysis to the given data. Ignore income taxes.

Sales		\$290
Inventory, May 31	\$ 50	
Purchases	192	
Available for sale	242	
Inventory, June 30	40	
Cost of goods sold		202
Gross margin		\$ 88
Operating expenses		
Wages	\$ 36	
Utilities	5	
Advertising	10	
Depreciation	1	
Office expenses	4	
Insurance and property taxes	3	59
Operating income		<u>\$ 29</u>

Exhibit 7-13

Carlson Company
Budgeted Income Statement for
the Month Ended June 30, 20X4
(in thousands)

PROBLEMS

7-36 Cash Budget

Ruben Cooper is the owner and manager of a children's toy shop, Wonder Toys. From the following data, Cooper wants to prepare a cash budget showing expected cash receipts and disbursements for the month of September and the cash balance expected as of September 30, 2020.

- Planned cash balance, August 31, 2020: €300,000
- Customer receivables as of August 31: €1,590,000 total, €240,000 from July sales, €1,350,000 from August sales
- Accounts payable, August 31: €1,380,000
- Merchandise purchases for September: €1,350,000, 40% paid in the month of purchase, 60% paid in the next month
- Payrolls due in September: €270,000
- Other expenses for September, payable in September: €135,000
- Accrued taxes for September, payable in November: €22,500
- Bank note due September 10: €270,000 plus €21,600 interest
- Depreciation for September: €6,300
- Two-year insurance policy due September 15 for renewal: €4,500, to be paid in cash.
- Sales for September: €3,000,000, half collected in the month of sale, 40% in next month, 10% in the third month.

Prepare the cash budget for the month ending September 30, 2020.

7-37 Cash Budget

Exclusive Candles is a mid-size company that sells ultrasonic aroma diffusers and humidifiers with LED lights. On October 1, 2020, part of the trial balance showed the following:

	DR	CR
Cash	\$10,000	
Accounts receivable	31,240	
Allowance for bad debts		\$4,200
Merchandise inventory	28,560	
Accounts payable, merchandise		14,560

The company pays for its purchase within 15 days of purchase, so assume that half of the purchases of any month are due and paid for in the following month.

The cost of the merchandise purchased is \$24 per box. At the end of each month, it is desired to have an inventory equal in units to 70% of the following month's sales in units.

Sales terms include a 2% discount if payment is made by the end of the calendar month. Past experience indicates that 60% of sales will be collected during the month, 30% in the following calendar month, 5% in the next following calendar month, and the remaining 5% will be uncollectible. The company's fiscal year begins August 1.

Unit selling price	\$ 44
August actual sales	\$ 17,600
September actual sales	88,000
October estimated sales	74,800
November estimated sales	39,600
Total sales expected in the fiscal year	\$1,056,000

Exclusive of bad debts, total budgeted selling and general administration expenses for the fiscal year are estimated at \$169,200, of which \$54,000 is fixed expense (which includes \$25,800 annual depreciation charge). The company incurs these fixed expenses uniformly throughout the year. The balance of the selling and administration expenses varies with sales. Expenses are paid as incurred. Prepare a statement of estimated cash receipts and disbursements for October 2020.

7-38 Budget at Indian Hotel Company

Indian Hotel Company (IHC), headquartered in Mumbai, India, has around 100 luxury hotels in different parts of India. For one of these hotels, Taj Bengal, Kolkata, the management expects occupancy rates to be 90% in October, November, and December; 80% in September, January, and February; and 70% the rest of the year. This hotel has 300 rooms and the average room rental is ₹20,000 per night.

Of this, on average 15% is received as a deposit the month before the stay, 60% is received in the month of stay, and 23% is collected the month after. The remaining 2% is never collected.

Most of the costs of running the hotel are fixed. The variable costs are only ₹2,400 per occupied room per night. Fixed salaries (including perks) run ₹32,000,000 per month, depreciation is ₹28,000,000 a month, other fixed operating costs are ₹9,600,000 per month, and interest expense is ₹48,000,000 per month. Variable costs and salaries are paid in the month they are incurred, depreciation is recorded at the end of each quarter, other fixed operating costs are paid as incurred, and interest is paid semiannually each June and December.

1. Prepare a monthly cash budget for this hotel for the entire year. Assume 30 days a month.
2. How much would the hotel's annual profit increase if occupancy rates increased by 5% during the off-season (that is, from 70% to 75% in each of the months from March to August)?

7-39 Activity-Based Budgeting

Home Town Furnitures incurred losses for the past two quarters. In an immediate rescue measure, the CEO of the company issued instructions to every department to cut costs. Accordingly, the packaging and delivery department for the company was required to cut costs by 15%. The traditional functional budget for the packaging and delivery department was as follows:

Salaries, four employees at \$42,000	\$168,000
Benefits at 10%	33,600
Depreciation under straight line basis	76,000
Supplies	43,400
Overhead at 35% of above costs	<u>112,350</u>
Total	<u>\$433,350</u>

Therefore, the packaging and delivery department needed to find \$65,003 to cut.

Isabella Clarke, recent MBA graduate, was asked to prepare a budget for the department paring \$65,003. As a first step, she decided to recast the traditional budget into an activity-based budget as follows:

Handling, 11,200 moves	\$112,000
Packaging, 620,000 pounds	93,000
Shipping, 404,000 boxes	202,000
Record keeping, 65,000 transactions	<u>26,350</u>
Total	<u>\$433,350</u>

1. What action might Isabella suggest to attain a \$65,003 budget cut? Why would these be the best actions to pursue?
2. Which budget helped you most in answering question 1? Explain.

7-40 Budgeting, Behavior, and Ethics

Mathew Philp, president of North Idaho Mining, Ltd., has made budgets a major focus for managers. Making budgets was such an important goal that the only two managers who had missed their budgets in 20X7 (by 2% and 4%, respectively) had been summarily fired. This caused all managers to be wary when setting their 20X8 budgets.

The Red Mountain division of North Idaho Mining had the following results for 20X7:

Sales, 1.6 million pounds at \$.95/pound	\$1,520,000
Variable costs	880,000
Fixed costs, primarily depreciation	<u>450,000</u>
Pretax profit	<u>\$ 190,000</u>

Molly Stark, general manager of Red Mountain, received a memo from Philp that contained the following:

We expect your profit for 20X8 to be at least \$209,000. Prepare a budget showing how you plan to accomplish this.

Stark was concerned because the market had recently softened. Her market research staff forecast that sales would be at or below the 20X7 level, and prices would likely be between \$.92 and \$.94 per pound. Her manufacturing manager reported that most of the fixed costs were committed and there were few efficiencies to be gained in the variable costs. He indicated that perhaps a 2% savings in variable costs might be achievable but certainly no more.

1. Prepare a budget for Stark to submit to headquarters. What dilemmas does Stark face in preparing this budget?
2. What problems do you see in the budgeting process at North Idaho Mining?
3. Suppose Stark submitted a budget showing a \$209,000 profit. It is now late in 20X8, and she has had a good year. Despite an industry-wide decline in sales, Red Mountain's sales matched last year's 1.6 million pounds, and the average price per pound was \$.945, nearly at last year's level and well above that forecast. Variable costs were cut by 2% through extensive efforts. Still, profit projections were more than \$9,000 below budget. Stark was concerned for her job so she approached the controller and requested that depreciation schedules be changed. By extending the lives of some equipment for 2 years, depreciation in 20X8 would be reduced by \$15,000. Estimating the economic lives of equipment is difficult, and it would be hard to prove that the old lives were better than the new proposed lives. What should the controller do? What ethical issues does this proposal raise?

7-41 Spreadsheets and Sensitivity Analysis of Income Statement

Study Appendix 7. A Speedy-Mart Store in Northcenter Mall has the following budgeted sales, which are uniform throughout the month:

May	\$450,000
June	375,000
July	330,000
August	420,000

Cost of goods sold averages 70% of sales, and merchandise is purchased and paid for essentially as needed. Employees earn fixed salaries of \$22,000 monthly and commissions of 10% of the current month's sales, paid as earned. Other expenses are rent, \$6,000, paid on the first of each month for that month's occupancy; miscellaneous expenses, 6% of sales, paid as incurred; insurance, \$450 per month, from a 1-year policy that was paid for on January 2; and depreciation, \$2,850 per month.

1. Using spreadsheet software, prepare a table of budget data for the Speedy-Mart Store.
2. Continue the spreadsheet in number 1 to prepare budget schedules for (a) disbursements for operating expenses and (b) operating income for June, July, and August.
3. Adjust the budget data appropriately for each of the following scenarios independently and recompute operating income using the spreadsheet:
 - a. A sales promotion that will cost \$30,000 in May could increase sales in each of the following 3 months by 5%.
 - b. Eliminating the sales commissions and increasing employees' salaries to \$52,500 per month could decrease sales thereafter by a net of 2%.

7-42 Spreadsheets and Sensitivity Analysis of Operating Expenses

Study Appendix 7. The high definition LCD division (HDLD) of Fisher Displays produces LCD TV displays. The displays are assembled from purchased components. The costs (value) added by HDLD are indirect costs, which include assembly labor, packaging, and shipping. HDLD produces two sizes of displays: 42 and 50". Cost behavior of HDLD is as follows:

	Fixed Cost/Month	Variable Cost
Purchased components		
50" Displays		\$80 per component
42" Displays		55 per component
Assembly labor	\$40,000	16 per component
Packaging	8,000	4 per display
Shipping	5,000	2 per display

Both displays require three components per display. Therefore, the total cost of components for 50" displays is \$240 and for 42" displays is \$165. HDLD uses a 6-month continuous budget that is revised monthly. Sales forecasts reflect the expectation that unit sales of 42" displays will be 25% higher than unit sales of 50" displays. Sales forecasts for the next 8 months are as follows:

	50" Displays	42" Displays
October	3,200 units	4,000 units
November	2,400	3,000
December	5,600	7,000
January	3,200	4,000
February	3,200	4,000
March	2,400	3,000
April	2,400	3,000
May	2,800	3,500

Treat each of the following events in succession.

1. Use spreadsheet software to prepare a table of budgeting information and an operating expense budget for HDLD for October–March. Prepare a spreadsheet that can be revised easily for succeeding months in parts 2 and 3.
2. October's actual sales were 2,800 50" displays and 3,600 42" displays. This outcome has caused HDLD to revise its sales forecasts downward by 10%. Revise the operating expense budget for November–April.
3. At the end of November, HDLD decides that the proportion of 50" to 42" displays is changing. Unit sales of 42" displays are expected to be 50% higher than unit sales of 50" displays sales. Expected sales of 50" displays are unchanged from number 2. Revise the operating expense budget for December–May.

CASES

7-43 Comprehensive Cash Budgeting

Christine Morrison, treasurer of Salt Lake Light Opera (SLLO), was preparing a loan request to the South Utah National Bank in December 20X4. The loan was necessary to meet the cash needs of the SLLO for year 20X5. In a few short years, the SLLO had established itself as a premier opera company. In addition to its regular subscription series, it started a series for new composers and offered a very popular holiday production. The holiday production was the most financially successful of the SLLO's activities, providing a base to support innovative productions that were artistically important to the SLLO but did not usually succeed financially.

	20X2	20X3	20X4
Assets			
Cash	\$2,688	\$ 229	\$ 208
Accounts receivable	2,942	3,372	4,440
Supplies inventory	700	700	500
Total current assets	\$6,330	\$4,301	\$ 5,148
Plant and equipment	2,643	4,838	5,809
Total assets	<u>\$8,973</u>	<u>\$9,139</u>	<u>\$10,957</u>
Liabilities and Equities			
Bank loan	\$ 0	\$ 0	\$ 1,620*
Accounts payable	420	720	780
Accrued payroll expenses	472	583	646
Mortgage, current	250	250	250
Total current liabilities	\$1,142	\$1,553	\$ 3,296
Other payables	270		
Mortgage payable, long-term	3,750	3,500	3,250
Net assets†	3,811	4,086	4,411
Total liabilities and equities	<u>\$8,973</u>	<u>\$9,139</u>	<u>\$10,957</u>

*Includes \$32,000 of accrued interest.

†The "Net assets" account for a nonprofit organization is similar to "Stockholders' equity" for a corporation.

Exhibit 7-14

Salt Lake Light Opera
Balance Sheets as of
December 31 (in thousands
of dollars)

Exhibit 7-15

Salt Lake Light Opera
Income Statements for the
Year Ended December 31
(in thousands of dollars)

	20X2	20X3	20X4
Ticket sales	\$3,303	\$4,060	\$5,263
Contributions	1,041	1,412	1,702
Grants and other revenues	1,202	1,361	1,874
Total revenues	\$5,546	\$6,833	\$8,839
Expenses*			
Production	\$4,071	\$4,805	\$6,307
Operations	271	332	473
Public relations and community development	1,082	1,421	1,734
Total expenses	\$5,424	\$6,558	\$8,514
Excess of revenues over expenses	\$ 122	\$ 275	\$ 325

*Expenses include depreciation of \$355, \$370, and \$470 and general and administrative expenses of \$1,549, \$1,688, and \$2,142 in the years 20X2, 20X3, and 20X4, respectively.

In total, the SLLO had done well financially, as shown in Exhibits 7-14 and 7-15. Its profitable operations had enabled it to build its own building and generally acquire a large number of assets. It had at least broken even every year since its incorporation, and management anticipates continued profitable operations. The Corporate Community for the Arts in Salt Lake and several private foundations had made many grants to the SLLO, and such grants are expected to continue. Most recently, the largest bank in town had agreed to sponsor the production of a new opera by a local composer. The SLLO's director of development, Harlan Wayne, expected such corporate sponsorships to increase in the future.

To provide facilities for the Opera's anticipated growth, SLLO began work on an addition to its building 2 years ago. The new facilities are intended primarily to support the experimental offerings that were becoming more numerous. The capital expansion was to be completed in 20X5; all that remained was acquisition and installation of lighting, sound equipment, and other new equipment to be purchased in 20X5.

SLLO had borrowed working capital from South Utah National Bank for the past several years. To qualify for the loans, the SLLO had to agree to the following:

1. Completely pay off the loan for 1 month during the course of the year.
2. Maintain cash and accounts receivable balances equal to (or greater than) 120% of the loan.
3. Maintain a compensating cash balance of \$200,000 at all times.

In the past, the SLLO has had no problem meeting these requirements. However, in 20X4 the SLLO had been unable to reduce the loan to zero for an entire month. Although South Utah continued to extend the needed credit, the loan manager expressed concern over the situation. She asked for a quarterly cash budget to justify the financing needed for 20X5. Ms. Morrison began to assemble the data needed to prepare such a budget.

SLLO received revenue from three main sources: ticket sales, contributions, and grants. Ms. Morrison formed Exhibit 7-16 to calculate the accounts receivable balance for each of these sources for 20X5. She assumed that SLLO would continue its normal practices for collecting pledges and grant revenues.

	Ticket Sales		Contributions		Grants	
	Revenues	End of Quarter Receivables	Revenues	End of Quarter Receivables	Revenues	End of Quarter Receivables
First Quarter	\$ 852	\$2,795	\$ 75	\$ 794	\$ 132	\$ 1,027
Second Quarter	1,584	3,100	363	888	448	1,130
Third Quarter	2,617	3,407	1,203	1,083	1,296	1,240
Fourth Quarter	1,519	3,683	442	1,170	528	1,342

Exhibit 7-16

Salt Lake Light Opera
Estimated Quarterly Revenues and End of Quarter Receivables for the Year Ended December 31, 20X5
(in thousands of dollars)

Most expenses were constant from month to month. An exception was supplies, which were purchased twice a year in December and June. In 20X5, SLLO expects to purchase \$200,000 of supplies in June and \$700,000 in December on terms of net, 30 days. The supplies inventory at the end of December was expected to be \$600,000. Depreciation expense of \$500,000 was planned for 20X5, and other expenses were expected to run at a steady rate of \$710,000 a month throughout the year, of which \$700,000 was payroll costs. Salaries and wages were paid on the Monday of the first week following the end of the month. The remaining \$10,000 of other expenses were paid as incurred.

The major portion of the new equipment to be installed in 20X5 was to be delivered in September; payments totaling \$400,000 would be made in four equal monthly installments beginning in September. In addition, small equipment purchases are expected to run \$20,000 per month throughout the year. They will be paid for on delivery.

In late 20X2, SLLO had borrowed \$4 million (classified as a mortgage payable) from Farmers' Life Insurance Company. The SLLO is repaying the loan over 16 years, in equal principal payments in June and December of each year. Interest at 8% annually is also paid on the unpaid balance on each of these dates. Total interest payments for 20X5, according to Ms. Morrison's calculations, would be \$275,000.

Interest on the working capital loan from South Utah National Bank was at an annual rate of 10%. Interest is accrued quarterly but paid annually; payment for 20X4's interest would be made on January 10, 20X5, and that for 20X5's interest would be made on January 10, 20X6. Working capital loans are taken out on the first day of the quarter that funds are needed, and they are repaid on the last day of the quarter when extra funds are generated. SLLO has tried to keep a minimum cash balance of \$200,000 at all times, even if loan requirements do not require it.

1. Compute the cash inflows and outflows for each quarter of 20X5. What are SLLO's loan requirements each quarter?
2. Prepare a projected income statement and balance sheet for SLLO for 20X5.
3. What financing strategy would you recommend for SLLO?

7-44 Cash Budgeting for a Hospital

Highline Hospital provides a wide range of health services in its community. Highline's board of directors has authorized the following capital expenditures:

Intra-aortic balloon pump	\$1,400,000
Computed tomography scanner	850,000
X-ray equipment	550,000
Laboratory equipment	<u>1,200,000</u>
Total	<u>\$4,000,000</u>

The expenditures are planned for October 1, 20X7, and the board wishes to know the amount of borrowing, if any, necessary on that date. Rebecca Singer, hospital controller, has gathered the following information to be used in preparing an analysis of future cash flows.

Billings, made in the month of service, for 20X7 are shown next, with actual amounts for January–June and estimated amounts for July–December:

Month	Amount Billed
January	\$5,300,000
February	5,300,000
March	5,400,000
April	5,400,000
May	5,700,000
June	6,000,000
July (estimated)	5,800,000
August (estimated)	6,200,000
September (estimated)	6,600,000
October (estimated)	6,800,000
November (estimated)	7,000,000
December (estimated)	6,600,000

Ninety percent of Highline billings are made to third parties, such as **BlueCross**, federal or state governments, and private insurance companies. The remaining 10% of the billings are made directly to patients. Historical patterns of billing collections are as follows:

	Third-Party Billings	Direct-Patient Billings
Month of service	20%	10%
Month following service	50	40
Second month following service	20	40
Uncollectible	10	10

Singer expects the same billing and collection patterns that have been experienced during the first 6 months of 20X7 to continue during the last 6 months of the year. The following schedule presents the purchases that have been made during the past 3 months and the planned purchases for the last 6 months of 20X7.

Month	Amount
April	\$1,300,000
May	1,450,000
June	1,450,000
July	1,500,000
August	1,800,000
September	2,200,000
October	2,350,000
November	2,700,000
December	2,100,000

All purchases are made on account, and accounts payable are remitted in the month following the purchase.

- Salaries for each month during the remainder of 20X7 are expected to be \$1,800,000 per month plus 20% of that month's billings. Salaries are paid in the month of service.
- Highline's monthly depreciation charges are \$150,000.
- Highline incurs interest expenses of \$180,000 per month and makes interest payments of \$540,000 on the last day of each calendar quarter.
- Endowment fund income is expected to continue to total \$210,000 per month.
- Highline has a cash balance of \$350,000 on July 1, 20X7, and has a policy of maintaining a minimum end-of-month cash balance of 10% of the current month's purchases.
- Highline Hospital employs a calendar-year reporting period.

1. Prepare a schedule of budgeted cash receipts by month for the third quarter of 20X7.
2. Prepare a schedule of budgeted cash disbursements by month for the third quarter of 20X7.
3. Determine the amount of borrowing, if any, necessary on October 1, 20X7, to acquire the capital items totaling \$4,000,000.

7-45 Comprehensive Budgeting for a University

Suppose you are the controller of Nebraska State University. The university president, Lisa Larsson, is preparing for her annual fund-raising campaign for 20X7–20X8. To set an appropriate target, she has asked you to prepare a budget for the academic year. You have collected the following data for the current year (20X6–20X7):

	Undergraduate Division	Graduate Division
Average salary of faculty member	\$58,000	\$58,000
Average faculty teaching load in semester credit-hours per year (eight undergraduate or six graduate courses)	24	18
Average number of students per class	30	20
Total enrollment (full-time and part-time students)	3,600	1,800
Average number of semester credit-hours carried each year per student	25	20
Full-time load, semester hours per year	30	24

For 20X7–20X8, all faculty and staff will receive a 6% salary increase. Undergraduate enrollment is expected to decline by 2%, but graduate enrollment is expected to increase by 5%.

- The 20X6–20X7 budget for operation and maintenance of facilities was \$500,000, which includes \$240,000 for salaries and wages. Experience so far this year indicates that the budget is accurate. Salaries and wages will increase by 6% and other operating costs will increase by \$12,000 in 20X7–20X8.
- The 20X6–20X7 and 20X7–20X8 budgets for the remaining expenditures are as follows:

	20X6–20X7	20X7–20X8
General administrative	\$500,000	\$525,000
Library		
Acquisitions	150,000	155,000
Operations	190,000	200,000
Health services	48,000	50,000
Intramural athletics	56,000	60,000
Intercollegiate athletics	240,000	245,000
Insurance and retirement	520,000	560,000
Interest	75,000	75,000

- Tuition is \$92 per credit hour. In addition, the state legislature provides \$780 per full-time-equivalent student. (A full-time equivalent is 30 undergraduate hours or 24 graduate hours.) Full-tuition scholarships are given to 30 full-time undergraduates and 50 full-time graduate students.
- Revenues other than tuition and the legislative apportionment are as follows:

	20X6–20X7	20X7–20X8
Endowment income	\$200,000	\$210,000
Net income from auxiliary services	325,000	335,000
Intercollegiate athletic receipts	290,000	300,000

- The chemistry/physics classroom building needs remodeling during the 20X7–20X8 period. Projected cost is \$575,000.
1. Prepare a schedule for 20X7–20X8 that shows, by division, (a) expected enrollment, (b) total credit hours, (c) full-time-equivalent enrollment, and (d) number of faculty members needed.
 2. Calculate the budget for faculty salaries for 20X7–20X8 by division.
 3. Calculate the budget for tuition revenue and legislative apportionment for 20X7–20X8 by division.
 4. Prepare a schedule for President Larsson showing the amount that must be raised by the annual fund-raising campaign.

NIKE 10-K PROBLEM

7-46 Budgeting Assumptions at Nike

Examine Nike's 2021 10-K presented in Appendix C. Find the section of the 10-K titled "Results of Operations" showing a condensed income statement for fiscal years 2019, 2020, and 2021. Use the condensed income statement to calculate budgeted net income for fiscal 2022 under the following alternative sets of assumptions. Round amounts to the nearest million dollars.

1. Note that Nike's revenues increased by about 19% last year. Assume cost of sales is 55% of revenue, selling and administrative expense is 30% of revenue, and income tax expense is 14% of income before income taxes. Assume that all costs are variable.
 - a. Calculate budgeted net income if revenue increases by 19%.
 - b. Calculate budgeted net income if revenue decreases by 19%.

2. Now assume that selling and administrative expense is fixed at the dollar amount shown in the 2021 10-K, but continue to assume cost of sales is 55% of revenue and income tax expense is 14% of income before income taxes.
 - a. Calculate budgeted net income if revenue increases by 19%.
 - b. Calculate budgeted net income if revenue decreases by 19%.
3. Note that Nike's gross margin was about 45% in fiscal 2021 but was about 1% lower in 2020 and about the same in 2019. Assume revenue for 2022 will be the same as in 2021, selling and administrative expense is a fixed cost equal to the dollar amount shown in the 2021 10-K, and income tax expense is 14% of income before income taxes.
 - a. Calculate budgeted net income if the gross margin increases to 46%.
 - b. Calculate budgeted net income if the gross margin decreases to 44%.

EXCEL APPLICATION EXERCISE

7-47 Preparing a Cash Budget to Assist Long-Range Planning

Goal: Create an Excel spreadsheet to prepare a cash budget to assist with long-range planning. Use the results to answer questions about your findings.

Scenario: Music Masters has asked you to prepare an analysis of its cash requirements until such time as its forecasted cash receipts begin to exceed its forecasted cash disbursements. The company will use your analysis to determine venture capital funding requests. Additional background information for your spreadsheet appears in Exercise 7-27 on p. 315.

When you have completed your spreadsheet, answer the following questions:

1. Based on its stated objective of stopping venture capital funding when cash receipts begin to exceed cash disbursements, in what month/year should Music Masters no longer require venture capital funding? Why?
2. What is the total amount of expenditures Music Masters will incur before its cash receipts begin to exceed its cash disbursements? What is the total amount of venture capital funding that Music Masters should request?
3. Is the amount of venture capital funding that Music Masters should request equal to its total expenditures? If not, why are the amounts different?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
 - Row 1: Chapter 7 Decision Guideline
 - Row 2: Music Masters
 - Row 3: Cash Budget for Venture Capital Requirements
 - Row 4: Today's Date
3. Merge and center the four heading rows across columns A–F.
4. In row 7, create the following bold-faced, center-justified column headings with a column width of 10.57:
 - Column B: 20X7
 - Column C: 20X8
 - Column D: 20X9
 - Column E: 20Y0
 - Column F: Total
5. In column A, create the following row headings:
 - Row 8: Equipment Purchase
 - Row 9: Salaries and Other Operating Expenses
 - Row 10: Revenues
 - Row 11: Net Cash Requirements

Note: Adjust column width as necessary.
6. Use data from Exercise 7-27 to enter the amounts for the yearly cash requirements for the three income/expense categories. Use formulas to calculate the appropriate yearly amounts within each category when necessary.

Hint: Use different signs for the cash receipt (revenue) and cash disbursement (expense) amounts.

7. Use the SUM function to calculate totals for each column in row 11 and for each row in column F.

8. Format amounts in rows 8 and 11 as follows:

Number tab: Category:
Decimal: 0
Symbol: \$

9. Format amounts in Rows 9 and 10 as follows:

Number tab: Category:
Decimal: 0
Symbol: None

10. Apply top and bottom borders to the amounts in row 11 by clicking the drop-down indicator on the Borders icon from the toolbar. Select the “Top and Double Bottom Border.”
11. Save your work, and print a copy for your files.

COLLABORATIVE LEARNING EXERCISE

7-48 Personal Budgeting

Budgeting is useful to many different types of entities, including the individual. Consider an entity that you know well, the college or university student. Form a group of two to six students, and pool the information that you have about what it costs to spend a year as a full-time student.

Prepare a revenue and expense budget for an average prospective full-time student at your college or university. Identify possible sources of revenue and the amount to be received from each. Identify the costs a student is likely to incur during the year. To simplify your analysis, assume that cash disbursements are made immediately for all expenses so the budgeted income statement and cash budget are identical.

When all groups have completed their budgets, compare those budgets. What are the differences? What assumptions led to the differences?

INTERNET EXERCISES

7-49 Carnival Corporation

The budgeting process helps firms to identify sources of revenues and expenses as well as the timing of cash flows. While many parts of the budgeting process are confidential, there are some things that may be identifiable by someone outside the firm who would like to make some potential budget projections for the following year. Consider **Carnival Corporation**, the cruise ship firm. Go to the Carnival Web site at www.carnivalcorp.com.

1. Look at the list of Carnival Corporation’s global brands. How many different brand lines operate under the corporation shell? What are they? Visit a couple of the links. Do the brands each offer exactly the same services? Why might the firm have different names for the cruise lines serving different areas?
2. The sales figure is one of the most important pieces of information the firm uses in beginning the planning process. Carnival’s sales figure is made up primarily of two parts—the number of passenger cruise days and the price charged for each passenger cruise day. Go to “Investor Relations” and then “Annual Reports.” From the list of Annual Reports, open Carnival’s annual report for the most recent year. Notice the total revenues for the year and then find information about passenger capacity. What is the occupancy percentage?
3. Find the information provided by management about the expected increase in passenger capacity during the coming years. Assuming revenue increases in proportion to passenger capacity, what would be the expected revenue for 2022? Should the firm expect an increase in costs associated with the increase in capacity? When budgeting for these costs, would the costs be proportional to the increase in revenues? Why or why not?
4. The other component in revenue is how much the passenger pays for the cruise. Select one of the cruise line links from the main page. Find the subsequent link that takes you to information about cruise prices. Are prices for the same length cruise always the same? Look at the fine print with respect to the cruise pricing. What does it tell about how the price is determined? Why might the capacity level of the cruise determine the price that is charged for the cruise?

Flexible Budgets and Variance Analysis

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Identify variances and label them as favorable or unfavorable.
2. Distinguish between flexible budgets and static budgets.
3. Use flexible-budget formulas to construct a flexible budget.
4. Compute and interpret static-budget variances, flexible-budget variances, and sales-activity variances.
5. Understand how the setting of standards affects the computation and interpretation of variances.
6. Compute and interpret price and quantity variances for materials and labor.
7. Compute variable overhead spending and efficiency variances.
8. Compute the fixed-overhead spending variance.

► MCDONALD'S

McDonald's is consistently ranked among the world's best-known brands in *Bloomberg Businessweek's* annual ranking of global brands. You can eat a Big Mac under the golden arches in more than 119 countries.

With total sales of more than \$23 billion, the challenge is to ensure that the taste of each Big Mac is the same at each of the more than 40,000 company-owned, franchised, or affiliated restaurants. How does McDonald's maintain cost and quality control? How does it ensure that each of the over 68 million customers it serves daily receives the same quality product? It uses standards, budgets, and variance analysis. For example, the standards for material are the same for hamburgers wherever they are sold in the United States—1 bun, 1 hamburger patty, 1 pickle slice, 1/8 tablespoon of dehydrated onion, 1/4 tablespoon mustard, and 1/2 ounce of ketchup. For each of these ingredients management determines variances—differences between the amount actually used and what should have been used given the number and types of sandwiches produced.

McDonald's managers budget sales for each hour during the day. Based on the sales budgeted, they construct a budget for each of the materials that make up their menu. They use the budget for planning (to make sure materials will be available when needed) and control (to evaluate the use of materials). McDonald's applies these planning and control concepts not just to material costs, but also to labor and overhead costs. Further, McDonald's uses budgets for planning and control of revenues, as well as costs. Understanding what went wrong and what went right helps managers plan and manage more effectively in future periods.

McDonald's also uses nonfinancial standards to meet its quality and service goals. Here are three examples: (1) The standard time for a drive-through customer is 284 seconds, from pulling up to the menu board to driving away; (2) employees must destroy cooked meat that is not used in a sandwich within

30 minutes; and (3) once employees make a sandwich and place it in the transfer bin, they must sell it within 10 minutes or throw it away.

This chapter focuses on flexible budgets and variances. Flexible budgets extend the budget developed in Chapter 7 for a single level of activity. Flexible budgets help managers plan and evaluate results for levels of activity other than the level originally planned. Variances are deviations of actual results from expected (or planned) results. Each variance should cause a manager to ask, “Why did results differ from the plan?” Variances are an important evaluation tool that directs management to areas that deserve attention and helps managers identify ways to improve future decisions and results. (For more background on how managers use variances, you might want to review the discussion of management by exception in Chapter 1, p. 24.) ■



Mipstudio/Shutterstock

Using Budgets and Variances to Evaluate Results

To illustrate how companies use budgets and variances, consider **Beg Pakaian**, a firm in Kuala Lumpur that manufactures a wheeled, collapsible suitcase carrier popular with airline flight crews. Assume for simplicity that the company produces a single product, sales are equal to production, and inventory levels are zero. Exhibit 8-1 shows the actual results for sales volume of 7,000 units in June 2023 in column (1); the budgeted amounts for sales volume of 9,000 units in column (2); and the variances, the differences between the first two columns, in column (3).

Favorable and Unfavorable Variances

Recall from Chapter 1 that variances are deviations from plans. In this chapter we focus on deviations of profits, revenues, and costs from budgeted amounts. We label profit, revenue, and cost variances as favorable or unfavorable depending on the direction of the effect on profitability. **Favorable profit variances** arise when actual profits exceed budgeted profits.

Using flexible budgets to analyze performance is important to individual McDonald's restaurants, such as this one in Asia, as well as to the company as a whole.

Objective 1

Identify variances and label them as favorable or unfavorable.

favorable profit variance

A variance that occurs when actual profit exceeds budgeted profit.

	Actual (1)	Budget @ 9,000 units (2)	Variances (3)
Units	7,000	9,000	2,000 U
Sales	\$217,000	\$279,000	\$62,000 U
Variable costs			
Variable manufacturing costs	\$151,270	\$189,000	\$37,730 F
Shipping costs (selling)	5,000	5,400	400 F
Administrative costs	2,000	1,800	200 U
Total variable costs	\$158,270	\$196,200	\$37,930 F
Contribution margin	\$58,730	\$82,800	\$24,070 U
Fixed expenses			
Fixed manufacturing costs	\$37,300	\$37,000	\$300 U
Fixed selling and administrative costs	33,000	33,000	—
Total fixed costs	\$70,300	\$70,000	\$300 U
Operating income (loss)	<u>\$(11,570)</u>	<u>\$12,800</u>	<u>\$24,370 U</u>

U = Unfavorable cost variances occur when actual costs are more than budgeted costs. Unfavorable revenue (or profit) variances occur when actual revenues (or profits) are less than budgeted.

F = Favorable cost variances occur when actual costs are less than budgeted costs. Favorable revenue (or profit) variances occur when actual revenues (or profits) are more than budgeted.

Exhibit 8-1

Beg Pakaian

Performance Report Using a Static Budget for the Month Ended June 30, 2023

unfavorable profit variance

A variance that occurs when actual profit falls below budgeted profit.

favorable revenue variance

A variance that occurs when actual revenue exceeds budgeted revenue.

unfavorable revenue variance

A variance that occurs when actual revenue falls below budgeted revenue.

unfavorable cost variance

A variance that occurs when actual costs exceed budgeted costs.

favorable cost variance

A variance that occurs when actual costs are less than budgeted costs.

Unfavorable profit variances arise when actual profits fall below budgeted profits. Because increases in revenues increase profits, revenue variances work in exactly the same way: Actual revenues that exceed budgeted revenues result in **favorable revenue variances**, and actual revenues that fall short of budgeted revenues result in **unfavorable revenue variances**. However, cost variances work in the opposite way because increases in costs decrease profitability: When actual costs exceed budgeted costs, we have **unfavorable cost variances**; when actual costs are less than budgeted costs, we have **favorable cost variances**. The following chart summarizes these relationships using the abbreviations that we will use for favorable (F) and unfavorable (U) variances.

Favorable (F) Versus Unfavorable (U) Variances			
	Profits	Revenues	Costs
Actual > Expected	F	F	U
Actual < Expected	U	U	F

The favorable and unfavorable labels indicate only the directional relationships summarized in the chart above—they do not indicate that the explanation for the variance is necessarily good or bad. For example, spending less than budgeted for maintenance expenditures will create a favorable variance but may nonetheless have adverse effects, especially in later periods when the effects of too-low maintenance began to materialize. As another example, spending less than budgeted on research and development will create a favorable variance but might mean that research expenditures were lower than the optimal level. The important point is that the favorable and unfavorable labels do not, by themselves, indicate whether decisions were good or bad. Rather than basing evaluation of variances only on these labels, managers should determine the explanation for the direction of the relation between actual and expected results and then carefully evaluate the implications of the explanation.

Static Budgets Versus Flexible Budgets

Let’s consider two ways to prepare a budget. A budget prepared for only one level of activity is a **static budget**. A budget that adjusts to different levels of activity is a **flexible budget** (sometimes called a **variable budget**). To illustrate these concepts, suppose Beg Pakaian expects to sell 9,000 units in 2023. The static budget consists of the revenues, costs, and profits expected at a volume of 9,000 units. However, to prepare for the possibility that volume might be lower than 9,000 units, Beg Pakaian could prepare a flexible budget that predicts revenues, costs, and profits at lower volumes, say, volumes of 7,000 and 8,000 units. Flexible budgets show the revenues, costs, and profits expected at alternative volumes.

Flexible-Budget Formulas

To develop a flexible budget, managers use flexible-budget formulas that describe revenue and cost behavior with respect to appropriate cost drivers. The cost functions that we introduced in Chapter 2 and estimated in Chapter 3 are examples of flexible-budget formulas. Exhibit 8-2 shows a graphical version of the flexible-budget formula for Beg Pakaian based on a single cost

Objective 2

Distinguish between flexible budgets and static budgets.

static budget

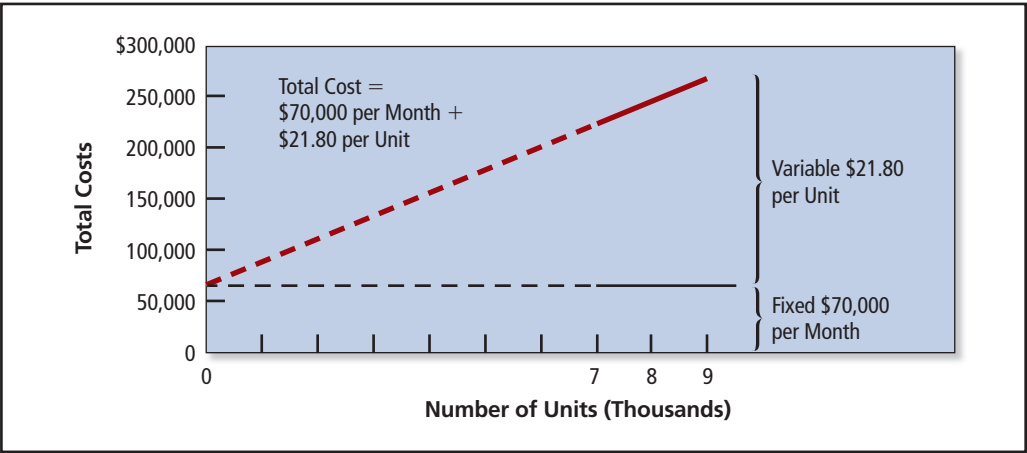
A budget that is prepared for only one expected level of activity.

Objective 3

Use flexible-budget formulas to construct a flexible budget.

Exhibit 8-2

Beg Pakaian
Graph of Flexible Budget of Costs



driver, units of output. The solid line between 7,000 and 9,000 units indicates that the relevant range for these flexible-budget formulas is 7,000 to 9,000 units. Within this range, we expect fixed costs to be constant at \$70,000 per month, the point where the line meets the vertical axis, and variable costs to be \$21.80 per unit, the slope of the line. The dashed line below 7,000 units indicates that this portion of the flexible-budget line is outside the relevant range.

Exhibit 8-3 shows flexible budgets for output levels of 7,000, 8,000, and 9,000 units, respectively. The flexible budgets incorporate effects of changes in activity on each revenue and cost. Note that the static budget is just the flexible budget for the original planned level of activity. Thus, the amounts shown in the budget column in Exhibit 8-1 for sales of 9,000 unit, the static budget, are exactly the same as the amounts in the far right column of Exhibit 8-3, the flexible budget for sales of 9,000 units.

How does the master budget introduced in Chapter 7 relate to static and flexible budgets? The modifier “master” refers to the scope of the budget, not to whether it is static or flexible. Master budgets are comprehensive, encompassing all the components shown in Exhibit 7-2. Flexible budgets can also be comprehensive, although often they are more narrowly focused. The master budgets used in Chapter 7 were static master budgets that assumed one fixed level of volume. However, there is no reason that a company could not prepare a flexible master budget.

Activity-Based Flexible Budgets

Beg Pakaian’s flexible budget in Exhibit 8-3 is based on a single cost driver—units of output. This is an appropriate approach when “units of output” is a plausible and reliable cost driver for all of a company’s costs. But what if some of a company’s costs are driven by activities such as order processing or setting up for production? A company that has an activity-based costing system with multiple cost drivers, such as the systems described in Chapter 4, will prepare an **activity-based flexible budget** by budgeting costs for each activity using the related cost driver.

Exhibit 8-4 shows an activity-based flexible budget for the Beg Pakaian. There are four activities: processing, setup, marketing, and administration. For each activity, costs depend on a different cost driver. For example, in Exhibit 8-4 we assume that setup costs are variable with respect to the “number of setups,” whereas in Exhibit 8-3 we assumed that the \$12,000 of setup costs included in the manufacturing costs of \$37,000 are fixed with respect to “units of output.” To see why setup costs might vary with respect to the number of setups but not with respect to the number of units, consider the example of setup supplies. Each time employees set up a production run, they use a batch of setup supplies. However, once the run is set up, production of additional units uses no additional setup supplies. Thus, the cost of supplies varies directly with the number of setups (at a cost of \$500 per setup) but does not vary directly with the number of units produced.

Compare the traditional flexible budgets (Exhibit 8-3) and the activity-based flexible budgets (Exhibit 8-4). Note that assumptions about fixed and variable costs differ in the two exhibits. Because of differing assumptions about cost behavior, the calculated cost using a single cost driver differs from the calculated cost using multiple activity-based cost drivers.

flexible budget (variable budget)

A budget that adjusts to different levels of activity.

activity-based flexible budget

A budget based on budgeted costs for each activity using the related cost driver.

	Flexible-Budget Formula	Flexible Budgets for Various Levels of Sales/Production Activity		
		7,000	8,000	9,000
Units		7,000	8,000	9,000
Sales	\$ 31.00	\$217,000	\$248,000	\$279,000
Variable costs				
Variable manufacturing costs	\$ 21.00	\$147,000	\$168,000	\$189,000
Shipping costs (selling)	0.60	4,200	4,800	5,400
Administrative costs	0.20	1,400	1,600	1,800
Total variable costs	\$ 21.80	\$152,600	\$174,400	\$196,200
Contribution margin	\$ 9.20	\$ 64,400	\$ 73,600	\$ 82,800
Fixed costs per month				
Fixed manufacturing costs	\$37,000	\$ 37,000	\$ 37,000	\$ 37,000
Fixed selling and administrative costs	33,000	33,000	33,000	33,000
Total fixed costs	\$70,000	\$ 70,000	\$ 70,000	\$ 70,000
Operating income (loss)		\$ (5,600)	\$ 3,600	\$ 12,800

Exhibit 8-3
Beg Pakaian
Flexible Budgets

Exhibit 8-4

Beg Pakaian

Activity-Based Flexible Budget for the Month Ended June 30, 2023

	Budget Formula		
	Units		
Sales in units		7,000	8,000
Sales in dollars	\$31.00/unit	<u>\$217,000</u>	<u>\$248,000</u>
ACTIVITY			
Processing	Cost Driver: Number of Machine Hours (MH)		
Cost-driver level		<u>14,000</u>	<u>16,000</u>
Variable costs	\$10.50/MH	\$147,000	\$168,000
Fixed costs	\$13,000	\$ 13,000	\$ 13,000
Total costs of processing activity		<u>\$160,000</u>	<u>\$202,000</u>
Setup	Cost Driver: Number of Setups		
Cost-driver level		<u>20</u>	<u>22</u>
Variable costs	\$500/setup	\$ 10,000	\$ 11,000
Fixed costs	\$12,000	\$ 12,000	\$ 12,000
Total costs of setup activity		<u>\$ 22,000</u>	<u>\$ 24,000</u>
Marketing	Cost Driver: Number of Orders		
Cost-driver level		<u>350</u>	<u>400</u>
Variable costs	\$12.00/order	\$ 4,200	\$ 4,800
Fixed costs	\$15,000	\$ 15,000	\$ 15,000
Total costs of marketing activity		<u>\$ 19,200</u>	<u>\$ 20,400</u>
Administration	Cost Driver: Number of Units		
Cost-driver level		<u>7,000</u>	<u>8,000</u>
Variable costs	\$.20/unit	\$ 1,400	\$ 1,600
Fixed costs	\$18,000	\$ 18,000	\$ 18,000
Total costs of administration activity		<u>\$ 19,400</u>	<u>\$ 19,800</u>
Total costs		<u>\$220,600</u>	<u>\$243,400</u>
Operating income (loss)		<u>\$ (3,600)</u>	<u>\$ 12,800</u>

When should a company use a more sophisticated activity-based flexible budget with multiple cost drivers rather than a simple flexible budget with a single cost driver, such as units of output? When a significant portion of its costs vary with cost drivers other than units of output. For the remainder of this chapter, we return to a simpler flexible budget based on a single cost driver: units of output.

Static-Budget Variances and Flexible-Budget Variances

How should we evaluate the performance of Beg Pakaian for June 2023? We can examine variances, which compare actual amounts with budgeted amounts. However, we now have two candidates for “the” budgeted amount: The static budget for the original expected level of output or the flexible budget for the achieved level of output.

STATIC-BUDGET VARIANCE Let’s begin by comparing Beg Pakaian actual results with the static budget for a projected sales volume of 9,000 units. Differences between actual results and the static budget for the original planned level of output are **static-budget variances**. Column 2 of Exhibit 8-1 is the static budget for projected sales of 9,000 units. Column 3 shows the static-budget variances. Exhibit 8-1 shows the difference between the actual operating loss of \$11,570 and budgeted operating income of \$12,800 is a \$24,370 U static-budget income variance.

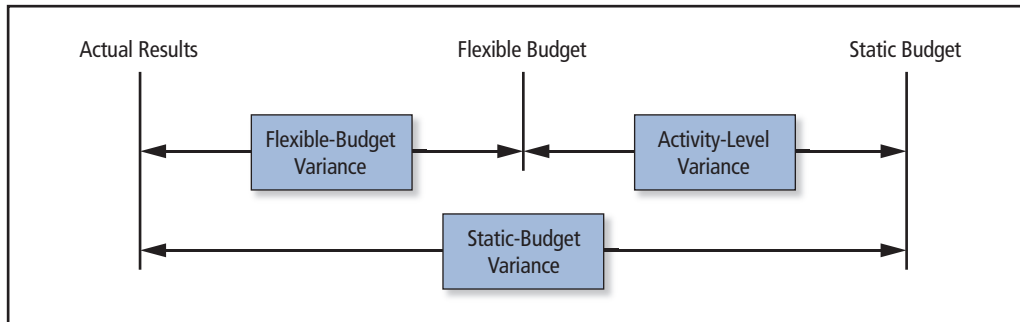
The static-budget variance shows the difference between actual results and the original budgeted amounts for sales of 9,000 units, but does not take into account that the actual level of sales was only

Objective 4

Compute and interpret static-budget variances, flexible-budget variances, and sales-activity variances.

static-budget variance

The difference between actual results and the static budget for the original planned level of output.

**Exhibit 8-5**

Relationship Between the Static-Budget Variance and the Flexible-Budget and Activity-Level Variances

7,000 units. When you produce only 7,000 units wouldn't you expect income to be lower than in the static budget for production of 9,000 units? Of course! Therefore, we introduce flexible-budget variances to compare actual results with budgeted results adjusted to reflect the actual volume achieved.

FLEXIBLE-BUDGET VARIANCE Differences between actual results and the flexible budget for the actual level of output achieved are **flexible-budget variances**. Flexible budget variances reflect how actual results deviate from what was expected given the achieved level of activity. The flexible-budget approach says, "Give me any achieved activity level, and I'll provide a budget tailored to that particular level." For example, when Beg Pakaian's sales turn out to be 7,000 units instead of 9,000, the flexible budget shows what income to expect based on the achieved sales level of 7,000 units. Many companies routinely "flex" their budgets to provide a better benchmark for evaluating performance.

Integrating Static-Budget, Flexible-Budget, and Sales-Activity Variances

We saw earlier that a static-budget variance is the difference between actual results and the original plan, the static budget. Exhibit 8-5 shows that the static-budget variance is the sum of (1) the difference between actual results and the flexible budget (the flexible-budget variance discussed previously), and (2) the difference between the flexible budget and the static budget—the **activity-level variance**. The activity-level variance describes the budgeted effect of operating at an actual level of activity that is different than the level of activity used to determine the static budget. Therefore, if the actual level of activity is the same as the level in the original, static budget, the activity-level variance will be zero. The flexible-budget variance is the difference between actual results and planned results in the flexible budget for the actual level of activity.

The division of static-budget variances into flexible-budget variances and activity-level variances is illustrated for Beg Pakaian in Exhibit 8-6. The activity-level variances here are **sales-activity variances** because sales is used as the measure of activity level. The flexible budget (column 3) for sales-activity of 7,000 units taken from Exhibit 8-3 (and simplified) provides an explanatory bridge between the static budget (column 5) for sales-activity of 9,000 units and the actual results (column 1). The bottom lines of Exhibit 8-6 summarize the income variances. Note that the sum of the activity-level variance and the flexible-budget variance equals the static-budget variance: \$18,400 U + \$5,970 U = \$24,370 U.

flexible-budget variance

The difference between actual results and the flexible budget for the actual level of output achieved.

activity-level variances

The differences between the static budget amounts and the amounts in the flexible budget.

sales-activity variances

The activity-level variances when sales is used as the cost driver.

Making Managerial Decisions

Consider a company that plans to sell 1,000 units for \$3 per unit. Budgeted variable costs are \$2 per unit, budgeted fixed costs are \$700, and the static-budget profit is \$300. Suppose the company actually sells 800 units and income is \$110. Compute and interpret the static-budget income variance, the sales-activity income variance, and the flexible-budget income variance.

Answer

There is a \$190 unfavorable static-budget income variance, the difference between static budgeted profit of \$300 and the actual profit of \$110. The static-budget variance is the

sum of two components: the sales-activity variance and the flexible-budget variance. The sales-activity income variance is the difference between the static-budgeted profit of \$300 for planned production of 1,000 units versus the flexible-budgeted profit of \$100 for production of 800 units, a \$200 unfavorable variance that indicates the budgeted effect of failing to achieve the original planned level of sales. The flexible-budget income variance is the difference between the flexible-budgeted profit of \$100 versus the actual profit of \$110, a favorable variance of \$10 that indicates that, given the achieved level of sales, the operation was efficient.

	Actual Results at Actual Activity Level* (1)	Flexible-Budget Variances † (2) = (1) – (3)	Flexible Budget For Actual Sales Activity ‡ (3)	Sales-Activity Variances (4) = (3) – (5)	Static Budget* (5)
Units	<u>7,000</u>	<u>—</u>	<u>7,000</u>	<u>2,000 U</u>	<u>9,000</u>
Sales	\$ 217,000	<u>—</u>	\$217,000	\$62,000 U	\$279,000
Variable costs	<u>158,270</u>	<u>5,670 U</u>	<u>152,600</u>	<u>43,600 F</u>	<u>196,200</u>
Contribution margin	\$ 58,730	\$5,670 U	\$ 64,400	\$18,400 U	\$ 82,800
Fixed costs	<u>70,300</u>	<u>300 U</u>	<u>70,000</u>	<u>—</u>	<u>70,000</u>
Operating income	<u>\$ (11,570)</u>	<u>\$5,970 U</u>	<u>\$ (5,600)</u>	<u>\$18,400 U</u>	<u>\$ 12,800</u>
	↑	Total flexible-budget variances		Total sales-activity variances	↑
		\$5,970 U		\$18,400 U	
	Total static budget variances, \$24,370 U				

U = Unfavorable. F = Favorable.

*Figures are from Exhibit 8-1.

†Figures are shown in more detail in Exhibit 8-7.

‡Figures are from the 7,000-unit column in Exhibit 8-3.

Exhibit 8-6

Beg Pakaian

Summary of Performance for the Month Ended June 30, 2023

Revenue and Cost Variances

Because income is the sum of revenues less costs, we can describe any income variance as the sum of revenue and cost variances. For example, a static-budget income variance can be described as the sum of the static-budget revenue variance and the static-budget cost variances. Similarly, a flexible-budget income variance is the sum of the flexible-budget revenue variance and the flexible-budget cost variances, and an activity-level income variance is the sum of the activity-level revenue variance and the activity-level cost variances.

Sales-Activity Variances

For Beg Pakaian, we assume that the driver for variable costs in the flexible budget is unit sales volume, so the activity-level variances are sales-activity variances. Beg Pakaian's sales activity fell 2,000 units short of the planned level. The sales-activity variances (totaling \$18,400 U) in the final three columns of Exhibit 8-6 measure the budgeted effect of falling short of the original sales objective. Falling short of the sales target by 2,000 units explains \$18,400 of the income shortfall relative to the amount initially budgeted (a \$5,600 flexible-budget loss instead of a \$12,800 static-budget profit). Figure 8-6 also shows that we can express the sales-activity income variance as the sum of the sales-activity revenue variance and sales-activity cost variances:

$$\begin{aligned}
 \text{Sales-activity income variance} &= \text{Sales-activity revenue variance} \\
 &\quad + \text{Sales-activity variable-cost variance} \\
 &\quad + \text{Sales-activity fixed-cost variance} \\
 &= \$62,000 \text{ U} + \$43,600 \text{ F} + \$0 \\
 &= \$18,400 \text{ U}
 \end{aligned}$$

Alternatively, we can also derive this \$18,400 sales-activity income variance as the shortfall of 2,000 units multiplied by the budgeted contribution margin of \$9.20 per unit (from the first column of Exhibit 8-3):

$$\begin{aligned}
 \text{Sales-activity income variance} &= (\text{Actual units} - \text{Static budget units}) \times \text{Budgeted contribution per unit} \\
 &= (7,000 - 9,000) \times \$9.20 \\
 &= \$18,400 \text{ unfavorable}
 \end{aligned}$$

Who has responsibility for the sales-activity income variance? Marketing managers usually have the primary responsibility for reaching the sales level specified in the static budget. Many factors can cause variations in sales, including poor production quality and missed delivery schedules. Nevertheless, marketing managers are typically in the best position to explain why actual sales levels differed from plans.

Note that changes in unit prices or unit variable costs do not affect activity-level variances. Why? Only the unit sales volume affects the sales-activity variances because the flexible budget and the static budget use the same budgeted unit prices, unit variable costs, and total fixed costs. The static and flexible budgets differ only due to different assumed levels of activity. Also note that there can never be a sales-activity variance for fixed costs, as long as the budgeted activity levels remain within the relevant range. Why? Because for fixed costs, the total budgeted amounts are the same in the flexible budget and the static budget.

Flexible-Budget Variances

Exhibit 8-6 shows income variances as the sum of revenue and cost variances. The flexible-budget variances are shown in column (2), the difference between actual results in column (1) and the flexible-budget amounts for the actual sales activity in column (3). The flexible-budget income variance is as follows:

Flexible-budget income variance = Actual income – Flexible-budget income (at actual sales level)

$$\begin{aligned} &= (-\$11,570) - (-\$5,600) \\ &= \$5,970 \text{ U} \end{aligned}$$

Column (2) of Exhibit 8-6 shows the \$5,970 U flexible-budget income variance is the sum of three variances, the flexible-budget revenue variance (which in this example is \$0 because there is no difference between the actual sales price and the flexible-budgeted sales price), a \$5,670 U flexible-budget variable-cost variance, and a \$300 U flexible-budget fixed-cost variance.

Note that Exhibit 8-1 showed a favorable total variable-cost static-budget variance, yet there is an unfavorable variable-cost flexible-budget variance in Exhibit 8-6. Why is this? Sales fell far short of the static-budget volume of 9,000 units. The favorable static-budget variance of \$37,930 in Exhibit 8-1 occurs because actual variable costs to produce 7,000 units were lower than the budgeted costs to produce 9,000 units, the volume projected in the static budget. However, the variable-cost static-budget variance combines two effects, the expected effect of producing fewer units (measured by the activity-level variable-cost variance \$43,600 F) and the difference between actual variable costs and the expected costs from the flexible budget for the achieved level of output (measured by the flexible-budget variable-cost variance \$5,670 U).

Exhibit 8-7 provides flexible-budget cost variances in even more detail, showing flexible-budget variances for individual variable and fixed manufacturing costs. For example, the \$5,670 U variable-cost flexible-budget variance in Exhibit 8-6 is the sum of eight individual variable-cost variances. These eight individual variances net to the overall variance of \$5,670 U.

The last column of Exhibit 8-7 provides examples of some possible explanations for Beg Pakaian's variances. These explanations illustrate our earlier point that you should not assume that the "favorable" and "unfavorable" labels tell you everything you need to know. Instead, always ask questions and look for underlying explanations to be sure you understand why variances occurred and who is responsible. For example, the \$400 U variance due to higher than budgeted cleanup costs does not indicate poor performance by the person responsible for cleaning—once the spill had occurred, the decision to clean up the spilled solvent was undoubtedly a good decision. Instead, this variance should be attributed to the person responsible for the spill. Similarly, it is not clear that the \$800 U variance due to the use of airfreight is the responsibility of the shipping manager. Could the need for airfreight delivery have been avoided with additional planning and coordination by sales staff? Or by production? Evaluation of management's decisions and who is responsible depends on the answers to questions such as these.

	Actual Costs Incurred	Flexible Budget*	Flexible- Budget Variances†	Possible Explanation
Units	7,000	7,000	—	
Variable costs				
Direct materials	\$ 69,920	\$ 70,000	\$ 80 F	Lower prices but higher usage
Direct labor	61,500	56,000	5,500 U	Higher wage rates and higher usage
Indirect labor	9,100	11,900	2,800 F	Decreased setup time
Idle time	3,550	2,800	750 U	Excessive machine breakdowns
Cleanup time	2,500	2,100	400 U	Cleanup of spilled solvent
Supplies	4,700	4,200	500 U	Higher prices and higher usage
Variable manufacturing costs	\$151,270	\$147,000	\$4,270 U	
Shipping	5,000	4,200	800 U	Use of air freight to meet delivery
Administration	2,000	1,400	600 U	Excessive copying and long-distance calls
Total variable costs	\$158,270	\$152,600	\$5,670 U	
Fixed costs				
Factory supervision	\$ 14,700	\$ 14,400	\$ 300 U	Salary increase
Factory rent	5,000	5,000	—	
Equipment depreciation	15,000	15,000	—	
Other fixed factory costs	2,600	2,600	—	
Fixed manufacturing costs	\$ 37,300	\$ 37,000	\$ 300 U	
Fixed selling and administrative costs	33,000	33,000	—	
Total fixed costs	\$ 70,300	\$ 70,000	\$ 300 U	
Total variable and fixed costs	\$228,570	\$222,600	\$5,970 U	

*From 7,000-unit column of Exhibit 8-3.
†This is a line-by-line breakout of the variances in column 2 of Exhibit 8-6.

Exhibit 8-7

Beg Pakaian

Cost-Control Performance Report for the Month Ended June 30, 2023

Objective 5

Understand how the setting of standards affects the computation and interpretation of variances.

standard cost

A cost that should be achieved.

expected cost

The cost most likely to be attained.

currently attainable standards

Levels of performance that managers can achieve by realistic levels of effort.

perfection standards (ideal standards)

Expressions of the most efficient performance possible under the best conceivable conditions, using existing specifications and equipment.

The Role of Standards in Determining Variances

Both static-budget variances and flexible-budget variances depend on the costs used in the budget formulas. Budget formula costs are **standard costs**—costs that should be achieved. However, standard costs are defined in different ways by different companies. Many companies set standard cost equal to **expected cost**, the cost that is most likely to be attained. However, other companies use a definition based on **currently attainable standards**—levels of performance that managers can achieve by realistic levels of effort, including allowances for normal defectives, spoilage, waste, and nonproductive time. However, depending on what is considered a “realistic” level of effort and what are “normal” allowances, currently attainable standards can range from easily attainable to extremely difficult to attain. The level at which standards are set will affect the variances generated and the incentives created.

Easily attainable standards will generally lead to favorable variances and, because employees can attain them with little effort, they may not provide much motivation. Extremely difficult-to-attain standards will generally lead to unfavorable variances and also may not motivate employees. The most difficult-to-attain standards are **perfection standards** (also called **ideal standards**). Perfection standards represent the most efficient performance possible under the best conceivable conditions, using existing specifications and equipment. Perfection standards make no provision for waste, spoilage, machine breakdowns, or other inefficiencies inherent in a normal system. Those who favor using perfection standards maintain that the generally unfavorable variances will constantly remind personnel of the need for continuous improvement in all phases of operations. Although concern for continuous improvement is widespread, perfection standards are not widely used because of their adverse effect on employee motivation. Employees tend to ignore goals that they know cannot be reached.

The Need to Adapt Standard Cost Approaches

Critics of standard costs and variance analysis maintain that predetermined standards do not work well in today's dynamic, fast-paced, just-in-time environment. Nonetheless, companies continue to use standards and to measure performance against them. Surveys in nine different countries have shown that between 56% and 92% of manufacturing companies use standard costs. Companies have apparently adapted the approach to fit their environment.

To apply standards in a dynamic environment, how should managers measure and report variances? First, they should continually evaluate their standards. If a company is in a state of continuous improvement, it must continually revise its standards. Second, standards and variances should measure key strategic variables. The concept of setting a benchmark, comparing actual results to the benchmark, and identifying causes for any differences is universal. We can apply it to many types of measures, such as production quantity or quality, as well as to costs. Finally, variances should not lead to affixing blame. Standards are plans, and things do not always go according to plan—often with no one being at fault.

One company that has adapted standard costs to meet its particular needs is the Brass Products Division (BPD) at **Parker Hannifin Corporation**, a \$13 billion company that produces motion and control technologies and systems. BPD uses standard costs and variances to pinpoint problem

areas that need attention if the division is to meet its goal of continuous improvement. Among the changes that have increased the value of the standard cost information are more timely product cost information, variances computed at more detailed levels, and regular meetings to help employees understand their impact on the variances.

Managers and accountants adapt the standard cost concept to fit the particular needs of a company. For example, BPD created three new variances: (1) The standard run quantity variance examines the effect of actual compared to optimal batch size for production runs; (2) the material substitution variance compares material costs to the costs of alternative materials; and (3) the method variance measures costs using actual machines compared to costs using alternative machines. All three variances use the concept of setting a standard and comparing actual results to the standard, but they do not apply the traditional standard cost-variance formulas.

Sources: Adapted from D. Johnsen and P. Sopariwala, "Standard Costing Is Alive and Well at Parker Brass," *Management Accounting Quarterly*, Winter 2000, pp. 12–20; C. B. Cheatham and L. R. Cheatham, "Redesigning Cost Systems: Is Standard Costing Obsolete?" *Accounting Horizons*, December 1996, pp. 23–31; C. Horngren, G. Foster, and S. Datar, *Cost Accounting: A Managerial Emphasis*, 12th ed. (Upper Saddle River, NJ: Prentice Hall, 2006), p. 229; and Parker Hannifin Corp., *Parker Hannifin 2012 Annual Report*.

Many companies set standards somewhere between easily-attained and extremely difficult-to-attain. The resulting variances reflect performance relative to an achievable standard so employees regard their attainment as probable if they apply normal effort and diligence. The major advantages of this approach to setting standards are as follows:

1. The resulting standards lead to variances that indicate a departure from what is normally expected and are more useful for management by exception. In contrast, perfection standards tend to lead to large unfavorable variances in every period because perfection is not attainable.
2. The standards represent what is expected under normal conditions, so companies can use the same standard costs for financial budgeting and inventory valuation. In contrast, they cannot use perfection standards for inventory valuation or financial budgeting because they know that the resulting standard costs are unrealistically low.
3. Reasonable standards have a desirable motivational impact on employees, especially when combined with incentives for continuous improvement. Employees accept the standards as reasonable performance goals.

What standards should a company use? Should a standard be so strict that the company rarely, if ever, meets it? Should the company attain the standard about 50% of the time? 90%? 20%? Individuals who have worked a lifetime setting and evaluating standards for budgeting disagree on this question, so there are no universal answers. As described in the Business First box above, companies are adapting standards to fit their particular needs.

Finding Explanations for Variances

When evaluating performance, managers distinguish between **effectiveness**—the degree to which an organization meets an objective—and **efficiency**—the degree to which an organization minimizes the resources used to achieve an objective. Performance may be effective, efficient, both, or neither.

effectiveness

The degree to which an organization meets an objective.

efficiency

The degree to which an organization minimizes the resources used to achieve an objective.

For example, Beg Pakaian set a static-budget objective of manufacturing and selling 9,000 units. It actually made and sold only 7,000 units. Was Beg Pakaian effective in meeting its sales objective? No. Performance was ineffective, as measured by the sales-activity variance. Was Beg Pakaian's performance efficient? Managers judge the degree of efficiency by comparing actual inputs used (such as the costs of direct materials and direct labor) to budgeted inputs for the level of output achieved (7,000 units). The less input used to produce a given output, the more efficient the operation. Beg Pakaian was inefficient because the actual cost of its inputs exceeded the cost expected for the actual level of output, as measured by the unfavorable flexible-budget variances.

A **McDonald's** restaurant could use a similar analysis to examine efficiency—the difference between actual costs and the flexible budget costs expected for the level of sales actually attained. Suppose the restaurant expects to sell 1 million Big Macs and prepares the static budget showing budgeted cost of \$100,000 for buns at \$.10 per bun. If the restaurant sells only 900,000 Big Macs and pays \$94,000 for buns, the static-budget cost variance is $\$100,000 - \$94,000 = \$6,000$ F. However, the static-budget variance doesn't adjust for the expected decrease in costs due to the decrease in sales volume. Buns for 900,000 Big Macs should cost only \$90,000, the flexible budget expected cost for the achieved sales of 900,000 Big Macs. Therefore, the sales-activity cost variance is $\$100,000 - \$90,000 = \$10,000$ F. The efficiency is measured by the flexible-budget cost variance of $\$94,000 - \$90,000 = \$4,000$ U, which shows the inefficiency of spending \$4,000 more for buns than expected given the lower actual sales level of 900,000 Big Macs.

Trade-Offs Among Variances

Because the various activities of an organization are interrelated, the level of performance in one area will often affect performance in other areas. Often there are trade-offs among costs. For example, China's **Laoxiangji** may generate favorable labor variances by hiring less-skilled and lower-paid employees, but this might also lead to more waste because substandard products need to be scrapped, resulting in unfavorable materials variances. As another example, **Saudi Arabia's SABIC** may experience unfavorable materials variances by purchasing higher-quality materials at a higher than planned price, but this may be more than offset by other favorable variances due to lower waste, fewer inspections, reduced labor time, and higher-quality products.

Because of the many interdependencies among activities, an “unfavorable” or “favorable” label should not lead a manager to jump to conclusions. By themselves, variances merely raise questions and provide clues to the causes of performance. Variances are attention directors, not problem solvers. Furthermore, because variances depend on standards as well as on actual results, the cause of unfavorable variances might be unrealistically high standards rather than poor execution by managers. One of the first questions a manager should consider when investigating a large variance is whether standards represented reasonable expectations.

When to Investigate Variances

When should management investigate a variance? For some critical items, any deviation may prompt a follow-up. However, for most items, managers recognize that, even if everything operates normally, variances are unlikely to be exactly zero. For these items, managers specify a range of “acceptable” variances based on economic analysis of how big a variance must be before investigation would be worth the effort. While the acceptable range is sometimes stated in percentage terms, it is important to also consider the dollar deviation from budget. For example, a 4% variance in a \$1 million material cost may deserve more attention than a 20% variance in a \$1,000 repair cost. Because knowing exactly when to investigate is difficult, many organizations have developed rules of thumb that incorporate both absolute and relative size measures such as “Investigate all variances exceeding either \$5,000 or 15% of expected cost.”

Comparisons with Prior Period's Results

Some organizations compare actual results with last year's results for the same period rather than using flexible-budget benchmarks. For example, an organization might compare March 2023's actual results to March 2022's actual results. However, simplistic comparisons with prior period results should always be used cautiously. In general, a carefully developed flexible budget provides a better benchmark than prior period results for evaluating performance. Why? First, using actual results from the prior year as a benchmark assumes that prior year values are what we aspire to achieve and don't contain any inefficiencies or substandard results. Second, many

changes occur in the environment and in the organization, and these changes can make a comparison to the prior year invalid. Few organizations and environments are so stable that the only difference between now and a year ago is merely the passage of time. For example, the turmoil in the stock market in 2008 and 2009 led many financial institutions to make sweeping changes in operations. Comparisons of operating results in these years to previous years would not have been meaningful because the economic climate was so different. Even comparisons with the prior month's actual results may not be as useful as comparisons with an up-to-date flexible budget. Comparisons with previous years may be useful for analyzing trends in such key variables as sales volume, market share, and product mix, but they do not help answer questions such as Beg Pakaian "Why did we have a loss of \$11,570 in June, when we expected a profit of \$12,800?"

Summary Problem for Your Review

PROBLEM

Refer to the data in Exhibits 8-1 and 8-3. Suppose actual production and sales were 8,500 units instead of 7,000 units; actual variable costs were \$188,800; and actual fixed costs were \$71,200. The selling price remained at \$31 per unit.

1. Compute the static-budget income variance. What does this tell you about the efficiency of operations? The effectiveness of operations?
2. Compute the sales-activity income variance. Is the performance of the marketing function the sole explanation for this variance? Why?
3. Using a flexible budget at the actual activity level, compute the budgeted contribution margin, budgeted income, and flexible-budget income variance. What do you learn from this variance?

SOLUTION

1. Actual operating income = $(8,500 \times \$31) - \$188,800 - \$71,200 = \$3,500$
 Static-budget operating income = \$12,800 (from Exhibit 8-1)
 Static-budget variance = $\$12,800 - \$3,500 = \$9,300$ U

Three factors affect the static-budget variance: sales activity, efficiency, and price changes. There is no way to tell from the static-budget variance alone how much of the \$9,300 U was caused by each of these factors.

2. Sales-activity variance = Budgeted unit contribution margin $\times$ Difference between the actual unit sales and the static budget unit sales
 $= \$9.20 \text{ per unit CM} \times (8,500 - 9,000)$
 $= \$4,600$ U

The sales-activity income variance quantifies the impact of the deviation from an original sales target while holding price and efficiency factors constant. This is a measure of the effectiveness of Beg Pakaian in meeting its sales objective. Management might attribute the failure to reach target sales to ineffectiveness of marketing personnel or to causes beyond the control of marketing personnel, such as material shortages, factory breakdowns, delivery problems, and so on.

3. The budget formulas in Exhibit 8-3 are the basis for the following answers:

Flexible-budget contribution margin = $\$9.20 \times 8,500 = \$78,200$

Flexible-budget operating income = $\$78,200 - \$70,000 \text{ fixed costs} = \$8,200$

Actual operating income = \$3,500 (from number 1)

Flexible-budget income variance = $\$8,200 - \$3,500 = \$4,700$ U

The flexible-budget variance shows that the company spent \$4,700 more to produce and sell the 8,500 units than it should have spent if operations had been efficient. Note that this \$4,700 U flexible-budget variance plus the \$4,600 U sales-activity variance total to the \$9,300 U static-budget variance.

More Detailed Analysis of Flexible-Budget Variances

The remainder of this chapter explains how to further analyze flexible-budget variances by dividing them into component variances. Previously, we explained how to divide the static-budget variance into activity-level and flexible-budget variances. In this section, we describe how to divide the flexible-budget variance into price and quantity variances (for material or labor) and into spending and efficiency variances (for variable overhead).

We begin with material and labor variances. Exhibit 8-8 shows how price and quantity variances fit in the framework depicted in Exhibit 8-5 and specifically how the sum of price and quantity variances equals the flexible-budget variance. Exhibit 8-8 provides only a broad conceptual overview—actual calculations are illustrated in Exhibit 8-9 after we introduce some additional required information.

Variances for Direct Material and Direct Labor

Let's consider the components of the flexible-budget variances for the Beg Pakaian. As shown in Exhibit 8-7, the flexible-budget variances for material and labor are \$80 F and \$5,500 U, respectively:

	Actual Cost Incurred	Flexible Budget	Flexible-Budget Variance
Direct materials	\$69,920	\$70,000	\$ 80 F
Direct labor	61,500	56,000	5,500 U

To further analyze the flexible-budget variances, we need more information. First, we need information about the standard prices and standard quantities used in the flexible budget formulas. Beg Pakaian's flexible budget is the amount that Beg Pakaian expected to incur based on standard quantities and standard prices for direct materials and direct labor to produce the output achieved, computed as follows:

$$\text{Flexible budget} = \text{Units of actual output achieved} \times \text{Standard input allowed per unit of output achieved} \times \text{Standard price per unit of input}$$

Note that the flexible budget is constructed for the level of actual output achieved. We will refer to the flexible budget for the actual output achieved as "standard cost allowed."

Let's assume the flexible-budget amounts in Exhibit 8-7 were based on \$10 per unit of output for direct materials and \$8 per unit of output for direct labor. Further assume these

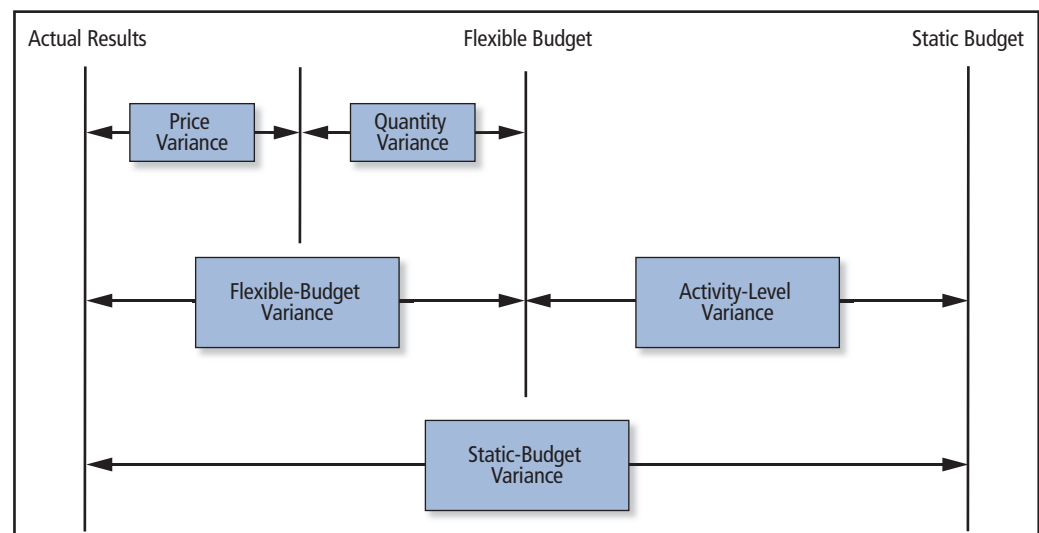


Exhibit 8-8

Relationship Between the Flexible-Budget Variance and the Price and Quantity Variances

amounts were the product of the standard quantities and the standard prices shown in the following table:

	Standards		
	Standard Quantity of Input Allowed per Unit of Output	Standard Price per Unit of Input	Flexible Budget Formula per Unit of Output
Direct materials	5 pounds	\$2/pound	\$10
Direct labor	$\frac{1}{2}$ hour	\$16/hour	8

For the 7,000 units of output achieved by Beg Pakaian, these standards translate into the budgeted standard costs allowed shown in Exhibit 8-7:

$$\text{Direct-materials cost allowed} = 7,000 \text{ units} \times 5 \text{ pounds} \times \$2.00 \text{ per pound} = \$70,000$$

$$\text{Direct-labor cost allowed} = 7,000 \text{ units} \times \frac{1}{2} \text{ hour} \times \$16.00 \text{ per hour} = \$56,000$$

We next introduce additional information about the actual quantities of material or labor used and the actual prices per unit of material or labor. Let's assume the following actual prices and quantities explain the actual direct material and direct labor costs shown in Exhibit 8-7:

- Direct materials: Beg Pakaian purchased and used 36,800 pounds of material at an actual unit price of \$1.90 for a total actual cost of $36,800 \times \$1.90 = \$69,920$.
- Direct labor: Beg Pakaian used 3,750 hours of labor at an actual hourly price (rate) of \$16.40, for a total cost of $3,750 \times \$16.40 = \$61,500$.

Computing Price and Quantity Variances

The flexible-budget variance (the difference between actual cost incurred and the flexible-budget cost) can be divided into 1) a quantity variance, attributable to the difference between actual quantity used and standard quantity allowed, and 2) a price variance, attributable to the difference between actual price per unit and standard price per unit. The **price variance** indicates whether the actual price paid was more or less than the standard price:

$$\text{Price variance} = (\text{Actual price} - \text{Standard price}) \times \text{Actual quantity used}$$

The **quantity variance** indicates whether the actual quantity used was more or less than the standard quantity allowed for the output achieved:

$$\text{Quantity variance} = (\text{Actual quantity used} - \text{Standard quantity allowed for actual output}) \times \text{Standard price}$$

Exhibit 8-9 shows the calculation of price and quantity variances for materials and labor for Beg Pakaian. Although the exhibit may seem complex at first, studying it will solidify your understanding of variance analysis.

Column A of Exhibit 8-9 contains the actual costs incurred based on the actual quantities used at actual prices. Column C is the flexible-budget amount based on standard input quantities allowed for the outputs achieved multiplied by standard prices. We insert column B, the actual input quantities used multiplied by standard prices, between A and C to separate price and quantity effects. The difference between columns A and B is the price variance, due to the difference between actual versus standard prices. The difference between columns B and C is the quantity variance, due to the difference between actual versus standard quantities.

The price and quantity variances corresponding to Beg Pakaian's flexible-budget variances for material and labor are as follows:

$$\begin{aligned} \text{Materials price variance} &= (\text{Actual price} - \text{Standard price}) \times \text{Actual quantity} \\ &= (\$1.90 - \$2.00) \text{ per pound} \times 36,800 \text{ pounds} \\ &= \$3,680 \text{ Favorable} \end{aligned}$$

$$\begin{aligned} \text{Labor price variance} &= (\text{Actual price} - \text{Standard price}) \times \text{Actual quantity} \\ &= (\$16.40 - \$16.00) \text{ per hour} \times 3,750 \text{ hours} \\ &= \$1,500 \text{ Unfavorable} \end{aligned}$$

Objective 6

Compute and interpret price and quantity variances for materials and labor.

price variance

The difference between actual input prices and standard input prices multiplied by the actual quantity of inputs used.

quantity variance

The difference between the actual quantity of inputs used and the standard quantity allowed for the good output achieved multiplied by the standard price of the input.

The quantity (or usage) variances are as follows:

$$\begin{aligned}
 \text{Materials quantity variance} &= (\text{Actual quantity} - \text{Standard quantity}) \times \text{Standard price} \\
 &= [36,800 - (7,000 \times 5)] \text{ pounds} \times \$2.00 \text{ per pound} \\
 &= [36,800 - 35,000] \text{ pounds} \times \$2.00 \text{ per pound} \\
 &= \$3,600 \text{ Unfavorable}
 \end{aligned}$$

$$\begin{aligned}
 \text{Labor quantity variance} &= (\text{Actual quantity} - \text{Standard quantity}) \times \text{Standard price} \\
 &= [3,750 - (7,000 \times 1/2)] \text{ hours} \times \$16.00 \text{ per hour} \\
 &= [3,750 - 3,500] \text{ hours} \times \$16.00 \text{ per hour} \\
 &= \$4,000 \text{ Unfavorable}
 \end{aligned}$$

By definition, the sum of the direct-materials price and quantity variances equals the total direct-materials flexible-budget variance. Similarly, the sum of the direct-labor price and quantity variances equals the direct-labor flexible-budget variance.

$$\begin{aligned}
 \text{Materials flexible-budget variance} &= \$3,680 \text{ Favorable} + \$3,600 \text{ Unfavorable} \\
 &= \$80 \text{ Favorable}
 \end{aligned}$$

$$\begin{aligned}
 \text{Labor flexible-budget variance} &= \$1,500 \text{ Unfavorable} + \$4,000 \text{ Unfavorable} \\
 &= \$5,500 \text{ Unfavorable}
 \end{aligned}$$

Note that the flexible budget quantities used in computing price and quantity variance are quantities of inputs, which are related to, but different than, the quantity of output achieved. For Beg Pakaian, a single-product firm, standard inputs allowed is simply units of output

Exhibit 8-9

General Approach to
Analysis of Direct-Labor and
Direct-Materials Variances

	A	B	C
	Actual Cost Incurred: Actual Input Quantities × Actual Prices	Actual Input Quantities × Standard Prices	Flexible Budget: Standard Input Quantities Allowed for Outputs Achieved × Standard Prices
In general	\$xxx	\$yyy	\$zzz
	↑	↑	↑
	Price variance (A – B)	Quantity variance (B – C)	
	Flexible-budget variance (A – C)		
Direct materials	36,800 lb × \$1.90/lb = \$69,920	36,800 lb × \$2.00/lb = \$73,600	7,000 units × 5 lb × \$2.00 = \$70,000
	↑	↑	↑
	Price variance (A – B) = \$69,920 – \$73,600 = \$3,680 F	Quantity variance (B – C) = \$73,600 – \$70,000 = \$3,600 U	
	Flexible-budget variance (A – C) \$69,920 – \$70,000 = \$80 F		
Direct labor	3,750 hr × \$16.40/hr = \$61,500	3,750 hr × \$16.00/hr = \$60,000	7,000 units × 0.5 hr × \$16.00 = \$56,000
	↑	↑	↑
	Price variance (A – B) = \$61,500 – \$60,000 = \$1,500 U	Quantity variance (B – C) = \$60,000 – \$56,000 = \$4,000 U	
	Flexible-budget variance (A – C) \$61,500 – \$56,000 = \$5,500 U		

multiplied by the standard quantity of input per unit. For more complex companies that manufacture a variety of products, there are standard inputs allowed for the output achieved for each product. For example, consider a furniture manufacturer that produced 12,000 chairs and 3,000 sofas. If each chair requires 1 standard labor hour and each sofa requires 2 standard labor hours, standard hours allowed for outputs achieved is $(12,000 \times 1) + (3,000 \times 2) = 18,000$. Standard hours allowed for output achieved is the result of translating disparate output units (chairs and sofas) into a common standard measure of activity (standard labor hours allowed for output achieved).

Exhibit 8-10 provides a graphical overview of the computation of price and quantity variances. Panels A and B show the simple cases where there is either a quantity or a price variance but not both, so there is no interaction between the price and quantity variances. In both panels, the flexible budget is the standard quantity allowed multiplied by the standard price—the rectangle shaded blue. The variances depend on the difference between standard and actual price and the difference between standard and actual quantity. In Panel A, the variance is the quantity used in excess of the standard quantity times the standard price—the rectangle shaded orange. In Panel B, the variance is the price paid in excess of the standard price times the standard quantity—the rectangle shaded purple.

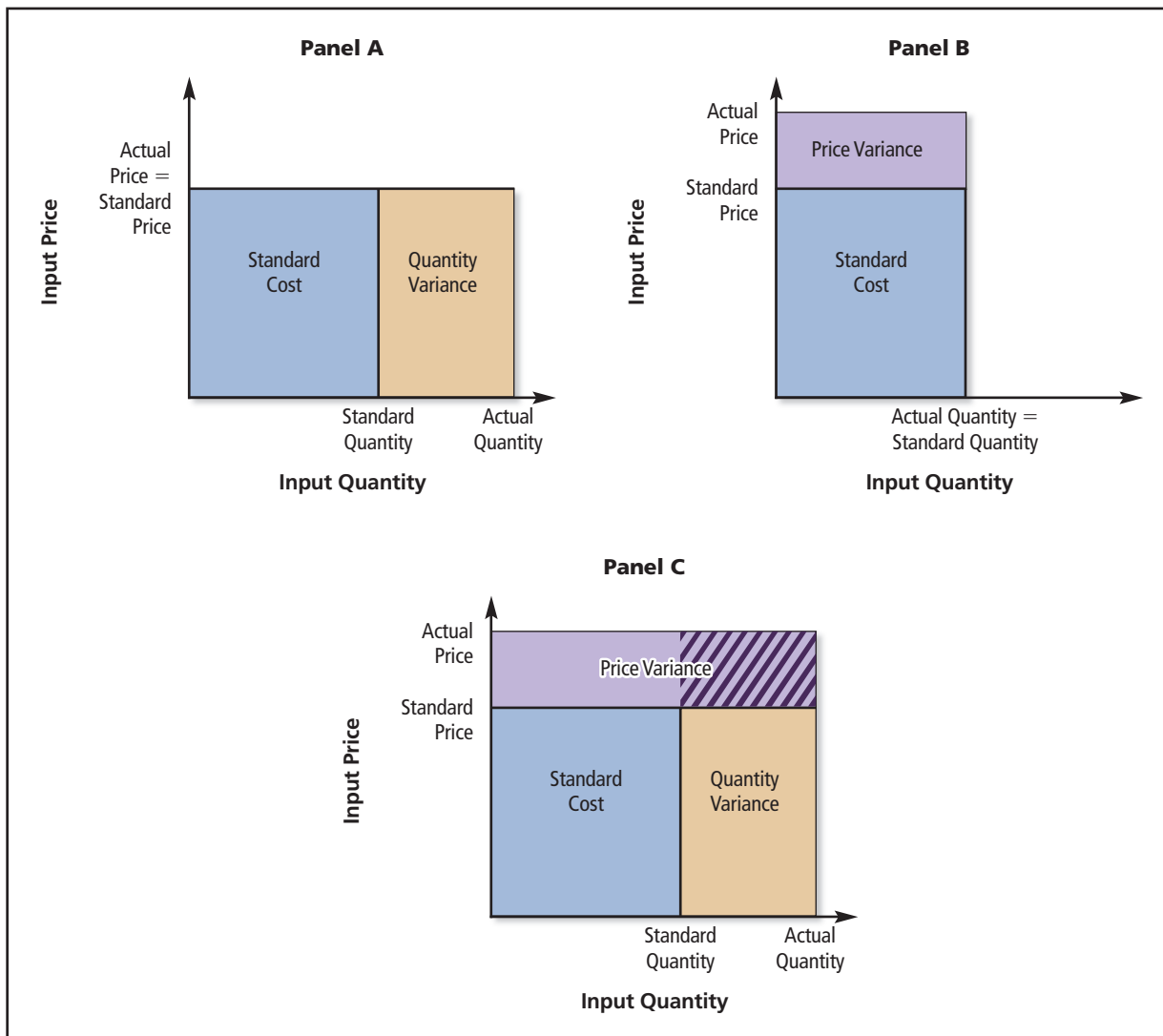


Exhibit 8-10

Graphical Representation of Quantity and Price Variances

Panel C illustrates the situation where both quantity and price variances exist. The interaction of the two variances is represented by the cross-hatched purple region. In concept, this joint effect could be defined to be a separate, third variance. In practice, most companies include this joint effect as part of the price variance, as in the calculations shown in Exhibit 8-9. This means the price variance is the result of multiplying the difference between actual and standard price by the total actual quantity used. This definition includes the joint effect represented by the purple cross-hatched area as part of the price variance. The quantity variance is then the difference between actual and standard quantity multiplied by the standard price.

rate variance

An alternative name for the price variance applied to labor.

usage variance (efficiency variance)

Alternative names for the quantity variance.

You are likely to encounter various terms used for price and quantity variances in practice. For example, many companies call a price variance applied to labor a **rate variance**, and many refer to quantity variances as **usage** or **efficiency variances**. Moreover, you may encounter new variance definitions such as those created by the Brass Products Division in the Business First box on p. 337 or in the Making Managerial Decisions section on p. 333. Because there is so much variation in definitions and terminology, be sure to ask whatever questions are necessary to be sure that you understand the exact definition of any variance that you encounter.

Interpreting Price and Quantity Variances

By dividing flexible-budget variances into price and quantity variances, we can better evaluate managers on variances that they can control. Consider an operating manager who has control over the quantity of materials used in the production process but little control over the price. In that case, the quantity variance will be more relevant than the price variance in evaluating the operating manager. Who has control over the price variance? The manager in charge of purchasing materials likely has some control over the price, and therefore is responsible for the price variance. However, even the purchasing manager may not have much control over price. Why? Because external market forces often are the primary influence on prices. Irrespective of whether any manager has control of price, it is useful to separate price and quantity variances whenever the quantity variance is important for evaluation. For example, the commodity prices of wheat, oats, corn, and rice may be outside the control of Singaporean food manufacturer **CerealTech Pte Ltd.**'s managers. By separating price variances from quantity variances, the breakfast cereal maker can focus on the quantity variance to assess whether managers used grain efficiently.

It is important to carefully consider the incentives created by price and quantity variances. Exclusive focus on material price variances can provide incentives that work against an organization's JIT and total quality management goals. For example, a purchasing manager focused only on creating a favorable material price variance may achieve a lower price by buying larger quantities or buying lower-quality material. However, the result could be excessive inventory handling and opportunity costs caused by large purchase quantities or increased manufacturing defects caused by lower-quality material. As another example, exclusive focus on labor price variances could motivate managers to use lower-cost (and lower-skilled) workers or to rush workers through critical tasks. In either case, the result could impair quality of products and services.

Companies that use variances primarily to fix blame often find that managers resort to cheating and subversion to beat the system. Lower-level operations managers usually have more information about their operations than higher-level managers. If supervisors use that information against them, lower-level managers might withhold or misstate valuable information for their own protection. For example, one manufacturing firm actually followed a policy of reducing the next period's departmental budget by the amount of the department's unfavorable variances in the current period. If a division had a \$50,000 expense budget for labor and \$52,000 of actual labor costs resulting in a \$2,000 unfavorable labor variance, the following period's budget would be reduced to \$48,000. This system led managers to cheat and to falsify reports to avoid unfavorable variances and avoid reductions in their budgets. We can criticize departmental managers' ethics in this situation, but the system design was also at fault.

Variances by themselves cannot provide the complete picture of why the company achieved or failed to achieve the budgeted results. For instance, one possible explanation for Beg Pakaian's set of variances is that a manager made a trade-off. Perhaps the manager purchased substandard-quality materials at a favorable price, saving \$3,680 (the favorable materials price variance) knowing that the substandard material would lead to extra waste of materials (the \$3,600 unfavorable material quantity variance). In this case, the material price variance more than offsets the material quantity variance, as indicated by the net materials flexible-budget variance of \$80 favorable.

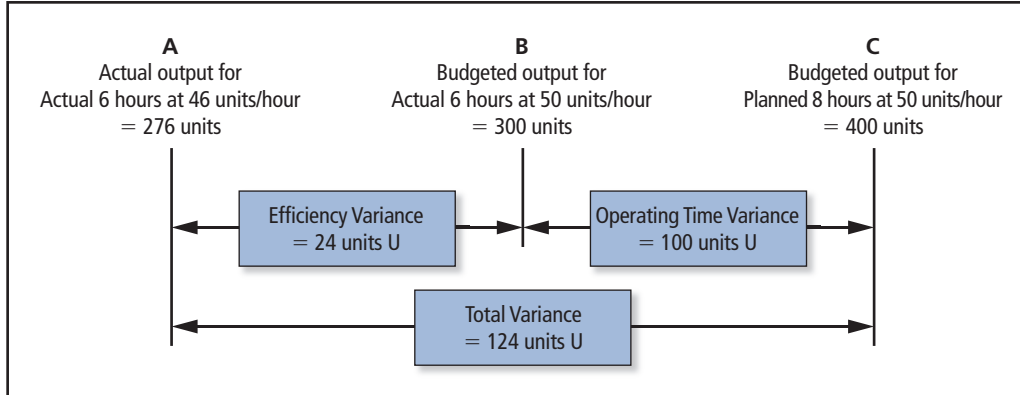
Of course, to fully understand the effect of the decision to purchase substandard materials, still more investigation and analysis might be required. For example, the material waste due to substandard materials might also have caused excess use of direct labor. Why? Perhaps Beg Pakaian used direct labor time working on units that ended up being defective, thus wasting that time. Suppose the labor wasted on the defective units was more than the \$80 favorable materials flexible budget variance described in the previous paragraph. Then, the decision to purchase substandard material was not successful because the labor cost inefficiencies caused by using substandard materials exceeded the materials cost savings from the favorable price. The important point again is that variances are useful tools that provide clues and direct attention to problems, but variances are only the starting point of the search for answers to the complex question of why actual results differ from expectations.

Making Managerial Decisions

Managers can apply the concepts of variance analysis to construct new variance definitions to fit new situations. For example, consider a production plant that plans to produce 50 units per hour and work 8 hours per day for a total planned production of 400 units each day. On March 23, the plant produced just 276 units for a total unfavorable production variance of

124 units. Because of machine breakdowns, the plant operated for only 6 hours that day. Using a three-column framework like that used in Exhibit 8-9, define variances that separate how much of the 124 unit shortfall in production was caused by operating only 6 hours versus how much was caused by low production efficiency during the 6 hours of actual operation.

Answer



Column A shows actual production of 276 units over 6 actual operating hours equates to 46 units per hour. Column C shows standard production of 8 hours per day $\times$ 50 units per hour = 400 units per day. Column B shows standard production rates for actual operating hours, 6 hours of production $\times$ 50 units per hour = 300 units. The difference between columns B and C is the production shortfall caused by loss of 2 hours of operating time due to the machine breakdowns, 2 hours $\times$ 50 units per

hour = 100 unit unfavorable variance. The difference between columns A and B is the shortfall caused by an actual rate of production ($276 \div 6 = 46$ units per hour) lower than the standard rate of 50 units per hour. This difference is the rate shortfall (4 units per hour) multiplied by the actual hours worked for the day (6 hours) = 24 unit unfavorable variance. The total variance, 100 units + 24 units = 124 units, is the difference between columns A and C.

Overhead Variances

The evaluation of overhead variances is different from the evaluation of direct materials and direct labor because overhead costs are generally indirect costs that companies allocate rather than trace to output. In this section, we outline the framework used to construct variable overhead variances and then briefly discuss variances for fixed overhead. (See Chapter 13 for more extensive discussion of fixed overhead variances.)

Objective 7

Compute variable overhead spending and efficiency variances.

Variable Overhead Variances

Companies allocate variable overhead to output based on some cost driver. For example, the variable-overhead cost driver for Beg Pakaian is direct-labor hours. The variable-overhead flexible-budget variance can be divided into two variances. When actual cost-driver activity differs from the standard amount allowed for the actual output achieved, we have a **variable-overhead efficiency variance**, calculated as follows:

variable-overhead efficiency variance

The difference between actual cost-driver activity and the standard amount allowed for the actual output achieved multiplied by the standard variable-overhead rate per cost-driver unit.

$$\text{Variable-overhead efficiency variance} = \left(\text{Actual cost-driver activity} - \text{Standard cost-driver activity allowed} \right) \times \text{Standard variable-overhead rate per cost-driver unit}$$

The variable-overhead efficiency variance depends entirely on whether the quantity of the cost driver used is more or less than the quantity allowed for the actual output achieved. It measures how control of the cost driver activity affected variable overhead costs.

The **variable-overhead spending variance** arises when actual variable overhead costs differ from the amount predicted for the actual cost-driver activity:

variable-overhead spending variance

The difference between the actual variable overhead cost and the amount predicted for the actual level of cost-driver activity.

$$\text{Variable-overhead spending variance} = \text{Actual variable overhead} - \left(\text{Standard variable overhead rate per unit of cost-driver} \times \text{Actual cost-driver activity used} \right)$$

This variance combines price and quantity effects and tells us how the actual variable overhead cost compares to the predicted amount for the actual level of cost-driver activity.

Exhibit 8-11 illustrates the calculation of variable and fixed overhead variances for Beg Pakaian. The exhibit breaks the \$500 unfavorable flexible-budget variable overhead variance for supplies into spending and efficiency variances. We compute the efficiency variance by multiplying the standard variable overhead rate times the difference between the quantity of the cost driver used and the quantity of the cost driver allowed for the output achieved. For Beg Pakaian, standards allow 1/2 hour of the cost driver direct labor for each unit of output, or 3,500 hours allowed for the 7,000 units of output achieved. Therefore, the flexible budget

Exhibit 8-11
General Approach to Analysis
of Overhead Variances

	A	B	C
	Actual Overhead Costs Incurred	Predicted Overhead Based on Actual Driver Use × Standard Prices	Flexible Budget: Standard Driver Use Allowed for Output Achieved × Standard Prices
Variable Overhead: Supplies	\$4,700 (given)	3,750 hr × \$1.20/hr = \$4,500	3,500 hr × \$1.20/hr = \$4,200
	↑ Spending variance (A – B) \$4,700 – \$4,500 = \$200 U	↑ Efficiency variance (B – C) \$4,500 – \$4,200 = \$300 U	↑
	Flexible-budget variance (A – C) \$4,700 – \$4,200 = \$500 U		
Fixed Overhead: Factory supervision	\$14,700	\$14,400	\$14,400
	↑ Spending variance (A – B) = \$14,700 – \$14,400 = \$300 U	↑ Never a variance (B – C) = 0 \$14,400 – \$14,400 = 0 by definition	↑
	Flexible-budget variance (A – C) \$14,700 – \$14,400 = \$300 U		

amount of \$4,200 for supplies in Exhibit 8-7 translates to $\$4,200 \div 3,500 \text{ hours} = \$1.20$ per direct-labor hour allowed for output achieved. Because Beg Pakaian used 3,750 labor hours when the standard for production of 7,000 units is $1/2 \text{ hour/unit} \times 7,000 \text{ units} = 3,500$ standard hours allowed, it used an excess of 250 labor hours. Each labor hour drives \$1.20 of variable overhead, so the excess labor hours drive $250 \text{ units} \times \$1.20/\text{unit} = \$300$ of extra variable overhead costs.

$$\begin{aligned} \text{Variable-overhead efficiency} &= \left(\frac{\text{Actual direct-labor hours} - \text{Standard direct-labor hours allowed}}{\text{Standard variable-overhead rates per hour}} \right) \times \text{Standard variable-overhead rates per hour} \\ &= \left(\frac{3,750 \text{ Actual hours} - 3,500 \text{ Standard hours allowed}}{\text{Standard variable-overhead rates per hour}} \right) \times \$1.20 \text{ per hour} \\ &= (250 \text{ excess hours}) \times \$1.20 \text{ per hour} \\ &= \$300 \text{ Unfavorable} \end{aligned}$$

This example illustrates a general principle: When actual cost-driver activity exceeds the activity allowed for the actual output achieved, variable-overhead efficiency variances are unfavorable and vice versa. In essence, the variable-overhead efficiency variance tells management how much variable overhead cost it wastes if the variance is unfavorable (or saves, if the variance is favorable) due to cost-driver activity.

The other component of the flexible-budget variance measures control of overhead spending given actual cost-driver activity. The variable-overhead spending variance is the difference between the actual variable overhead and the amount of variable overhead predicted when using 3,750 actual direct-labor hours:

$$\begin{aligned} \text{Variable-overhead spending} &= \text{Actual variable overhead} - \left(\frac{\text{Standard variable overhead rate}}{\text{Standard variable overhead rate}} \times \text{Actual direct-labor hours used} \right) \\ &= \$4,700 - (\$1.20 \times 3,750) \\ &= \$4,700 - \$4,500 \\ &= \$200 \text{ Unfavorable} \end{aligned}$$

Like other variances, a variable-overhead variance does not by itself identify the causes of results that differ from the static and flexible budgets. The distinction between efficiency and spending variances for variable overhead provides a springboard for more investigation, but the only way for management to discover why overhead performance did not agree with the budget is to investigate possible causes.

Fixed Overhead Variances

The framework for analysis of fixed overhead variances differs from the framework for variable cost variances. Consider factory supervision, a fixed cost, shown at the bottom of Exhibit 8-11. The flexible budget in column B based on actual use of the cost driver and the flexible budget in column C based on standard use of the cost driver are always the same. Why? Because fixed overhead does not vary with the level of use of the cost driver. Because there is no difference between columns B and C, the entire fixed overhead flexible-budget variance in Exhibit 8-11 is due to the difference between columns A and B. This difference between the actual fixed-overhead cost in column A and the budgeted cost in columns B and C is the **fixed-overhead spending variance**. For example, Beg Pakaian's factory supervision fixed-overhead spending variance is the flexible-budget variance of $\$14,700 - \$14,400 = \$300$ unfavorable, the difference between the actual cost of factory supervision and the budgeted fixed amount.

In Chapter 13, you will encounter a second type of fixed-overhead variance, the production-volume variance. Because this second type of variance does not involve the control of costs, we consider only the fixed-overhead spending variance in this chapter.

Objective 8

Compute the fixed-overhead spending variance.

fixed-overhead spending variance

The difference between actual fixed overhead and budgeted fixed overhead.

Summary Problem for Your Review

PROBLEM

The following questions are based on standards for the Beg Pakaian in this chapter.

- Direct materials: standard, 5 pounds per unit at \$2 per pound
- Direct labor: standard, 1/2 hour at \$16 per hour

Earlier we computed variances based on actual results for production of 7,000 units. Suppose now we have actual results for production of 8,500 units:

- Direct materials: Beg Pakaian purchased and used 46,000 pounds at an actual unit price of \$1.85 per pound, for an actual total cost of \$85,100.
- Direct labor: Beg Pakaian used 4,125 hours of labor at an actual hourly rate of \$16.80, for a total actual cost of \$69,300.

1. Compute the flexible-budget variance and the price and quantity variances for direct labor and direct material.
2. In requirement 1, you should have computed a direct-materials price variance of \$6,900 favorable. Is this a good outcome? Explain.

SOLUTION

1. The variances are as follows:

	A	B	C
	Actual Input Quantities × Actual Prices	Actual Input Quantities × Standard Prices	Flexible Budget: Standard Input Quantities Allowed for Outputs Achieved × Standard Prices
Direct materials	46,000 lb × \$1.85/lb = \$85,100	46,000 lb × \$2.00/lb = \$92,000	8,500 units × 5 lb × \$2.00/lb = \$85,000
	↑	↑	↑
	Price variance (A – B) = \$85,100 – \$92,000 = \$6,900 F	Quantity variance (B – C) = \$92,000 – \$85,000 = \$7,000 U	
	Flexible-budget variance (A – C) = \$85,100 – \$85,000 = \$100 U		
Direct labor	4,125 hr × \$16.80/hr = \$69,300	4,125 hr × \$16.00/hr = \$66,000	8,500 units × 0.5 hr × \$16.00/hr = \$68,000
	↑	↑	↑
	Price variance (A – B) = \$69,300 – \$66,000 = \$3,300 U	Quantity variance (B – C) = \$66,000 – \$68,000 = \$2,000 F	
	Flexible-budget variance (A – C) = \$69,300 – \$68,000 = \$1,300 U		

2. The favorable price variance may not be a good outcome. When prices are low, it may motivate Beg Pakaian managers to buy extra inventory in excess of its immediate needs, causing extra storage and handling costs. The favorable price variance may also mean that lower quality material has been purchased. The favorable materials price variance is a good outcome only if it exceeds any unfavorable material, labor, and overhead variances caused by the volume and quality of materials purchased.

Highlights to Remember

- 1. Identify variances and label them as favorable or unfavorable.** Variances are differences between actual and budgeted results. When the direction of the difference corresponds to actual profit greater than budgeted, the variance is labeled as favorable. When the direction corresponds to actual profit less than budgeted, the variance is unfavorable.
- 2. Distinguish between flexible budgets and static budgets.** Flexible budgets are geared to changing levels of cost-driver activity rather than to the single level of the static budget. Organizations tailor flexible budgets to particular levels of sales or cost-driver activity—before or after the fact. Flexible budgets tell how much revenue and cost to expect for any level of activity.
- 3. Use flexible-budget formulas to construct a flexible budget.** Cost functions, or flexible-budget formulas, reflect fixed- and variable-cost behavior and allow managers to compute budgets for any volume of output achieved. We compute the flexible-budget amounts for variable costs by multiplying the variable cost per unit of output times the level of output. The flexible-budgeted fixed cost is a lump sum, independent of the level of output (within the relevant range).
- 4. Compute and interpret static-budget variances, flexible-budget variances, and sales-activity variances.** Static-budget variances are differences between actual results and the budgeted amounts for the level of activity assumed in the static budget. Sales-activity variances are the budgeted effects of operating at the actual achieved level of activity rather than the level of activity assumed in the static budget. Flexible-budget variances are the deviations of actual results from the flexible budget amounts for the achieved level of activity.
- 5. Understand how the setting of standards affects the computation and interpretation of variances.** Because variances are the difference between budgeted and actual amounts, they depend on the standards used to construct the budget. Most companies set standards that are neither too easy nor too hard to attain.
- 6. Compute and interpret price and quantity variances for materials and labor.** Managers often find it useful to subdivide flexible-budget variances for variable inputs into price and quantity variances. Price variances (also referred to as rate variances) reflect the effects of changing input prices, holding inputs constant at actual input use. Quantity variances (also referred to as usage variances or efficiency variances) reflect the effects of different levels of input usage, holding prices constant at standard prices.
- 7. Compute variable overhead spending and efficiency variances.** The variable-overhead spending variance is the difference between the actual variable overhead and the amount of variable overhead budgeted for the actual level of cost-driver activity. The variable-overhead efficiency variance is the difference between the actual cost-driver activity and the amount of cost-driver activity allowed for the actual output achieved, costed at the standard variable-overhead rate.
- 8. Compute the fixed-overhead spending variance.** The fixed-overhead spending variance is the difference between the actual fixed overhead expenditures and the budgeted amount of fixed overhead.

Accounting Vocabulary

activity-based flexible budget, p. 331	fixed-overhead spending variance, p. 347	unfavorable cost variance, p. 330
activity-level variances, p. 333	flexible budget, p. 330	unfavorable profit variance, p. 330
currently attainable standards, p. 336	flexible-budget variance, p. 333	unfavorable revenue variance, p. 330
effectiveness, p. 337	ideal standards, p. 336	usage variance, p. 344
efficiency, p. 337	perfection standards, p. 336	variable budget, p. 330
efficiency variance, p. 344	price variance, p. 341	variable-overhead efficiency variance, p. 346
expected cost, p. 336	quantity variance, p. 341	variable-overhead spending variance, p. 346
favorable cost variance, p. 330	rate variance, p. 344	
favorable profit variance, p. 329	sales-activity variances, p. 333	
favorable revenue variance, p. 330	standard cost, p. 336	
	static budget, p. 330	
	static-budget variance, p. 332	

Fundamental Assignment Material

8-A1 Flexible and Static Budgets

Walcker Transportation Company's general manager reports quarterly to the company president on the firm's operating performance. The company uses a budget based on detailed expectations for the forthcoming quarter. The general manager has just received the condensed quarterly performance report shown in Exhibit 8-12.

Although the general manager was upset about not obtaining enough revenue, she was happy that her cost performance was favorable; otherwise, her net income would be even worse.

The president was not satisfied with the performance report and remarked, "I can see some merit in comparing actual performance with budgeted performance because we can see whether actual revenue coincided with our best guess for budget purposes. But I can't see how this performance report helps me evaluate cost-control performance."

1. Prepare a columnar flexible budget for Walcker Transportation at revenue levels of \$12,600,000, \$13,000,000, and \$13,400,000. Use the format of the last three columns of Exhibit 8-3, p. 331. Assume that the prices and mix of products sold are equal to the budgeted prices and mix.
2. Write out the flexible budget formula for costs as a function of revenue.
3. Prepare a condensed table showing the static budget variance, the sales-activity variance, and the flexible-budget variance. Use the format of Exhibit 8-6, p. 334.

8-A2 Activity Level Variances

The systems consulting department of Gullickson Golf Products designs systems for data collection, encoding, and reporting to fit the needs of other departments within the company. The cost driver for costs in the systems consulting department is the number of requests made to the department. The expected variable cost of handling a request was \$500, and the number of requests expected for June 20X1 was 75. Gullickson budgeted its monthly fixed costs for the department (salaries, equipment depreciation, space costs) at \$65,000.

The actual number of requests serviced by systems consulting in June 20X1 was 90, and the total costs incurred by the department was \$124,000. Of that amount, \$78,000 was for fixed costs.

Compute the static budget variances and the flexible-budget variances for variable and fixed costs for the systems consulting department for June 20X1.

Exhibit 8-12

Walcker Transportation Operating Performance Report

Second Quarter, 20X1

	Budget	Actual	Variance
Net revenue	<u>\$13,000,000</u>	<u>\$12,700,000</u>	<u>\$300,000 U</u>
<i>Variable Costs</i>			
Fuel	\$ 520,000	\$ 516,000	\$ 4,000 F
Repairs and maintenance	390,000	398,000	8,000 U
Supplies and miscellaneous	2,080,000	2,070,000	10,000 F
Variable payroll	<u>8,060,000</u>	<u>7,940,000</u>	<u>120,000 F</u>
Total variable costs*	<u>\$11,050,000</u>	<u>\$10,924,000</u>	<u>\$126,000 F</u>
<i>Fixed Costs</i>			
Supervision	\$ 160,000	\$ 177,000	\$ 17,000 U
Rent	200,000	200,000	—
Depreciation	460,000	460,000	—
Other fixed costs	<u>170,000</u>	<u>163,000</u>	<u>7,000 F</u>
Total fixed costs	<u>990,000</u>	<u>1,000,000</u>	<u>\$ 10,000 U</u>
Total fixed and variable costs	<u>\$12,040,000</u>	<u>\$11,924,000</u>	<u>\$116,000 F</u>
Operating income	<u>\$ 960,000</u>	<u>\$ 776,000</u>	<u>\$184,000 U</u>

U = Unfavorable. F = Favorable.

*For purposes of this analysis, assume that all of these costs are totally variable with respect to sales revenue. In practice, many are mixed and would have to be subdivided into variable and fixed components before a meaningful analysis could be made. Also, assume that the prices and mix of services sold remain unchanged.

8-A3 Direct-Material and Direct-Labor Variances

Hill Fine Instruments manufactures trumpets, trombones, tubas, and other brass instruments. The following standards were developed for a line of trumpets:

	Standard Inputs Expected for Each Unit of Output Achieved	Standard Price per Unit of Input
Direct materials	5 pounds	\$10 per pound
Direct labor	10 hours	\$25 per hour

During April, Hill scheduled 550 trumpets for production. However, the company produced only 525.

Hill purchased and used 3,100 pounds of direct materials at a unit price of \$9.00 per pound. It used 5,500 hours of direct labor at an actual rate of \$26.00 per hour.

1. Compute the standard cost per trumpet for direct materials and direct labor.
2. Compute the price variances and quantity variances for direct materials and direct labor.
3. Based on these sketchy data, what clues for investigation are provided by the variances?

8-B1 Summary Performance Reports

Consider the following data for Robert Campbell Tax Services:

- Static budget data: sales, 3,500 clients at \$350 each; variable costs, \$300 per client; fixed costs, \$150,000
- Actual results at actual prices: sales, 3,000 clients at \$360 per client; variable costs, \$920,000; fixed costs, \$159,500

1. Prepare a summary performance report similar to Exhibit 8-6, p. 334.
2. Fill in the blanks:

Static-budget income		\$ —
Variances		
Sales-activity variances	\$ —	
Flexible-budget variances	—	—
Actual income		\$ —

8-B2 Material and Labor Variances

Consider the following data for Tripp Manufacturing:

	Direct Materials	Direct Labor
Actual price per unit of input (lb and hr)	\$ 7.50	\$ 12.00
Standard price per unit of input	\$ 7.00	\$ 14.00
Standard inputs allowed per unit of output	10	2
Actual units of input	116,000	29,000
Actual units of output (product)	14,400	14,400

1. Compute the price, quantity, and flexible-budget variances for direct materials and direct labor. Use U or F to indicate whether the variances are unfavorable or favorable.
2. Prepare a plausible explanation for the performance.

8-B3 Variable-Overhead Variances

You have been asked to prepare an analysis of the overhead costs in the order processing department of a mail-order company like **Eddie Bauer**. As an initial step, you prepare a summary of some events that bear on overhead for the most recent period. Variable overhead is applied based on hours of processing-clerk labor. The standard variable-overhead rate per order was \$.06. The rate of 10 orders per hour is regarded as standard productivity per clerk. The total overhead incurred was \$204,000, of which \$138,000 was fixed. The fixed-overhead spending variance was \$2,500 unfavorable. The variable-overhead flexible-budget variance was \$6,000 unfavorable. The variable-overhead spending variance was \$3,600 favorable.

Find the following:

1. Variable-overhead efficiency variance
2. Actual hours of input
3. Standard hours of input allowed for output achieved
4. Budgeted-fixed overhead

MyLab Accounting

Additional Assignment Material

QUESTIONS

8-1 Distinguish between favorable and unfavorable cost (and revenue) variances.

8-2 “Master budgets are always static master budgets.” Do you agree? Explain.

8-3 “We want a flexible budget because costs are difficult to predict. We need the flexibility to change budgeted costs as input prices change.” Does a flexible budget serve this purpose? Explain.

8-4 Explain the role of understanding cost behavior and cost-driver activities for flexible budgeting.

8-5 “An activity-based flexible budget has a ‘flex’ for every activity.” Do you agree? Explain.

8-6 “Effectiveness and efficiency go hand in hand. You can’t have one without the other.” Do you agree? Explain.

8-7 Differentiate between a static-budget variance and a flexible-budget variance.

8-8 “Managers should be rewarded for favorable variances and punished for unfavorable variances.” Do you agree? Explain.

8-9 “A good control system places the blame for every unfavorable variance on someone in

the organization. Without affixing blame, no one will take responsibility for cost control.” Do you agree? Explain.

8-10 Who is usually responsible for sales-activity variances? Why?

8-11 Why is the use of perfection standards not advocated widely?

8-12 What are two possible approaches to setting “currently attainable standards”?

8-13 “A standard is one point in a band or range of acceptable outcomes.” Evaluate this statement.

8-14 “Price variances should be computed even if prices are regarded as being outside of company control.” Do you agree? Explain.

8-15 What are some common causes of unfavorable quantity variances?

8-16 “Failure to meet price standards is the responsibility of the purchasing officer.” Do you agree? Explain.

8-17 What decides the variable-overhead efficiency variance?

8-18 Would you recommend conducting an investigation for each and every variance?

CRITICAL THINKING EXERCISES

8-19 Interpretation of Favorable and Unfavorable Variances

A division budgeted an operating profit of \$3,000 on sales of \$8,000 and costs of \$5,000. However, at the beginning of the period one of the division’s machines broke down and could not be fixed until the end of the period. When the machine broke, the division manager determined that there were two feasible alternatives: First, production and sales could be cut back by 25%, reducing sales to \$6,000 and costs to \$4,000. (Note that costs are not reduced by 25% because some of the costs are fixed.) Second, a replacement machine could be obtained and installed, allowing sales to be maintained at \$8,000 but increasing costs to \$6,500. The division manager analyzed the alternatives and concluded that revenues less costs would be greater if sales were reduced (\$6,000 less \$4,000 = \$2,000 operating profit) than if the replacement machine was obtained (\$8,000 less \$6,500 = \$1,500 operating profit). The manager, therefore, chose not to replace the machine. However, because revenue was lower than planned by \$2,000, there is an unfavorable revenue variance of \$2,000. Comment on how the unfavorable revenue variance should be interpreted in evaluating the performance of the manager.

8-20 Marketing Responsibility for Sales-Activity Variances

Suppose a company budgeted an operating profit of \$100 on sales of \$1,000. Actual sales were \$900. The marketing department claimed that because sales were down 10%, it was responsible for only 10% of \$100 or \$10 of any drop in profit. Any further shortfall must be someone else’s responsibility. Comment on this claim.

8-21 Production Responsibility for Flexible-Budget Variances

Suppose a plant manager planned to produce 100 units of product at a total cost of \$1,000. Instead, actual production was 10% higher at 110 units. When costs came in at less than a 10% increase in costs

or \$1,100, the plant manager claimed that she should get credit for a favorable variance equal to the amount by which the actual costs fell short of \$1,100. Comment on this claim.

8-22 Responsibility of Purchasing Manager

A company's purchasing manager bought 5,000 pounds of material for \$5.50 per pound instead of the budgeted \$6.00 per pound, resulting in a favorable variance of \$2,500. The company has a policy of rewarding employees with 20% of any cost savings they generate. Before awarding a \$500 bonus to the purchasing manager, what other variances would you look at to determine the total effect of the purchasing decision? Explain.

8-23 Variable-Overhead Efficiency Variance

Birmingham Company had a \$1,000 U variable-overhead efficiency variance. Neither the plant manager, who was responsible primarily for labor scheduling, nor the administrative manager, who was responsible for most support services, felt responsible for the variance. Who should be held responsible? Why?

EXERCISES

8-24 Flexible Budget

Kookaburra Sports, Australia, produced 88,000 cricket balls in 2020. Its manufacturing costs included A\$1,760,000 variable and A\$88,000 fixed. Assume that no price changes will occur in 2021 and that no changes in the production methods are anticipated. Compute the budgeted cost for producing 110,000 balls in 2021.

8-25 Basic Flexible Budget

The manager of Mobility Transport Company in Bradford, United Kingdom, is attempting to predict the costs of operating a fleet of cars hired by a local college administration. Among the items of concern are fuel, £0.25 per kilometer, and depreciation, £7,200 per car per year.

The manager is preparing a flexible budget for the coming year. Prepare the flexible-budget amounts for fuel and depreciation for each car at a level of 30,000, 45,000, and 65,000 kilometers.

8-26 Flexible Budget

Pohle Designs has a department that makes high-quality leather cases for iPads. Consider the following data for a recent month:

	Budget Formula per Unit	Various Levels of Output		
Units		10,000	11,000	12,000
Sales	\$19	\$?	\$?	\$?
Variable costs				
Direct materials	?	65,000	?	?
Hand labor	4.40	?	?	?
Fixed costs				
Depreciation		?	18,000	?
Salaries		?	?	33,000

Fill in the unknowns.

8-27 Basic Flexible Budget

The budgeted prices for materials and direct labor per unit of finished product are \$8 and \$7, respectively. The production manager is delighted about the following data:

	Static Budget	Actual Costs	Variance
Direct materials	\$59,200	\$49,900	\$9,300 F
Direct labor	51,800	39,200	12,600 F

Is the manager's happiness justified? Prepare a report that might provide a more detailed explanation of why the static budget was not achieved. Good output was 5,300 units.

8-28 Activity-Level Variances

Materials-support costs for the Pittsburgh Steel Company (PSC) are variable costs that depend on the weight of material (plate steel, castings, etc.) moved. For the current budget period and based on scheduled production, PSC expected to move 750,000 pounds of material at a cost of \$.25 per pound. Several orders were canceled by customers, and PSC moved only 650,000 pounds of material. Total materials support costs for the period were \$177,000.

Compare actual support costs to the static-budget support costs by computing static budget, activity-level, and flexible-budget variances for materials-support costs.

8-29 Direct-Material Variances

Nakhon Custom Shirt Company uses a special fabric in the production of dress shirts. During August, Nakhon Custom Shirt purchased and used 4,100 square yards in the production of 3,700 shirts at a total cost of ฿2,812,600. (฿ stands for the Thai baht. There are roughly 30 bahts to a U.S. dollar.) The standard allows one yard at ฿680 per yard for each shirt.

Calculate the material price variance and the material quantity variance.

8-30 Labor Variance

Ben Schmidt, the manager of Hanover Bridge Construction Company, Germany, uses standards to evaluate the performance of labor. Due to a recent fire breakout in its office, a considerable number of records have been lost, and Ben only has partial data for June, 2020. He knows that the total direct-labor flexible-budget variance was €3,286 favorable. Moreover, a recent pay raise caused an unfavorable labor price variance for June of €2,314. The actual hours of input were 3,560 and the standard labor price was €20 per hour.

1. Find the actual labor rate per hour.
2. Determine the standard hours allowed for the output achieved.

8-31 Quantity Variances

Majestic Jewelry Box Company produced 19,500 jewelry boxes in 2020. The standard direct-material allowance is 1.5 square foot wood, at a cost of \$4.80 per square foot. Actually, 28,050 square foot material (input) was used to produce 19,500 jewelry boxes (output).

Similarly, the standard allowance for direct labor is 5.1 hours to produce one jewelry box, and the standard hourly labor cost is \$12. But 100,650 hours were used to produce the 19,500 jewelry boxes.

Compute the quantity variances for direct materials and direct labor.

8-32 Labor and Material Variances

Standard direct-labor rate	€ 30.00
Actual direct-labor rate	€ 23.50
Standard direct-labor hours	10,000
Direct-labor quantity variance—unfavorable	€18,000
Standard unit price of materials	€ 9.20
Actual quantity purchased and used	2,500
Standard quantity allowed for actual production	1,850
Materials purchase price variance—favorable	€ 1,000

1. Compute the actual hours worked, rounded to the nearest hour.
2. Compute the actual purchase price per unit of materials, rounded to the nearest euro cent.

8-33 Material and Labor Variances

Consider the following data:

	Direct Materials	Direct Labor
Costs incurred: actual inputs × actual prices incurred	£240,990	£202,510
Actual inputs × expected prices	254,310	192,500
Standard inputs allowed for actual outputs achieved × expected prices	260,400	185,000

Compute the price, quantity, and flexible-budget variances for direct materials and direct labor. Use U or F to indicate whether the variances are unfavorable or favorable.

PROBLEMS**8-34 Hotel Parking Service**

In early 2020, Hotel Regalia International, a five-star hotel in Seoul, South Korea, outsourced its car parking services to Seoul Park Services. The following is the budget prepared by Seoul Park Services for the year 2020 (figures in thousands of Won, ₩):

Revenue from parking fees	₩6,000,000
Variable costs	600,000
Contribution margin	₩5,400,000
Fixed costs	5,400,000
Operating income	₩ 0

The fees were based on an average of 30,000 vehicle-parking days (vehicles multiplied by the number of days in the park) per week for the 20-week season, multiplied by average parking fee of ₩10,000 per day.

Though the season was booming for the first four weeks, during the early fifth week, the state authority declared a partial lockdown in the wake of the COVID-19 pandemic. As a result, for the rest of the season, the occupancy rate of the hotel and the demand for parking services dropped sharply.

Total revenues fell ₩1,440 million short of the original budget. Variable costs fell as expected, and fixed costs were unaltered except for the salary of 50% of the workforce who were terminated. The savings in the fixed cost due to the above decision were ₩360 million.

Prepare a columnar summary of performance, showing the original (static) budget, sales-activity variances, flexible budget, flexible-budget variances, and actual results.

8-35 Flexible and Static Budgets

The ATK Club in Kolkata, India, organizes an annual get-together of its members on the eve of its foundation day. The original (static) budget and actual results for this year's program were as follows:

	Static Budget	Actual	Variance
Attendees	75	90	
Revenue	₹210,000	₹260,400	₹50,400 F
Cost of dinner at ₹1,520 per person	114,000	141,360	27,360 U
Beverages, ₹480 per person	36,000	37,280	1,280 U
Rental of the hotel, 6,000 plus 8% tax	6,480	6,480	0
Music, 3 hours at ₹20,000 per hour	760,000	70,000	10,000 U
Profit	₹ (6,480)	₹ 5,280	₹11,760 F

1. Subdivide each variance into a sales-activity variance portion and a flexible-budget variance portion.
2. Provide possible explanations for the variances.

8-36 Summary Explanation

In 2020, Procter & Gamble produced 60,000 units of a mid-range electric toothbrush, 12,000 more than budgeted. Production data are as follows. Except for physical units, all quantities are in dollars.

	Actual Results at Actual Prices	Flexible Budget Variances	Flexible Budget	Sales Activity Variances	Static Budget
Physical units	60,000	—	?	?	48,000
Sales	?	6,600 F	?	?	624,000
Variable costs	378,000	?	360,000	?	?
Contribution margin	?	?	?	?	?
Fixed costs	?	9600 U	?	?	72,000
Income	?	?	?	?	?

1. Fill in the unknowns.
2. Give a brief summary explanation of why the original target income was not attained.

8-37 Explanation of Variance in Income

Horizon Consultants provides tax consultancy services to its clients. The company's standard contribution margins average 70% of pound sales, and the average fees for services are £100 per consultancy. Average productivity is two consultancies per hour. Some employees work for commissions and others for an hourly rate. The static budget for 2020 had predicted 400,000 consultancies, but the firm could complete only 350,000 consultancies.

Fixed costs such as rent, supervision, advertising, and other items were budgeted at £22 million, but the budget was exceeded by £300,000 because of extra advertising in an attempt to boost revenue. There were no variances from the average service fees, but the actual commissions paid to tax preparers and the actual productivity per hour resulted in flexible budget variances (i.e., total price and quantity variances) for variable costs of £450,000 unfavorable.

Harry Wilson, the owner of the firm, is unhappy because the budgeted income of £6 million could not be reached. He is concerned with the decline in revenue as well as the unfavorable variable-cost variances.

Explain why the budgeted income was not attained. Use a presentation similar to Exhibit 8-6, p. 334. Complete your explanation by summarizing what happened, using no more than three sentences.

8-38 Activity and Flexible-Budget Variances at KFC

Suppose a chain of **KFC** franchises in Shanghai had budgeted sales for 2012 of RMB 7.8 million (where RMB stands for the Chinese unit of currency, officially the renminbi, also called the yuan). Cost of goods sold and other variable costs were expected to be 55% of sales. Budgeted annual fixed costs were RMB 2.1 million. A strong Chinese economy caused actual 2012 sales to rise to RMB 10 million and actual profits to increase to RMB 2,050,000. Fixed costs in 2012 were as budgeted. The franchisee was pleased with the increase in profit.

1. Compute the sales-activity variance and the flexible-budget variance for income for 2012. What can the franchisee learn from these variances?
2. Suppose that in 2013 the Chinese economy weakened, and the franchise's sales fell back to the RMB 7.8 million level. Given what happened in 2012, what do you expect to happen to profits in 2013?

8-39 Summary of App Based Taxi Aggregator's Performance

The performance (in thousands of euro) of Swift Cab, an app-based taxi aggregator, for the year 2020 is shown in the following table:

	Actual Results at Actual Prices	Static Budget	Variance
Revenue	€ ?	€462,000	€ ?
Variable expenses	<u>342,960</u>	<u>300,300*</u>	<u>42,660 U</u>
Contribution margin	?	161,700	?
Fixed expenses	<u>114,360</u>	<u>105,600</u>	<u>8,760 U</u>
Income	<u>€ ?</u>	<u>€ 56,100</u>	<u>€ ?</u>

*Includes cost of fuel of €66,000.

The static budget had been based on a budget of €0.35 revenue per passenger mile. A passenger mile is one paying passenger who travels one mile. An average fare decreases of 6% had helped generate an increase in passenger miles travelled that was 20% in excess of the static budget for the year.

The price per liter of fuel rose above the price used to formulate the static budget. The average fuel price increase for the year was 20%.

1. Prepare a summary report to help the CEO understand performance for 2020.
2. Assume that fuel cost is purely variable, and the quantity of fuel used was at the same level of efficiency as prescribed in the static budget. What part of the flexible-budget variance for variable expenses is attributable to fuel expenses? Explain.

8-40 Hospital Costs and Explanation of Variances

The emergency room at Rochester General Hospital uses a flexible budget based on patients seen as the measure of activity. The hospital must maintain an adequate staff of attending and on-call physicians at all times, so patient activity does not affect physician scheduling. Nurse scheduling varies as volume changes, however. A standard of 0.5 nurse hours per patient visit was set. Hourly pay for nurses ranges from \$9 to \$18 per hour, and the average pay rate is \$15 per hour. The hospital considers all materials to be supplies, a part of overhead; there are no direct materials. A statistical study showed that the cost of supplies and other variable overhead is more closely associated with nurse hours than with patient visits. The standard for supplies and other variable overhead is \$10 per nurse hour.

The head physician of the emergency room unit, Brad Narr, is responsible for control of costs. During October the emergency room unit treated 4,000 patients. The budget and actual costs were as follows:

	Budget	Actual	Variance
Patient visits	3,800	4,000	200
Nurse hours	1,900	2,080	180
Nursing cost	\$ 28,500	\$ 33,180	\$4,680
Supplies and other variable overhead	19,000	20,340	1,340
Fixed costs	92,600	92,600	0
Total cost	<u>\$140,100</u>	<u>\$146,120</u>	<u>\$6,020</u>

1. Calculate price and quantity variances for nursing costs.
2. Calculate spending and efficiency variances for supplies and other variable overhead.
3. The hospital's chief administrator has asked Dr. Narr to explain the variances. Provide possible explanations.

8-4I Flexible Budgeting

For the convenience of its reporters and staff based in London, **CNN** operates a motor pool. The motor pool operated with 25 vehicles until February of this year, when it acquired an additional automobile. The motor pool furnishes petrol (gasoline), oil, and other supplies for the cars and hires one mechanic who does routine maintenance and minor repairs. Major repairs are done at a nearby commercial garage. A supervisor manages the operations.

Each year the supervisor prepares an operating budget, informing CNN management of the funds needed to operate the pool. Depreciation on the automobiles is recorded in the budget in order to determine the cost per mile.

The following schedule presents the annual budget approved by the news division. The actual costs for March are compared with one-twelfth of the annual budget.

CNN London Motor Pool				
Budget Report for March 20X1				
	Annual Budget	One-Month Budget	March Actual	Over (Under)
Petrol (gasoline)	£ 82,500	£ 6,875	£ 8,200	£1,325
Oil, minor repairs, parts, and supplies	30,000	2,500	2,540	40
Outside repairs	2,700	225	50	(175)
Insurance	4,800	400	416	16
Salaries and benefits	21,600	1,800	1,800	—
Depreciation	22,800	1,900	1,976	76
Total costs	<u>£164,400</u>	<u>£13,700</u>	<u>£14,982</u>	<u>£1,282</u>
Total kilometers	1,500,000	125,000	140,000	
Cost per kilometer	£ 0.1096	£0.1096	£0.1070	
Number of automobiles	25	25	26	

The annual budget was constructed based on the following assumptions:

1. 25 automobiles in the pool
2. 60,000 kilometers per year per automobile
3. 8 kilometers per liter of petrol for each automobile
4. £.44 per liter of petrol
5. £.02 per kilometer for oil, minor repairs, parts, and supplies
6. £108 per automobile in outside repairs

The supervisor is unhappy with the monthly report comparing budget and actual costs for March; she claims it presents her performance unfairly. Her previous employer used flexible budgeting to compare actual costs with budgeted amounts.

1. Employing flexible-budgeting techniques, prepare a report that shows budgeted amounts, actual costs, and monthly variation for March.
2. Explain briefly the basis of your budget figure for outside repairs.

8-42 Activity-Based Flexible Budget

Cost behavior analysis for the four activity centers in the billing department of Fargo Power Company is given next.

Traceable Costs			
Activity Center	Variable	Fixed	Cost-Driver Activity
Account inquiry	\$ 79,910	\$156,380	3,300 labor hours
Correspondence	9,800	25,584	2,800 letters
Account billing	154,377	81,400	2,440,000 lines
Bill verification	10,797	78,050	20,000 accounts

The billing department constructs a flexible budget for each activity center based on the following ranges of cost-driver activity.

Activity Center	Cost Driver	Relevant Range	
Account inquiry	Labor hours	3,000	5,000
Correspondence	Letters	2,500	3,500
Account billing	Lines	2,000,000	3,000,000
Bill verification	Accounts	15,000	25,000

1. Develop flexible-budget formulas for each of the four activity centers.
2. Compute the budgeted total cost in each activity center for each of these levels of cost-driver activity: (a) the smallest activity in the relevant range, (b) the midpoint of the relevant range, and (c) the highest activity in the relevant range.
3. Determine the total cost function for the billing department.
4. The following table gives the actual results for the billing department. Prepare a cost-control performance report comparing the flexible budget to actual results for each activity center. Compute flexible-budget variances.

Activity Center	Actual Cost-Driver Level	Actual Cost
Account inquiry	4,300 labor hours	\$235,400
Correspondence	3,200 letters	38,020
Account billing	2,950,000 lines	285,000
Bill verification	23,000 accounts	105,320

8-43 Straightforward Variance Analysis

Happy Fizz Beverages Company produces different variants of fruit juice in one-liter tetra packs. The production data regarding its strawberry juice tetra packs for June, 2020, are as follows:

- Materials purchased and used, 6,600 pounds
- Direct-labor costs incurred, 11,000 hours, £84,700
- Variable-overhead costs incurred, £9,240
- Finished units produced, 2,000
- Actual material cost, £0.97 per pound
- Standard variable-overhead rate, £0.80 per direct-labor hour
- Standard direct-labor cost, £8 per hour
- Standard materials cost, £1 per pound
- Standard pounds of materials in a finished unit (one-liter pack), 3
- Standard direct-labor hours per finished unit, 5

Prepare schedules of all variances, using the formats of Exhibits 8-9 and 8-11 on pp. 342 and 346.

8-44 Variance Analysis

St. Lawrence Iron Works, Ontario, Canada, uses standard costs and a flexible budget to control its manufacture of cast iron. The purchase manager of the company is responsible for the material price variances whereas the production manager is responsible for all other variances. Operating data for September, 2020 are as follows:

- Finished units produced: 150,000 pounds of cast iron.
- Direct materials: Purchased and used, 495,000 pounds of iron at C\$0.90 per pound; standard price is C\$0.85 per pound. Standard allowed per pound of cast iron is 3 pounds.
- Direct labor: Actual costs, 825,000 hours for C\$6,352,500. Standard allowed per pound of cast iron is 5 hours. Standard price per direct-labor hour is C\$8.00.
- Variable manufacturing overhead: Actual costs, C\$693,000. Budget formula is C\$0.80 per standard direct-labor hour.

Compute the following:

- Materials purchase-price variance
 - Materials quantity variance
 - Direct-labor price variance
 - Direct-labor quantity variance
 - Variable manufacturing-overhead spending variance
 - Variable manufacturing-overhead efficiency variance
- What is the budget allowance for direct labor?
 - Would it be any different if production were 160,000 pounds?

8-45 Similarity of Direct-Labor and Variable-Overhead Variances

Prestige Inc. produces a range of home appliances ranging from mixer grinders and food processors to induction cooktops. For the past few quarters, the company has been facing great difficulty in controlling costs of its induction cooktop unit located in Texas. In the last quarter, the company installed a standard-cost and flexible-budget system. A summarized result of the unit for the last quarter is as follows:

	Expected Cost per Standard Direct-Labor Hour	Flexible-Budget Variance
Lubricants	\$ 0.60	\$660 F
Other supplies	0.30	450 U
Rework	0.60	900 U
Other indirect labor	1.50	900 U
Total variable overhead	<u>\$ 3.00</u>	<u>\$1,590 U</u>

F = Favorable and U = Unfavorable.

The department had initially planned to manufacture 18,000 induction cooktops in 12,000 standard direct-labor hours allowed. Material shortages and some abnormal weather conditions resulted in the production of just 16,200 units in 11,600 actual direct-labor hours. The standard wage rate is \$5.25 per hour, which was \$0.15 higher than the actual hourly rate.

- Prepare a detailed performance report with two major sections: direct-labor and variable overhead.
- Prepare a summary analysis of price and quantity variances for direct labor and spending and efficiency variances for variable overhead.
- Explain the similarities and differences between the direct-labor and variable-overhead variances. What are some of the likely causes of the overhead variances?

8-46 Material, Labor, and Overhead Variances

Poulsbo Kayak Company makes molded plastic kayaks. Standard costs for an entry-level whitewater kayak are as follows:

Direct materials, 60 lb at \$5.50/lb	\$330
Direct labor, 1.5 hr at \$16/hr	24
Overhead, at \$12 per kayak	12
Total	<u>\$366</u>

The overhead rate assumes production of 450 kayaks per month. The overhead cost function is \$2,808 + (\$5.76 × number of kayaks).

During March, Poulsbo produced 430 kayaks and had the following actual results:

Direct materials purchased and used	27,000 pounds at \$5.30/lb
Direct labor	670 hours at \$15.90/hr
Actual overhead	\$5,335

1. Compute material, labor, and overhead variances.
2. Interpret the variances.
3. Suppose the cost function for variable overhead was \$3.84 per labor hour instead of \$5.76 per kayak. Compute the variable-overhead efficiency variance and the total overhead spending variance. Would these variances lead you to a different interpretation of the overhead variances from the interpretation in requirement 2? Explain.

8-47 Automation and Direct Labor as Overhead

Kilgore Precision Machining (KPM) has a highly automated manufacturing process for producing a variety of auto parts. Through the use of computer-aided manufacturing and robotics, the company has reduced its labor costs to only 5% of total manufacturing costs. Consequently, the company does not account for labor as a separate item but instead accounts for labor as part of overhead.

Consider a part used in antilock braking systems. The static budget for producing 750 units in March 20X1 is as follows:

Direct materials	\$18,000*
Overhead	
Supplies	1,875
Power	1,310
Rent and other building services	2,815
Factory labor	1,500
Depreciation	4,500
Total manufacturing costs	<u>\$30,000</u>

*3 lb/unit * \$8/lb * 750 units.

Supplies and power are variable, and the other overhead items are fixed costs. Actual costs in March 20X1 for producing 900 units of the brake part were as follows:

Direct materials	\$21,840*
Overhead	
Supplies	2,132
Power	1,612
Rent and other building services	2,775
Factory labor	1,618
Depreciation	4,500
Total manufacturing costs	<u>\$34,477</u>

*KPM purchased and used 2,800 pounds of materials at \$7.80 per pound.

1. Compute (a) the direct-materials price and quantity variances and (b) the flexible-budget variance for each overhead item.
2. Comment on the way KPM accounts for and controls factory labor.

8-48 Standard Material Allowances

Royal Chemical Products Ltd. produces and supplies chemical products for industrial use. The company is planning to introduce a new variant of its existing chemical product XV20 under the brand name XV20-Supreme. The new variant is 20% more effective as compared to its predecessor and hence cost efficient.

The new chemical solution is made by combining X-10 and V-10, boiling the mixture, adding a new chemical S-20 and bottling the resulting solution in 10-liter packs. The initial mix, which is

10 liters in volume, consists of 12 kilograms of X-10 and 9.6 liters of V-10. A 20% reduction in volume occurs during the boiling process. The solution is then cooled slightly before adding 5 kilograms of S-10 to each 10-liter container; the addition of S-10 does not affect the total liquid volume.

The purchase prices of the raw materials used in the manufacture of this new chemical solution are as follows:

X-10	\$4.40 per kilogram
V-10	\$9.20 per liter
S-10	\$6.40 per kilogram

Determine the standard quantity for each of the raw materials needed to produce 10 liters of XV-20 Supreme solution and the total standard materials cost of 10 liters of the new solution.

8-49 Role of Defective Units and Nonproductive Time in Setting Standards

Haig McNamee owns and operates McNamee Machining, a subcontractor to several aerospace industry contractors. When Mr. McNamee wins a bid to produce a piece of equipment, he sets standard costs for the production of the item. He then compares actual manufacturing costs with the standards to judge the efficiency of production.

In April 20X1, McNamee won a bid to produce 15,000 units of a shielded component used in a navigation device. Specifications for the component were very tight, and Mr. McNamee expected that on average 1 out of every 6 finished components would fail his final inspection, even if employees exercise every care in production. There was no way to identify defective items before production was complete. Therefore, the company had to produce 18,000 units to get 15,000 good components. The company set standards to include an allowance for the expected number of defective items.

Each final component contained 3.2 pounds of direct materials, and the company expected normal scrap from production to average an additional 0.4 pounds per unit. It expected the direct material to cost \$11.40 per pound plus \$.80 per pound for shipping and handling.

Machining of the components required close attention by skilled machinists. Each component required 4 hours of machining time. McNamee paid the machinists \$20 per hour, and they worked 40-hour weeks. Of the 40 hours, employees spent an average of 32 hours directly on production. The other 8 hours consisted of time for breaks and waiting time when machines were broken down or there was no work to be done. Nevertheless, the company considered all payments to machinists to be direct labor, whether or not they represented time spent directly on production. In addition to the basic wage rate, McNamee paid fringe benefits averaging \$6 per hour and payroll taxes of 10% of the basic wages.

Determine the standard cost of direct materials and direct labor for each good unit of output.

8-50 Review Problem

Quality Chocolate Company, Switzerland, uses standard costs and a flexible budget to control its manufacture of chocolate products. The following is the budgeted cost statement of the company for its 10-ounce Choco Bars.

Direct materials (11 ounce @ CHF0.06)	CHF0.66
Direct Labor (0.10 hours @ CHF2.00)	0.20
Standard Prime Cost	CHF0.86

Variable overhead is applied at 80% of direct labor costs. The company has a fixed cost CHF50,000 associated with this product.

During the month of December, 2020, the company experienced the following actual results:

1. Choco bars produced and sold: 200,000 units.
2. Direct materials: 2,240,000 ounces were used at an actual cost of CHF 0.0625 per ounce, for a total of CHF140,000.
3. Direct labor: 19,500 hours were used at an actual hourly rate of CHF2.10, for a total cost of CHF40,950.

Actual variable-overhead incurred was CHF33,000 and actual fixed cost was similar to what had been budgeted.

You are required to:

1. Prepare a statement showing budgeted and actual cost for actual production of 200,000 units.
2. Compute the price and quantity variances for direct materials and direct labor.
3. Evaluate the performance of the company.

8-51 Review Problem on Standards and Flexible Budgets; Answers Are Provided

The Des Moines Leather Company makes a variety of leather goods. It uses standard costs and a flexible budget to aid planning and control. Budgeted variable overhead at a 45,000-direct-labor-hour level is \$81,000.

During April, the company had a favorable variable-overhead efficiency variance of \$2,970. Material purchases were \$241,900. Actual direct-labor costs incurred were \$422,100. The direct-labor quantity variance was \$15,300 unfavorable. The actual average wage rate was \$.60 lower than the standard average wage rate.

The company uses a variable-overhead rate of 20% of standard direct-labor cost for flexible-budgeting purposes. Actual variable overhead for the month was \$92,250.

Compute the following amounts; use U or F to indicate whether variances are unfavorable or favorable.

1. Standard direct-labor cost per hour
2. Actual direct-labor hours worked
3. Total direct-labor price variance
4. Total flexible budget for direct-labor costs
5. Total direct-labor flexible-budget variance
6. Variable-overhead spending variance in total

8-51 Answers to Problem 8-51

1. \$9. The variable-overhead rate is \$1.80, obtained by dividing \$81,000 by 45,000 hours. Therefore, the direct-labor rate must be $\$1.80 \div 0.20 = \$9$.
2. 50,250 hours. Actual costs, $\$422,100 \div (\$9 - \$0.60) = 50,250$ hours.
3. \$30,150 F. $50,250$ actual hours $\times \$0.60 = \$30,150$.
4. \$436,950. Quantity variance was \$15,300 U. Therefore, excess hours must have been $\$15,300 \div \$9 = 1,700$. Consequently, standard hours allowed must be $50,250 - 1,700 = 48,550$. Flexible budget = $48,550 \times \$9 = \$436,950$.
5. \$14,850 F. $\$436,950 - \$422,100 = \$14,850$ F; or $\$30,150$ F $- \$15,300$ U = $\$14,850$ F.
6. \$7,830 U. Flexible budget = $48,550 \times 1.80 = \$87,390$. Total variance = $\$92,250 - \$87,390 = \$4,860$ U. Spending variance = Total variance $-$ Efficiency variance = $\$4,860 + \$2,970 = \$7,830$ U. Check: $\$92,250 - (0.20 \times \$422,100) = \$7,830$.

CASES

8-52 Activity and Flexible-Budget Variances

Several years ago, Methodist Hospital initiated its substance abuse program, which focused on counseling current and potential substance abusers. The program was funded by a grant from the state department of health that paid \$76 per visit for counseling. Pat Leizinger, CFO of Methodist Hospital, was concerned about the substance abuse program. It had never broken even and, thus, was subsidized by the other patients in the hospital. Mr. Leizinger was preparing the hospital's budget for 20X8, and he did not like the substance abuse program's financial situation. The results for 20X7 are shown below:

Revenues (\$76 per visit; 17,000 visits)	<u>\$1,292,000</u>
Cost of services:	
Supplies	\$ 114,750
Physician salaries	204,000
Nurse salaries	153,000
Overhead	<u>676,200</u>
Total direct cost of services	1,147,950
General and administrative expenses	<u>194,250</u>
Total expenses	<u>1,342,200</u>
Net loss	<u>\$ (50,200)</u>

Substance Abuse Program
20X7 Results

A recent cost analysis had determined the following facts about the behavior of costs in the substance abuse program:

- Supplies and physician and nurse salaries were totally variable with respect to number of visits within the range of 15,000–30,000.
- Variable overhead was equal to 20% of labor costs in 20X7; the remainder of the overhead was fixed.
- \$181,500 of the general and administrative cost was fixed; the remainder varied with number of visits.
- Costs in 20X8 are expected to behave the same as those in 20X7, except that variable-overhead costs will be 21% of labor costs in 20X8 compared to only 20% of labor costs in 20X7. (Fixed overhead costs will remain the same in 20X8 as in 20X7.)

Leizinger had been pressuring the director of the substance abuse program, Jody Lee, for the last couple of years to try to get her costs under control. Ms. Lee responded that it was a very important program for the community. Besides, the program was so close to breaking even that all it needed was a little more time and the results would be better. She predicted 18,000 visits in 20X8, an increase of nearly 6%, which would certainly make the financial picture brighter.

Leizinger agreed on the importance of the program, but he also said that pressures were building from others in Methodist Hospital to eliminate programs that were a drain on the hospital's resources. Thus, he believed that if the substance abuse program was not at least at a break-even point in 20X8, the program would be in jeopardy. He doesn't believe that even the increase of 1,000 visits would be enough to break even.

- Compute the cost function for the substance abuse program for use in budgeting for 20X8. That is, compute the variable cost per visit and the total annual fixed cost based on the cost analysis that Leizinger conducted.
- Compute the budgeted profit (loss) for 20X8, assuming that there will be 18,000 visits at \$76 each and the costs behave as expected.
- Suppose that Methodist Hospital accepted the budget for the substance abuse program that you computed in number 2. At the end of 20X8, the actual loss for the program was \$15,500 and the actual number of visits was 18,400. Explain the difference between the amount of loss you budgeted in number 2 and the actual loss of \$15,500 in as much detail as you can, given the information you have. Based on this, give a one-sentence answer to each of the following questions:
 - What was the financial impact of the extra 400 visits?
 - How well did the substance abuse program control its costs in 20X8?

8-53 Activity-Based Costing and Flexible Budgeting

A new printing department provides printing services to the other departments of Farmers & Mechanics Insurance Company (FMIC). Before the establishment of the in-house printing department, the departments contracted with external printers for their printing work. FMIC's printing policy is to charge departments for the variable printing costs on the basis of number of pages printed. The company recovers fixed costs in pricing of external jobs.

The first year's budget for the printing department was based on the department's expected total costs divided by the planned number of pages to be printed.

Most external government accounts and all internal jobs were expected to use only single-color printing. External commercial accounts use primarily four-color printing. FMIC estimated its variable costs based on the typical mix of single-color versus four-color printing and the average variable cost of printing a four-color page that is one-fourth graphics and three-fourths text. The expected annual costs for each division were as follows:

Department	Planned Pages Printed	Budgeted Charges	Estimated Cost per Page
Government accounts	120,000	\$ 90,000	
Commercial accounts	250,000	300,000	
Internal departments	50,000	30,000	
Total	<u>420,000</u>	<u>\$420,000</u>	\$1

After the first month of operations, the printing department announced that its variable cost estimate of \$1 per page was too low. The first month's actual costs were \$51,000 to print 40,000 pages.

Government accounts	9,000 pages
Commercial accounts	27,500
Central administration	3,500

Two reasons were cited for higher-than-expected costs: All departments were using more printing services than planned, and government and internal jobs were using more four-color printing and more graphics than anticipated in the original variable cost projections. The printing department also argued that it would have to purchase additional four-color printing equipment if demand for four-color printing continued to grow.

1. Compare the printing department actual results, static budget, and flexible budget for the month just completed.
2. Discuss possible reasons why the printing department static budget was inaccurate.
3. An ABC study completed by a consultant indicated that printing costs are driven by number of pages (at \$.35 per page), and use of colors (at \$1 extra per page for color).
 - a. Discuss the likely effects of using the ABC results for budgeting and control of printing department use.
 - b. Discuss the assumptions regarding cost behavior implied in the ABC study results.
 - c. All commercial accounts during the first month (27,500 pages) used four colors per page. Compare the cost of commercial accounts under the old and the proposed ABC system.

8-54 Analyzing Performance

Hopkins Community Hospital operates an outpatient clinic in a town several miles from the main hospital. For several years the clinic has struggled just to break even. The clinic's financial budget for 20X7 is shown below:

20X7 Budget			
	Total		Per Patient
Revenues (4,000 patients at \$180 each)		\$ 720,000	\$180
Cost of services			
Physicians	\$240,000		
Nurses and technicians	180,000		
Supplies	60,000		
Overhead	252,000	732,000	183
Net loss		\$ (12,000)	\$ (3)

On the average, billings for each patient-visit are expected to be \$180. Costs in 20X7 are expected to average \$183 per patient-visit, as follows:

Physician time	\$ 60
Nurse and technician time	45
Supplies	15
Overhead	63
Total	<u>\$183</u>

The clinic is generally staffed by one physician who must be present whether or not there is a patient to see. Currently, about 10% of the physician's time is idle. The clinic employs nurses and technicians to meet the actual workload necessitated by patient appointments. Their cost averages \$30 per hour, and usage varies proportionately with the number of patient-visits. Supplies cost is also variable with respect to patient-visits. Fixed overhead in 20X7 was expected to be \$180,000; the remaining \$72,000 of overhead varies with respect to patient visits. Included in the fixed overhead was \$30,000

of hospital-wide administrative costs that the hospital allocates to the clinic and \$37,500 of depreciation on the clinic's property and equipment.

Cindy Ryden, controller of Hopkins Community Hospital, reported the actual loss of \$20,200 in 20X7 shown next. This represented the fifth straight year of losses. She does not feel it is right for patients in the main hospital to subsidize those using the clinic. Therefore, she suggested that unless the situation could be changed, the clinic should be closed. Brett Johnson, administrative vice president of the hospital, charged with oversight of the clinic, disagreed: "We provide a valuable service to the community with the clinic. Even if we are losing money, it is worthwhile to keep it open."

At the end of 20X7, the clinic's actual results for the year were as follows:

		Total
Revenues (3,800 patients at \$180)		\$ 684,000
Cost of services		
Physicians	\$231,000	
Nurses and technicians (5,800 hours)	182,700	
Supplies	58,500	
Overhead	<u>232,000</u>	<u>704,200</u>
Net loss		<u>\$ (20,200)</u>

1. Would Hopkins Community Hospital have saved money in 20X7 if the outpatient clinic was closed? Explain.
2. Explain the difference between the budgeted loss of \$12,000 and the actual loss of \$20,200 (that is, the static-budget variance of \$8,200) in as much detail as possible. From the analysis of the 20X7 results, what actions would you suggest to avoid a loss in 20X8?

8-55 Complete Variance Analysis

Gates Video Games manufactures video game machines. Market saturation and technological innovations have caused pricing pressures that have resulted in declining profits. To stem the slide in profits until the company can introduce new products, top management has turned its attention to both manufacturing economies and increased production. To realize these objectives, management developed an incentive program to reward production managers who contribute to an increase in the number of units produced and achieve cost reductions. In addition, the company instituted a JIT purchasing program so that it purchases raw materials on an as-needed basis.

The production managers have responded to the pressure to improve manufacturing performance in several ways that have resulted in an increase over normal production levels. The video game machines put together by the assembly group require parts from both the printed circuit boards (PCB) and the reading heads (RH) departments. To attain increased production levels, the PCB and RH departments started rejecting parts from suppliers that previously would have been tested and modified to meet manufacturing standards. Preventive maintenance on machines used in the production of these parts has been postponed with only emergency repair work being performed to keep production lines moving. The maintenance staff is concerned that there will be serious breakdowns and unsafe operating conditions.

The more aggressive assembly group production supervisors have pressured maintenance personnel to attend to their machines at the expense of other groups. This has resulted in machine downtime in the PCB and RH departments which, when coupled with demands for accelerated parts delivery by the assembly department, has led to more frequent parts rejections and increased friction among departments. Gates Video Games operates under a standard-costing system. The standard costs at a production level of 24,000 units per year are in part A of Exhibit 8-13.

Exhibit 8-13

Gates Video Games

Standard Cost per Unit			
	Quantity	Cost	Total
A. Standard Cost Report			
Direct materials:			
Housing unit	1 unit	\$ 20	\$ 20
Printed circuit boards (PCB)	2 boards	15	30
Reading heads (RH)	4 heads	10	40
Direct labor:			
Assembly department	2.0 hours	8	\$ 16
PCB department	1.0 hour	9	9
RH department	1.5 hours	10	15
Overhead:			
Variable	4.5 hours	\$ 2	\$ 9
Fixed	4.5 hours	4	<u>18</u>
Total manufacturing cost per unit			\$157
Selling and administrative:			
Fixed		\$ 12	<u>\$ 12</u>
Total standard cost per unit			<u>\$169</u>
B. Income Statement for May			
Revenues (2,200 units)		\$440,000	
Variable costs:			
Direct materials	220,400		
Direct labor	93,460		
Variable overhead	18,800		
Fixed costs:			
Overhead	37,600		
Selling and administrative	<u>22,000</u>		
Total costs		<u>392,260</u>	
Income before taxes		<u>\$ 47,740</u>	
C. Usage Report for May			
Cost Item	Actual Quantity	Actual Cost	
Direct materials:			
Housing units	2,200 units	\$ 44,000	
Printed circuit boards	4,700 boards	75,200	
Reading heads	9,200 heads	101,200	
Direct labor:			
Assembly department	3,900 hours	31,200	
PCB department	2,400 hours	23,760	
RH department	3,500 hours	38,500	
Overhead:			
Variable		18,800	
Fixed		<u>37,600</u>	
Total manufacturing costs		<u>\$370,260</u>	

Gates Video Games prepares monthly income statements based on actual expenses. Part B of Exhibit 8-13 shows the statement for May, when production and sales both reached 2,200 units. The budgeted sales price was \$200 per unit, and budgeted (normal) production and sales were 24,000 units per year. Top management was surprised by the low profit in spite of increased sales for May. The original budget had called for income before taxes of \$62,000, and with the added sales, the president had expected at least \$68,200 of income (\$6,200 more income; 200 extra units × \$31 per unit).

The president called on Michelle Barber, director of cost management, to report on the reasons for the shortfall in income. After a thorough review of the data, Barber prepared the report in part C of Exhibit 8-13.

1. Prepare a budgeted income statement in contribution margin format for Gates Video Games showing why the company expected income before taxes to be \$62,000.
2. Assume that you have been given Michelle Barber's task. Prepare a complete analysis explaining the reason for the difference between the original projected income before taxes of \$62,000 and the actual of \$47,740. Compute all the variances that are helpful in explaining this difference, and explain what you learn from the variances.

NIKE IO-K PROBLEM

8-56 Performance Standards

Examine **Nike's** income statement shown in condensed form as "Results of Operations" for fiscal years 2019, 2020, and 2021 in Appendix C. Suppose that Nike used results for 2020 to set standards for 2021. Assume that cost of sales is a variable cost and that selling and administrative costs are fixed costs and that income is simply revenue—cost of sales—selling and administrative costs. Prepare a static budget based on the assumption that sales and cost of sales (variable costs) will grow by 10%. Prepare a flexible budget based on the sales level achieved for 2021. Using the actual results for 2021, determine the static-budget variances, the sales-activity variances, and the flexible-budget variances for sales, cost of sales, selling and administrative costs, and income.

EXCEL APPLICATION EXERCISE

8-57 Flexible-Budget and Sales-Activity Variances

Goal: Create an Excel spreadsheet to prepare a summary performance report that identifies flexible-budget and sales-activity variances. Use the results to answer questions about your findings.

Scenario: David Campbell Tax Services has asked you to prepare a summary performance report identifying its flexible-budget and sales-activity variances. The background data for the summary performance report appears in the Fundamental Assignment Material 8-B1. Prepare the summary performance report using a format similar to Exhibit 8-6.

When you have completed your spreadsheet, answer the following questions:

1. What caused the flexible-budget variance for sales?
2. What was the change in actual income compared to the income calculated in the static budget?
3. Can the amount in question 2 be explained by the flexible-budget and sales-activity variances? Explain.

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 8 Decision Guideline
Row 2: Campbell Tax Services
Row 3: Summary Performance Report
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–H.
4. In column A, create the following row headings:
Row 8: Clients
Skip a row.
Row 10: Sales
Row 11: Variable Costs
Row 12: Contribution Margin
Row 13: Fixed Costs
Skip a row.
Row 15: Operating Income
5. Change the format of Contribution margin (row 12) and Operating income (row 15) to boldfaced headings.
Note: Adjust width of column A to accommodate row headings.
6. In row 7, create the following bold-faced, center-justified column headings:
Column B: Actual Results at Actual Activity
Column C: Flexible-Budget Variances

Skip a column.

Column E: Flexible Budget at Actual Activity

Column F: Sales-Activity Variances

Skip a column.

Column H: Static Budget

7. Change the format of the column headings in row 7 to permit the titles to be displayed on multiple lines within a single cell.

Alignment tab: Wrap Text: Checked

Note: Adjust column widths so that headings use only two lines. Adjust row height to ensure that row is same height as adjusted headings.

8. Change format of the column width of columns D and G to a size of 2.
9. Use the scenario data to fill in client and fixed cost amounts for actual, flexible-budget, and static-budget columns as well as variable costs for the actual column.
10. Calculate variable costs for flexible-budget and static budget columns. Use appropriate formulas to calculate sales, contribution margin, and operating income amounts for actual, flexible-budget, and static-budget columns.
11. Use appropriate formulas to calculate flexible-budget variances as actual – flexible budget and sales-activity variances as flexible budget – static budget and display as absolute values.

$$= \text{ABS}(\text{variance formula})$$
12. To indicate whether variances are favorable (F) or unfavorable (U), use one of the following formula templates:
 For sales, margin and income variances and for client variances,

$$= \text{IF}(\text{variance formula} > 0, "F", \text{IF}(\text{variance formula} < 0, "U", "-"))$$
 For clients, variable and fixed cost variances,

$$= \text{IF}(\text{variance formula} < 0, "F", \text{IF}(\text{variance formula} > 0, "U", "-"))$$

(Hint: Go to the "Help" text and type "copy formulas" in the search area to obtain instructions for copying formulas from one cell to another. If done correctly, you should have to type in each of the formula templates only once.)
13. Format all amounts as follows:

Number: Category:
 Decimal places: 0
 Symbol: None
 Negative numbers: Red with parentheses

14. Change the format of the amounts for sales, contribution margin, and operating income to display a dollar symbol.
15. Change the format of the operating income amounts for actual, flexible budget, and static budget to display as bold.
16. Change the format of the row headings for contribution margin and operating income to display as indented.

Alignment tab: Horizontal: Left (Indent)
 Indent: 1

Note: Adjust width of column A to accommodate row headings.

17. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape format in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

8-58 Setting Standards

Form groups of two to six persons each. The groups should each select a simple product or service. Be creative, but do not pick a product or service that is too complex. For those having difficulty choosing a product or service, some possibilities are as follows:

- One dozen chocolate-chip cookies
 - A 10-mile taxi ride
 - One copy of a 100-page course syllabus
 - A machine-knit wool sweater
 - A hand-knit wool sweater
 - One hour of lawn mowing and fertilizing
 - A hammer
1. Each student should individually estimate the direct materials and direct labor inputs needed to produce the product or service. For each type of direct material and direct labor, determine the standard quantity and standard price. Also, identify the overhead support needed, and determine the standard overhead cost of the product or service. The result should be a total standard cost for the product or service.
 2. Each group should compare the estimates of its members. Where estimates differ, determine why there were differences. Did assumptions differ? Did some members have more knowledge about the product or service than others? Form a group estimate of the standard cost of the product or service.
 3. After the group has agreed on a standard cost, discuss the process used to arrive at the cost. What assumptions did the group make? Is the standard cost an “ideal” standard or a “currently attainable” standard? Note how widely standard costs can vary depending on assumptions and knowledge of the production process.

INTERNET EXERCISE

8-59 Flexible Budgets at Hershey Food Corporation

This chapter focused on flexible budgets and variance analysis. While the information used to determine both of these is generally for internal purposes only and not available to an outsider, it is possible to look at what information a firm reports and, based on that information, to make some judgments about what occurred.

1. Look at the **Hershey Company** home page at www.hersheyland.com. Who is Hershey’s home page directed to? What are the most prominent items on the page? Where do you find financial information?
2. Click on “Investors” at the end of the page, and then “Reports and Filings.” Examine Hershey’s income statement from its most recent 10-K in “Annual Reports.” Prepare a static budget for income before income taxes based on the assumption that net sales and variable costs are expected to increase by 4% for the next fiscal year. Assume that cost of sales is the only variable cost and that all other costs are fixed costs. (The assumption that all other costs—including items such as realignment and impairment charges, gains on sales of businesses, and other such one-time charges—are fixed costs, is a simplification. A more realistic assumption might be that these are nonrecurring costs.)
3. Now, suppose that selling prices were exactly as budgeted in question 2, but sales and variable costs actually increased by 6% and fixed costs increased by 1%. Determine the static-budget variance, the sales-activity variance, and the flexible-budget variance for operating income.

Management Control Systems and Responsibility Accounting

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Describe the relationship of management control systems to organizational goals.
2. Explain the importance of evaluating performance and describe how it impacts motivation, goal congruence, and employee effort.
3. Develop performance measures and use them to monitor the achievements of an organization.
4. Use responsibility accounting to define an organizational subunit as a cost center, a profit center, or an investment center.
5. Prepare segment income statements for evaluating profit and investment centers using the contribution margin and controllable-cost concepts.
6. Measure performance against nonfinancial performance measures such as quality, cycle time, and productivity.
7. Use a balanced scorecard to integrate financial and nonfinancial measures of performance.
8. Describe the difficulties of management control in service and nonprofit organizations.

► HEALTH NET

It's 2:30 AM. You don't feel well. Should you call your doctor? Go to the emergency room? Is what you're feeling really something to worry about? What you need is good quality healthcare and you need it now, not tomorrow morning, and you do not want to worry about its cost. Sound familiar? This is a dilemma that we have all faced at some time. One healthcare organization that has a solution is **Health Net, LLC**, a subsidiary of **Centene Corporation**, one of the largest managed healthcare organizations in the United States. With approximately 3,000 employees and 85,000 network providers, they serve more than 3 million members (around 1 in 12 Californians).

Healthcare organizations must compete just as any other business, offering high-quality healthcare at an affordable cost. To maintain its competitive advantage, Health Net undertook a major information systems development program called "fourth generation medical management." According to Dr. Malik Hasan, former chairman and CEO, Health Net created this new management control system "because the greatest opportunity for increasing overall quality and decreasing the cost of healthcare lies in managing patient care by seamlessly linking the entire healthcare delivery system electronically." The system "gives physicians and healthcare providers instant, user-friendly electronic access to comprehensive information about a patient's medical history and the best clinical treatments recommended."

The result? A fast and preapproved referral to the best clinical resource, whether it be a specialist, the emergency room or urgent care center, your regular physician, or safe self-care. In other words, a satisfied customer! And as a bonus, costs are reduced. As former Medical Director John Danaher, MD, explains, "Paper charting and duplicative lab and radiology tests are eliminated."

This chapter builds on concepts developed in previous chapters to explore how managers blend the individual tools of management accounting to help achieve organizational goals. Tools such as activity-based costing, relevant costing, budgeting, and variance analysis are useful by themselves. They are most useful, however, when they are parts of an integrated system—a comprehensive plan to coordinate and evaluate all the activities of the organization’s value chain. Just as in the case of Health Net, managers of most organizations today realize that long-run success requires a focus on cost, quality, and service—the three components of the competitive edge. This chapter considers how the management control system helps managers achieve such a focus. As you will see, no single management control system is inherently superior to another. The “best” system for any organization is the one that most consistently leads to actions that meet the organization’s goals and objectives. ■



Indiapicture/Alamy Stock Photo

Management Control Systems

A **management control system** is an integrated set of techniques for gathering and using information to make planning and control decisions, for motivating employee behavior, and for evaluating performance. A well-designed management control system supports and coordinates the decision-making process and motivates individuals throughout the organization to act in concert. It also facilitates forecasting and budgeting. An effective management control system should

- clearly define and communicate the organization’s goals,
- ensure that managers and employees understand the specific actions required to achieve organizational goals,
- communicate results of actions across the organization, and
- motivate managers and employees to achieve the organization’s goals.

Exhibit 9-1 describes elements of the planning and control processes. As we pointed out in Chapter 1, planning and control are so strongly interrelated that it is somewhat artificial to separate them in practice. To the extent we can separate them, planning includes defining goals (A) and establishing and carrying out plans to achieve the goals (B). Control includes measuring and reporting results (C) and performance evaluation (D). The clockwise ordering of the elements represents the order that managers would naturally follow when designing and evaluating the management control system. However, once an organization has implemented the control system, it continues to adapt and revise the interrelated elements through feedback and learning. For example, the organization may revise the measures used to monitor and report in C to better fit with the goals in A. Similarly, it might realign the performance evaluation system in D to better fit with the specific plans and objectives in B. We will refer to Exhibit 9-1 often as we consider the design and operation of management control systems.

Management Control Systems and Organizational Goals

The first and most basic component in a management control system is the organization’s goals. Top managers set organization-wide goals, performance measures, and targets. These goals provide a long-term framework around which an organization will form its comprehensive plan for positioning itself in the market. Goals address the question in Exhibit 9-1, “What do we want to achieve?” However, goals without performance measures do not motivate managers.

A basic adage of management control is that “you get what you measure.” Because measures of performance set direction and motivate managers’ decisions, every performance measure should be consistent with organizational goals. Otherwise, managers who achieve high performance measures may not create value for the company and its owners. An ideal management control system should include at least one performance measure related to every goal. The book *Cracking the Value Code* states this succinctly when it says that we tend to “value what we measure but we do not always measure what we value.”

Doctors and managers at Health Net use a state-of-the-art medical management system and management control system to offer high-quality healthcare at an affordable price.

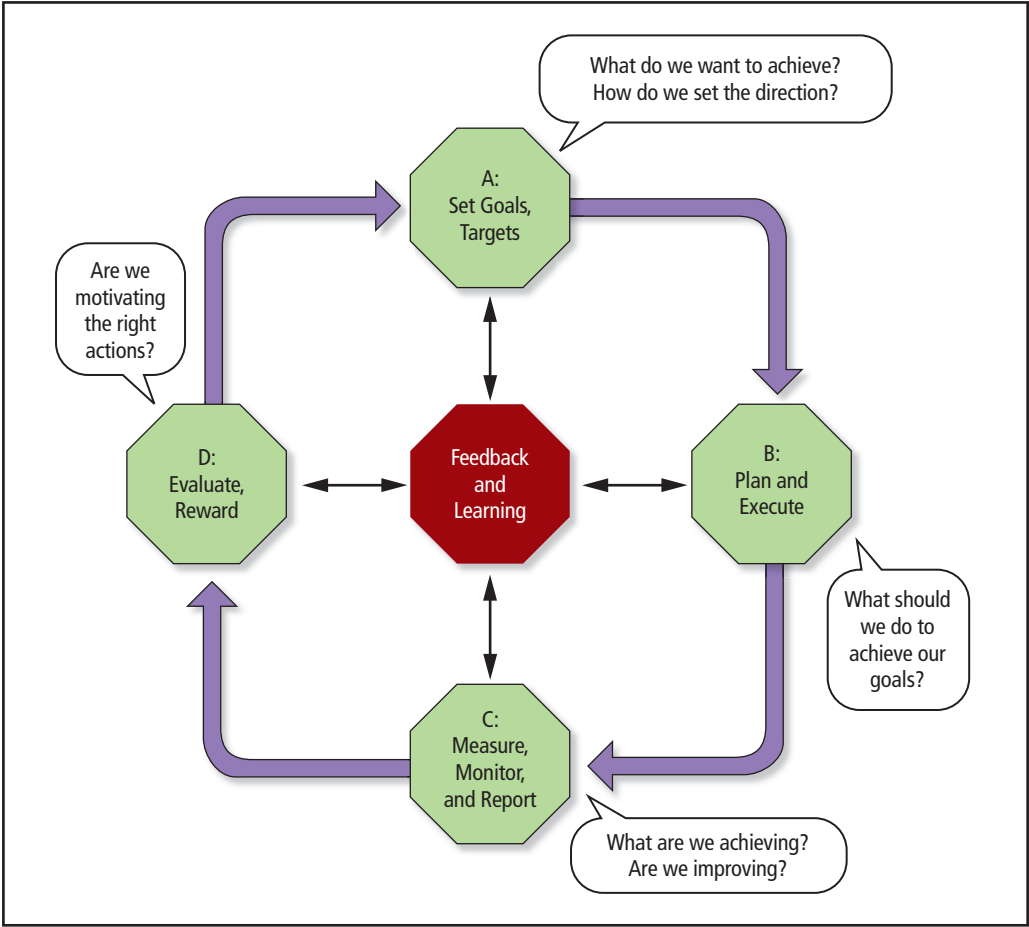
management control system

An integrated set of techniques for gathering and using information to make planning and control decisions, for motivating employee behavior, and for evaluating performance.

Objective 1

Describe the relationship of management control systems to organizational goals.

Exhibit 9-1
The Management Control
System



To illustrate, suppose a hotel such as the Swiss-based **Mövenpick** has the following organizational goals and related performance measures:

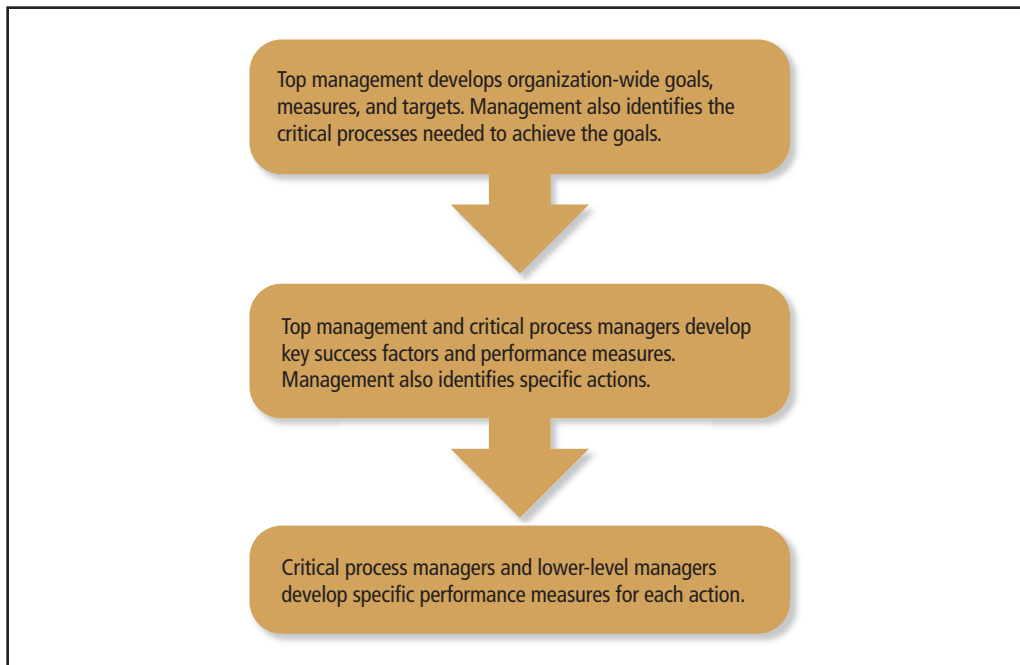
Organizational Goals	Performance Measures
Exceed guest expectations	• Customer satisfaction index • Number of repeat stays
Maximize revenue yield	• Occupancy rate • Average room rate • Income before fixed costs
Focus on innovation	• New products/services implemented per year • Number of employee suggestions

The company sets quantifiable targets for each of the measures. For example, the target for occupancy rate might be “at least 70%.” Note that every goal has at least one performance measure, and every measure is related to at least one goal.

Exhibit 9-2 illustrates how managers set goals and objectives and develop related performance measures for the organization. Performance measures become more specific as we move to lower levels of the organization. For example, higher-level managers work with subordinates within each business unit to select specific short-term actions (or activities) that managers can carry out, along with observable performance measures. One approach to selecting these actions and measures is for top managers to identify **key success factors**—characteristics or attributes that managers must achieve in order to drive the organization toward its goals. For example, at Mövenpick, a key success factor for the goal to exceed guest expectations might be timeliness. This key success factor suggests that Mövenpick should consider specific actions, such as

key success factors

Characteristics or attributes that managers must achieve in order to drive the organization toward its goals.

**Exhibit 9-2**

Translating Goals and Objectives into Performance Measures

implementing an express check-in system. In addition, it should measure timeliness by using performance measures, such as time to check in, time to check out, and response time to guest requests (for example, number of rings before someone at the front desk answers the telephone).

Balancing various goals is an important part of designing a management control system. Managers often face trade-offs. For example, a manager may meet a goal of increased customer satisfaction by establishing a more generous policy for accepting returned merchandise. However, this policy will also impose additional costs that decrease short-term profitability. Choosing the best trade-off between short-term profitability and long-term customer satisfaction is often difficult, especially when the long-term benefits of increased customer satisfaction are hard to predict.

Designing Management Control Systems

To design a management control system that meets the organization's needs, managers must identify what motivates employees, develop performance measures based on these motivations, and establish a monitoring and reporting structure for these measures. Let's look at each of these.

Motivating Employees

An important goal of the management control system is to motivate employees to work in the best interests of the organization. A good management control system fosters both goal congruence and managerial effort. A system fosters **goal congruence** when employees, responding to the incentives created by the control system, make decisions that help meet the overall goals of the organization. To be effective, goal congruence must be accompanied by **managerial effort**—exertion toward a goal or objective—including not only working harder or faster but also working smarter. It includes all conscious actions (such as supervising, planning, and analysis) that result in more efficiency and effectiveness.

As we saw in Exhibit 9-1, the challenge of management control system design is to induce (or at least not discourage) employee decisions that achieve organizational goals. For example, an organization may identify continuous improvement in employee efficiency and effectiveness as one of its goals. Employees, however, might perceive that continuous improvements will result in tighter standards, faster pace of work, and loss of jobs. Even though they may agree with management that continuous improvements are competitively necessary, management should not expect them to exert effort for continuous improvements unless rewards are in place to make this effort in their own best interests.

Objective 2

Explain the importance of evaluating performance and describe how it impacts motivation, goal congruence, and employee effort.

goal congruence

A condition where employees, responding to the incentives created by the control system, make decisions that help meet the overall goals of the organization.

managerial effort

Exertion toward a goal or objective, including all conscious actions (such as supervising, planning, and thinking) that result in more efficiency and effectiveness.

motivation

The drive that creates effort and action toward a goal.

As another example, students may enroll in a college course because their goal is to learn about management accounting. The faculty and the students share the same goal, but goal congruence is not enough. Faculty also introduce a grading system to reward student effort. Grading is a form of performance evaluation, similar to organizations using management control reports for raises, promotions, and other forms of rewards. Performance evaluation improves effort because most individuals tend to perform better when performance reports lead directly to personal rewards. Thus, manufacturers that set quality improvements as critical organizational goals, such as **Allen-Bradley** and **Corning**, put quality targets into the bonus plans of top managers and factory workers.

Motivation—the drive that creates effort and action toward a goal—is key to management control. Yet employees differ widely in their motivations. This makes the system designer’s task complex and ill-structured. Each system must fit the specific organizational environment and behavioral characteristics of the employees. The system designer must align individuals’ self-interests with the goals of the organization. Thus, the designer must predict the motivational impact of a particular system—how it will cause people to respond—and compare it to the motivational impact of other potential systems. Designing performance measures is not a back-office accounting task. It requires direction from top management and the direct involvement of those affected. Stephen Kaufman, former chairman of the board of **Arrow Electronics** put it this way: “It’s very difficult to define the right metric and anticipate exactly how your people will react to it. Your best chance of knowing whether it will have the intended effect is to talk to the people directly involved.”

All management control tools, such as budgets and variances, should constructively influence behavior. These tools are most effective when managers use them positively to encourage employees to improve performance, rather than negatively to punish, place blame, or find fault. Used negatively, these tools pose a threat to employees, who will resist the use of such techniques. Critics have pointed to **Enron**’s management control system as a major cause of the company’s problems. Employees were heavily rewarded for good performance. More importantly, the employees who were ranked lowest at each evaluation were fired. This created intense competition, which at first seemed to create exceptional performance levels for the company. Later, it became clear that the pressure for good performance caused some employees to use unethical methods to increase their performance measures, which eventually led to the demise of the company.

Developing Performance Measures

For most organizations, an effective management control system requires multiple performance measures, including both financial and nonfinancial measures, where the measures have the following characteristics:

1. Reflect key actions and activities that relate to the goals of the organization
2. Affected by actions of managers and employees
3. Readily understood by employees
4. Reasonably objective and easily measured
5. Used consistently and regularly in evaluating and rewarding managers and employees
6. Balance long-term and short-term concerns

Sometimes accountants and managers focus too much on financial measures—such as operating budgets, profit targets, or required return on investment—because the accounting system readily produces such measures. Further, it is often difficult to construct performance measures for nonfinancial goals such as customer satisfaction, improvements in quality, environmental stewardship, social responsibility, and organizational learning, which many companies list as key goals. However, well-designed management control systems develop and report both financial and nonfinancial measures of performance because “You can’t manage something you can’t measure.”

Nonfinancial measures often motivate employees toward achieving important performance goals. For example, **AT&T Universal Card Services**, which received the prestigious Baldrige National Quality Award (presented by the U.S. Department of Commerce), used 18 performance measures for its customer inquiries process. These measures include average speed of

Objective 3

Develop performance measures and use them to monitor the achievements of an organization.

Business First

Performance Measures in Practice

An organization's performance measures depend on its goals and objectives. For example, a software company and an auto manufacturer have different goals and objectives and therefore have different performance measures. The measures also must span a variety of key success factors for the organization. Performance measures too focused on one aspect of performance may foster neglect of other important factors.

Let's look at a classic management control system, the one developed by **General Electric** in the 1950s. The system focused on eight "key result areas," as GE called them:

Financial Key Result Areas

1. Profitability
2. Productivity
3. Market position

Nonfinancial Key Result Areas

4. Product leadership
5. Personnel development
6. Employee attitudes
7. Public responsibility
8. Balance between short-run and long-range goals

Measures in each of these eight areas are just as relevant today as in the 1950s. These are clearly long-run strategic goals. Measures might change as an organization adapts the means of achieving the goals, but the basic framework of a

management control system does not need to change as management fads come and go.

A more recent example is **Southwest Airlines**. The mission of Southwest Airlines is "dedication to the highest quality of customer service delivered with a sense of warmth, friendliness, individual pride, and company spirit." Yet, until recently, the company focused mainly on financial measures in evaluating managers. Recently, Southwest introduced nonfinancial measures into the mix, including the following:

- Load factor (percentage of seats occupied)
- Utilization factors on aircraft and personnel
- On-time performance
- Available seat miles
- Denied boarding rate
- Lost bag reports per 10,000 passengers
- Flight cancellation rate
- Employee head count
- Customer complaints per 10,000 passengers

By including nonfinancial measures, Southwest focuses managers' attention on the key success factors that relate most closely to Southwest's mission and goals.

Sources: David Solomons, *Divisional Performance: Measurement and Control* (Homewood, IL: Irwin, 1965); and Southwest Airlines Web site (www.southwest.com).

answer, abandon rate, and application processing time (3 days compared to the industry average of 34 days).

Financial measures often are lagging indicators that arrive too late to help prevent problems and ensure the organization's health. The effects of poor nonfinancial performance (for example, lack of organizational learning and low customer satisfaction) may not show up in the financial measures until the company has lost considerable ground. Many companies now stress management of the activities that drive revenues and costs, rather than waiting to explain the revenues or costs themselves. Superior financial performance usually follows from superior nonfinancial performance. Examples of both financial and nonfinancial measures are in the accompanying Business First box.

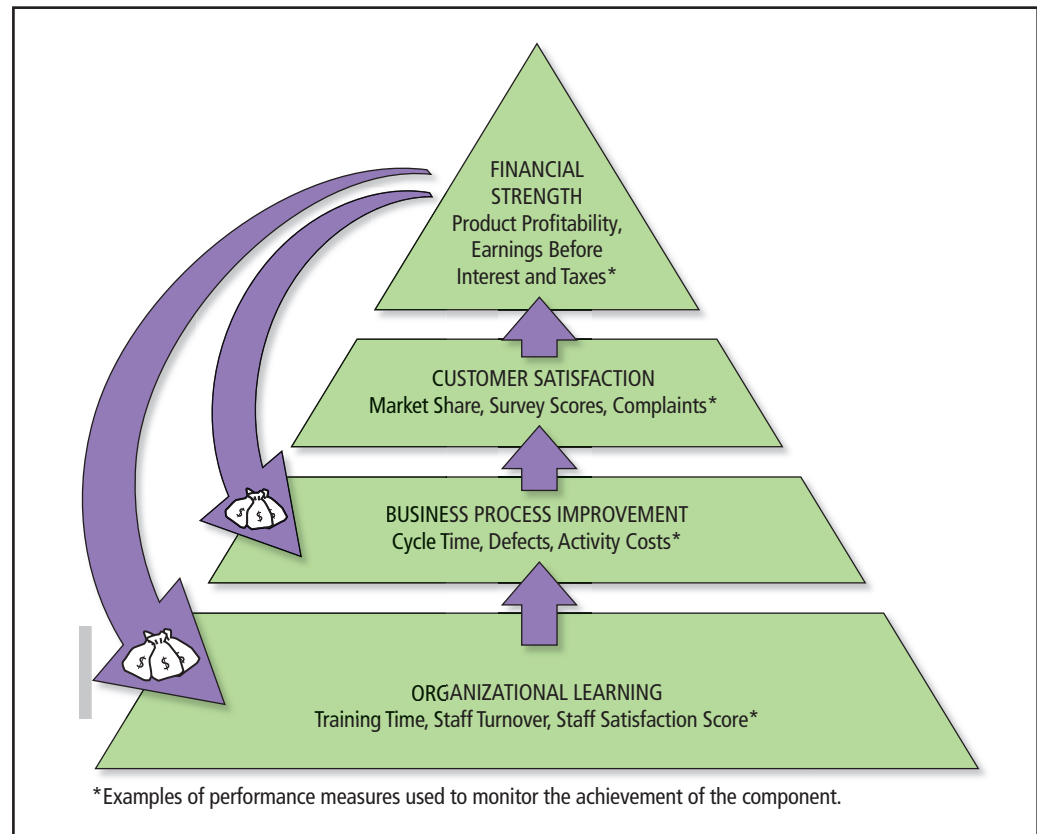
Monitoring and Reporting Results

Notice that Exhibit 9-1 has feedback and learning at the center of the management control system. Organization-wide learning is fundamental to gaining and maintaining financial strength. Some management experts have said that the only sustainable competitive advantage is the rate at which a company's managers learn. **Harley-Davidson**, a company with 2019 sales of about \$5.36 billion, emphasizes learning for operational excellence—eliminating waste, improving quality, and helping drive customer satisfaction.

Once a company has superior intellectual capital, how can it best maintain its leadership? Exhibit 9-3 shows how organizational learning leads to financial strength. Measures such as training time, employee turnover, and staff satisfaction scores on employee surveys monitor organizational learning. The result of learning is continuous process improvement. Measures such as lead time, number of defects (quality), and activity costs can assess improvement. Customers will value improved response time, higher quality, and lower prices and will increase their demand for products and services. Increased demand, combined with lower costs to make and deliver products and services, results in improved product profitability and earnings.

Exhibit 9-3

The Components of a Successful Organization and Measures of Achievement



Successful organizations continuously repeat this cycle, where learning leads to process improvements, which lead to increased customer satisfaction, which leads to improved financial strength, which provides the financial resources required to begin a new cycle of learning and process improvements.

There are no guarantees that each of the components automatically follows from success at the previous component. If efforts are not coordinated throughout the value chain, the cause-effect links can be broken. For example, new and improved products or services may fail if marketing and distribution techniques do not place them at the location desired by the customer. As another example, development of a great Web site does no good if customers never visit the site. The point is that improvement in business processes must be coordinated across all parts of the value chain.

Another message from Exhibit 9-3 is that a key driver of enterprise performance is the culture within the company that fosters continual learning and growth at all levels of management. It is not sufficient to use money to train managers without making sure that the resulting learning translates into improved processes, products, and services. This requires a culture of learning that motivates managers to translate learning into growth.

General Electric provides a good example of the application of the enterprise learning culture. With sales of nearly \$75.619 billion (2020), GE has demonstrated a remarkable ability to generate formidable profits with products ranging from aircraft engines to medical imaging to business and consumer financing. GE employs more than 205,000 people worldwide. In 2012, GE was fifteenth on *Fortune* magazine's "Most Admired Company in America," and in 2020, GE was listed in *Fortune 500* as the thirty-third largest business in the United States by gross revenue.

Just before he retired in 2001, former CEO Jack Welch attributed GE's success to

... a General Electric culture that values the contributions of every individual, thrives on learning, thirsts for the better idea, and has the flexibility and speed to put the better idea into action every day. We are a learning company, a company that studies its own successes and failures and those of others—a company that has the self-confidence and the resources to take big swings and pursue numerous opportunities based on winning ideas

and insights, regardless of their source. That appetite for learning, and the ability to act quickly on that learning, will provide GE with what we believe is an insurmountable and sustainable competitive advantage.

Exactly what did John Welch mean by the “ability to act quickly on that learning”? According to Welch, GE “opened [its] culture up to ideas from everyone, everywhere, killed NIH (Not Invented Here) thinking, decimated the bureaucracy, and made boundaryless behavior a reflexive and natural part of our culture, thereby creating the learning culture.” His successor, Jeff Immelt, points out another important part of the GE learning culture—openness to dropping old management approaches in favor of new and better techniques: “Most people inside GE learn from the past but have a healthy disrespect for history. They have an ability to live in the moment and not be burdened by the past, which is extremely important.”

Weighing Costs and Benefits

The designer of a management control system must always weigh the costs and benefits of various alternatives. Benefits and costs of management control systems are often difficult to measure, and both may become apparent only after implementation. For example, the director of accounting policy of **Citicorp** stated that, after using a very detailed management control system for several years, the system proved to be too costly to administer relative to the perceived benefits. Accordingly, Citicorp returned to a simpler, less costly—though less detailed—management control system. In contrast, **Home Depot** added detail in the form of additional metrics to its management control system. When employees asked then-CEO Bob Nardelli why they should use the new metrics, he compared the metrics to gauges in a car: “Why do you need a gas gauge? Why do you need a speedometer?” He believed the metrics were worth the cost because they help top management know what is occurring throughout the company.

Summary Problem for Your Review

PROBLEM

The Blue Harbor Inn is developing performance measures for each of its major goals. Top management established an organization-wide goal to “exceed guest expectations.” Among the key success factors are timeliness of customer service and quality of personalized service. Patty Bowen, vice president of sales, is the manager responsible for the actions required to meet the goal of exceeding guest expectations. She has already identified one action (objective) for the coming year—upgrade customer service department capabilities.

1. Identify several possible performance measures for the quality-of-personalized-service key success factor.
2. Recommend several specific actions or activities associated with upgrading customer service department capabilities that would drive Luxury Suites toward its goal of exceeding customer expectations.

SOLUTION

1. Performance measures for the quality of personalized service might include the number of changes to registration, rating on the “friendly, knowledgeable staff” question on the guest survey, number of complaints, percentage of return guests, and percentage of customers with completed customer profile (which profiles the special needs of customers).
2. Specific actions or activities might include training employees, implementing a call checklist (list of services and options available to the guest) and monitoring compliance with the list, developing a customer satisfaction survey, and reengineering the guest registration and reservation processes.

Controllability and Measurement of Financial Performance

controllable cost

Any cost that a manager's decisions and actions can influence.

uncontrollable cost

Any cost that the management of a responsibility center cannot affect within a given time span.

Management control systems often distinguish between controllable and uncontrollable events and between controllable and uncontrollable costs. These terms refer to relative rather than absolute controllability—no cost is completely under the control of a manager. A **controllable cost** is one that a manager's decisions and actions can influence to a reasonable extent. An **uncontrollable cost** is any cost that management cannot reasonably affect within a given time span. For example, India's **Reliance Industries Limited** (RIL) is likely to consider the cost of the crude oil used to make various chemicals as uncontrollable by the manager of a chemical factory because the manager cannot control the market price of crude oil. On the other hand, Reliance Industries is likely to consider labor costs as controllable by the factory manager even though there are some aspects of labor costs that are not controlled by the manager, such as the effects of union contracts on pay rates and labor usage.

The distinction between controllable and uncontrollable costs is used in evaluating the performance of a manager. Costs that are completely uncontrollable provide no insight into a manager's decisions and actions because, by definition, manager actions will not affect uncontrollable costs. In contrast, controllable costs provide evidence about costs that are affected by the manager's decisions.

Identifying Responsibility Centers

Objective 4

Use responsibility accounting to define an organizational subunit as a cost center, a profit center, or an investment center.

responsibility center

A set of activities and resources assigned to a manager, a group of managers, or other employees.

Designers of management control systems identify the responsibilities of each manager by establishing responsibility centers based on what a manager can control. A **responsibility center** is a set of activities and resources assigned to a manager, a group of managers, or other employees. A set of machines and machining activities, for example, may be a responsibility center for a production supervisor. The full production department may be a responsibility center for the department head. Finally, the entire organization may be a responsibility center for the president. In some organizations, groups of employees share management responsibility to create wide "ownership" of management decisions, to allow creative decision making, and to prevent one person's concern (or lack of concern) over risk from dominating decisions.

An effective management control system gives each manager responsibility for a group of activities and actions and then, as Exhibit 9-1 shows, monitors and reports on (1) the results of the activities and (2) the manager's influence on those results. Such a system has intrinsic appeal for most top managers (because it helps them delegate decision making and frees them to focus on more strategic issues) and lower-level managers (who value the decision-making autonomy they inherit). Thus, system designers apply **responsibility accounting** to identify what parts of the organization have primary responsibility for each action, develop performance measures and targets, and design reports of these measures by responsibility center. Responsibility centers usually have multiple goals and actions that the management control system monitors. We classify responsibility centers as cost centers, profit centers, or investment centers based on their managers' primary financial responsibilities.

responsibility accounting

Identifying what parts of the organization have primary responsibility for each action, developing performance measures and targets, and designing reports of these measures by responsibility center.

cost center

A responsibility center in which managers are responsible for costs only.

COST, PROFIT, AND INVESTMENT CENTERS In a **cost center**, managers are responsible for costs only. A cost center may encompass an entire department, or a department may contain several cost centers. For example, although one manager may supervise an assembly department, the department may contain several assembly lines and each assembly line may be considered a separate cost center. Likewise, within each line, each separate machine may be its own cost center. The determination of the number of cost centers depends on cost-benefit considerations—do the benefits (for planning, control, and evaluation) of smaller, more numerous cost centers exceed the higher costs of reporting?

profit center

A responsibility center in which managers are responsible for revenues as well as costs—that is, profitability.

In a **profit center** managers are responsible for controlling revenues as well as costs—that is, profitability. Despite the name, a profit center can exist in nonprofit organizations (though it might not be referred to as such) when a responsibility center receives revenues for its services. For example, **Rolling Arrays**, based in Singapore, is one of Asia's premier award-winning human resources (HR) transformation businesses. For decades, HR has been considered a cost center in organizations, but Rolling Arrays's approach transforms it into a profit center, because HR expertise leads to strategic decisions that improve a company's growth and profit.

An **investment center** adds responsibility for investment to profit-center responsibilities. Investment-center success depends on both income and invested capital, measured by relating income generated to the value of the capital employed.

Systems designers must understand operating processes and cost behavior to help identify responsibility for controllable costs. For example, by isolating activities and related cost drivers, activity-based costing (see Chapter 4) can help to point out controllable costs. **Procter & Gamble** credited its activity-based management control system with identifying controllable costs in one of its detergent divisions, which led to major strategic changes.

Responsibility center managers are often able to explain their center's uncontrollable costs, even in situations where they are not held responsible for these uncontrollable costs. For example, an importer of grapes from Chile to the United States suffered a sudden loss of sales several years ago after a few grapes were found to contain poisonous cyanide. Because the tampering was beyond the import manager's control, the manager was responsible for efficiency (the flexible-budget variance [see Chapter 8]) but not for the effects of activity volume (the sales-activity variance). Even though he was not held responsible for the sales-activity variance, the manager was in the best position to provide an explanation for the variance because he had the best information about the reasons for the decline in sales.

Contribution Margin

Many organizations combine the contribution approach to measuring income with responsibility accounting—that is, they report by cost behavior as well as by degrees of controllability. Exhibit 9-4 is an organization chart showing selected units of a retail grocery company like Germany's **Schwarz Group** (**Lidl** and **Kaufland**), the United Kingdom's **Tesco**, or France's **Carrefour**. Exhibit 9-5 illustrates the contribution approach to measuring financial performance of the various units shown on the organization chart. **Segments** are responsibility centers for which a company develops separate measures of revenues and costs. Exhibit 9-5 provides perspective on how a management-control system report can stress cost behavior, controllability, manager performance, and responsibility center performance simultaneously.

Line (a) in Exhibit 9-5 shows the contribution margin, sales revenues less variable expenses. The contribution margin ratio, defined as the ratio of contribution margin to sales, is especially helpful for predicting the impact on income of short-run changes in sales volume. Managers may quickly calculate expected changes in income by multiplying the contribution margin ratio by the expected change in dollar sales. For example, the contribution margin ratio for meats in the West Division is $\$180 \div \$900 = 0.20$. A \$1,000 increase in sales of meats in the West Division should produce a \$200 increase in contribution margin and income ($0.20 \times \$1,000 = \$200$) if there are no changes in selling prices, variable operating expenses per unit, fixed costs, or mix of sales.

investment center

A responsibility center where managers are responsible for investment as well as profits.

segments

Responsibility centers for which a company develops separate measures of revenues and costs.

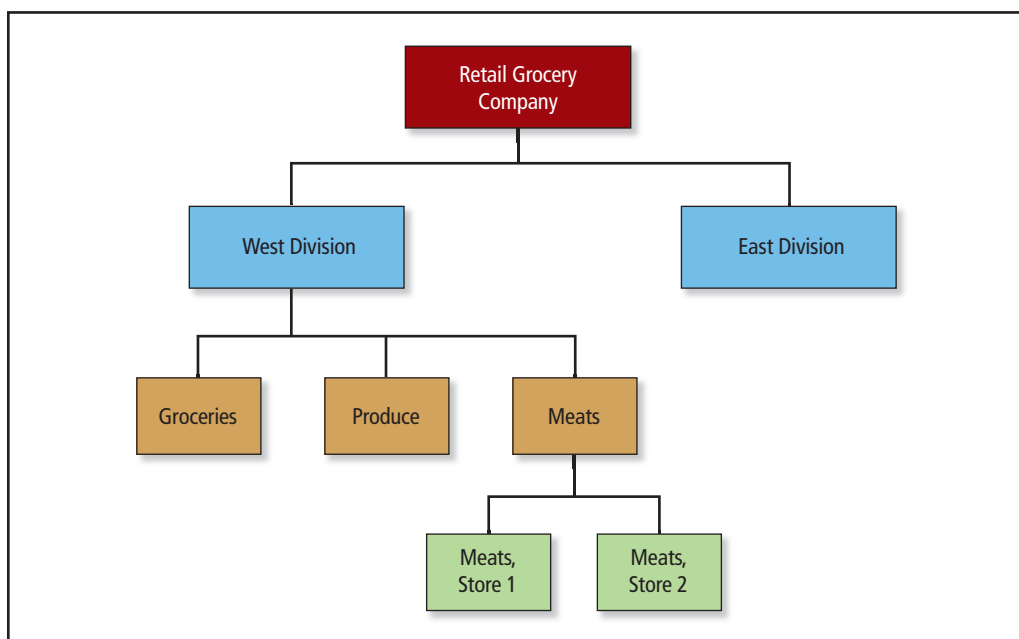


Exhibit 9-4

Retail Grocery Company
Organization Chart

	Company Breakdown into Two Divisions		Breakdown of West Division Only					Breakdown of West Division, Meats Only		
	Company as a Whole	East Division	West Division	Not Allocated†	Groceries	Produce	Meats	Not Allocated†	Store 1	Store 2
Net sales	\$4,000	\$1,500	\$2,500	—	\$1,300	\$300	\$900	—	\$600	\$300
Variable costs										
Cost of merchandise sold	\$3,000	\$1,100	\$1,900	—	\$1,000	\$230	\$670	—	\$450	\$220
Variable operating costs‡	260	100	160	—	100	10	50	—	35	15
Total variable costs	\$3,260	\$1,200	\$2,060	—	\$1,100	\$240	\$720	—	\$485	\$235
(a) Contribution margin	\$ 740	\$ 300	\$ 440	—	\$ 200	\$ 60	\$180	—	\$115	\$ 65
Less: Fixed costs										
controllable by segment managers§	260	100	160	\$ 20	40	10	90	\$ 30	35	25
(b) Contribution controllable by segment managers										
Less: Fixed costs	\$ 480	\$ 200	\$ 280	\$(20)	\$ 160	\$ 50	\$ 90	\$(30)	\$ 80	\$ 40
controllable by others¶	200	90	110	20	40	10	40	10	22	8
(c) Contribution by segments	\$ 280	\$ 110	\$ 170	\$(40)	\$ 120	\$ 40	\$ 50	\$(40)	\$ 58	\$ 32
Less: Unallocated costs	100									
(d) Income before income taxes	\$ 180									

*Three different types of segments are illustrated here: divisions, product lines, and stores. As you read across, note that the focus becomes narrower, from East and West divisions to West Division only, to meats in West Division only.

†Only those costs clearly identifiable to a product line or store should be allocated.

‡Principally wages and payroll-related costs.

§Examples are certain advertising, sales promotions, salespersons' salaries, management consulting, training, and supervision costs.

¶Examples are depreciation, property taxes, insurance, and perhaps the segment manager's salary.

||These costs are not clearly or practically allocable to any segment except by some highly questionable allocation base.

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Exhibit 9-5

Retail Grocery Store

Contribution Approach: Model Income Statement by Segments* (thousands of dollars)

Contribution Controllable by Segment Managers

Designers of management control systems distinguish between the segment as an economic investment and the manager as a decision maker. For instance, an extended period of drought coupled with an aging population may adversely affect the desirability of continued economic investment in a ski resort, but the resort manager may nonetheless be doing an excellent job under these adverse circumstances.

Exhibit 9-5 separates costs by controllability. The manager of meats at Store 1 may have influence over some local advertising but not other advertising, some fixed salaries but not other salaries, and so forth. Moreover, the meat manager at both the division and store levels may have zero influence over store depreciation or the president's salary. Managers on all levels help explain the total segment contribution, but they are responsible only for the controllable contribution. Note that we deduct the fixed costs controllable by the segment managers from the contribution margin to obtain the contribution controllable by segment managers. These controllable costs are usually discretionary fixed costs such as local advertising and some salaries.

As we move to the right in Exhibit 9-5, we see allocations of only part of the fixed costs to lower levels in the organization. For example, consider the line with fixed costs controllable by segment managers. Of the \$160,000 fixed costs that the West Division manager controls, groceries, produce, and meat departments control only \$140,000. We do not allocate the remaining \$20,000 of West Division fixed costs because they are not controllable farther down in the organization chart. That is, the West Division manager controls all \$160,000 of fixed costs, but subordinates (grocery, produce, and meat managers) control only \$140,000. Similarly, the meats manager controls \$90,000 of fixed costs, but subordinates at stores 1 and 2 control only \$35,000 and \$25,000, respectively.

Contribution by Segments

The contribution by segments, line (c) in Exhibit 9-5, is an attempt to approximate the financial performance of the segment, as distinguished from the financial performance of its manager, which we measure in line (b). The "fixed costs controllable by others" typically include committed costs (such as depreciation and property taxes) and discretionary costs (such as the segment manager's salary). Although the segment manager does not control these costs, they are necessary for the operation of the segment.

Unallocated Costs

Exhibit 9-5 shows "unallocated costs" immediately before line (d). These costs might include central corporate costs, such as the costs of top management and some corporate-level services (for example, legal and taxation). When an organization cannot find a persuasive cause-and-effect or activity-based justification for allocating such costs, it generally should not allocate them to segments.

Summary

The correct classification of costs as illustrated in Exhibit 9-5 is sometimes ambiguous. Determining controllability is a problem when a company allocates service department costs to other departments. Should a store manager bear a part of the division headquarters' costs? If so, how much and on what basis? How much, if any, store depreciation or lease expenses should we deduct in computing the controllable contribution? There are no universally correct answers to these questions. Each organization makes choices that balance costs and benefits. (This differs from the situation in external accounting systems, where tax or financial reporting regulations usually specify the required classification of costs.)

Because of the subjectivity involved in classification of costs, measures of financial performance such as those illustrated in Exhibit 9-5 are subjective. The calculation of the contribution margin near the top of the report tends to be the most objective, because managers can usually objectively identify and assign variable costs. As you read downward in the report, the allocations become increasingly subjective, and the resulting measures of contributions become more subject to dispute. Nonetheless, many organizations find that allocation of costs to units makes managers more aware of the costs of the entire organization and leads to better organizational cost control.

Objective 5

Prepare segment income statements for evaluating profit and investment centers using the contribution margin and controllable-cost concepts.

Making Managerial Decisions

Managers should try to distinguish between controllable and uncontrollable costs when designing segment financial reports. For each of the following costs of a cold storage in Singapore, indicate whether it is a variable cost, fixed cost controllable by segment managers, fixed cost controllable by someone other than the segment manager, or a cost the company normally does not allocate:

Property taxes
 Supervision of local sales staff
 Depreciation of store
 Cost of goods sold
 Local store advertising
 Corporate-level advertising
 Corporate-level public relations
 Temporary sales labor

Answer

Variable costs are generally controllable by the store manager. Cost of goods sold and temporary sales labor are examples.

Fixed costs controllable by the segment (store) manager include local store advertising and supervision of the local sales staff. The store manager usually decides the appropriate level for these costs.

Fixed costs controllable by those other than the store manager include property taxes and depreciation of the store. These costs relate directly to the store, but the store manager cannot change them.

Unallocated costs include corporate-level advertising and public relations. These costs have a tenuous link to the store.

Summary Problem for Your Review

PROBLEM

The House of Books in Dubai has two bookstores: Chapter Cafe and Browse & Brunch. Each store has managers who have a great deal of decision authority over their store. Advertising, market research, acquisition of books, legal services, and other staff functions, however, are handled by a central office. The current accounting system at House of Books allocates all costs to the stores. Results for 2021 were as follows:

Item	Total Company	Chapter Cafe	Browse and Brunch
Sales revenue	\$ 700,000	\$ 350,000	\$ 350,000
Cost of merchandise sold	450,000	225,000	225,000
Gross margin	<u>250,000</u>	<u>125,000</u>	<u>125,000</u>
Operating expenses			
Salaries and wages	63,000	30,000	33,000
Supplies	45,000	22,500	22,500
Rent and utilities	60,000	40,000	20,000
Depreciation	15,000	7,000	8,000
Allocated staff costs	60,000	30,000	30,000
Total operating expenses	<u>243,000</u>	<u>129,500</u>	<u>113,500</u>
Operating income (loss)	<u>\$ 7,000</u>	<u>\$ (4,500)</u>	<u>\$ 11,500</u>

Each bookstore manager makes decisions that affect salaries and wages, supplies, and depreciation. In contrast, rent and utilities are beyond the managers' control because the managers did not choose the location or the size of the store.

Supplies are variable costs. Variable salaries and wages are equal to 8% of the cost of merchandise sold; the remainder of salaries and wages is a fixed cost. Rent, utilities, and depreciation also are fixed costs. Staff costs represent the cost of activities performed by the central office. Events at the individual bookstores do not affect staff costs; nevertheless, House of Books allocates staff costs as a proportion of sales revenue.

1. Using the contribution approach, prepare a performance report that distinguishes the performance of each bookstore from that of the bookstore manager.
2. Evaluate the financial performance of each bookstore.
3. Evaluate the financial performance of each manager.

SOLUTION

1. See Exhibit 9-6.
2. We can evaluate the financial performances of the bookstores (that is, segments of the company) using the line “contribution by bookstore.” Browse and Brunch has a substantially higher contribution, despite equal levels of sales revenues in the two stores. The major reason for this advantage is that Browse and Brunch pays less for rent and utilities.
3. We can evaluate the financial performance of the managers using the line “contribution controllable by managers.” By this measure, the performance of Chapter Cafe’s manager is better than that of Browse and Brunch. The contribution margin is the same for each store, but Browse and Brunch’s manager paid \$4,000 more in controllable fixed costs than did Chapter Cafe’s manager. Note that the additional fixed costs could be beneficial in the long run. What is missing from each of these segment reports is the year’s master budget and a flexible budget, which would be the best benchmark for evaluating both bookstores and bookstore managers.

Item	Total Company	Chapter Cafe	Browse and Brunch
Sales revenue	\$700,000	\$350,000	\$350,000
Variable costs			
Cost of merchandise sold	450,000	225,000	225,000
Salaries and wages—variable portion	36,000	18,000	18,000
Supplies	45,000	22,500	22,500
Total variable costs	<u>531,000</u>	<u>265,500</u>	<u>265,500</u>
Contribution margin by bookstore	<u>169,000</u>	<u>84,500</u>	<u>84,500</u>
Less: Fixed costs controllable by bookstore managers			
Salaries and wages—fixed portion	27,000	12,000	15,000
Depreciation	<u>15,000</u>	<u>7,000</u>	<u>8,000</u>
Total controllable fixed costs	<u>42,000</u>	<u>19,000</u>	<u>23,000</u>
Contribution controllable by managers	<u>127,000</u>	<u>65,500</u>	<u>61,500</u>
Less: Fixed costs controllable by others			
Rent and utilities	<u>60,000</u>	<u>40,000</u>	<u>20,000</u>
Contribution by bookstore	<u>67,000</u>	<u>\$ 25,500</u>	<u>\$ 41,500</u>
Unallocated staff costs	60,000		
Operating income	<u>\$ 7,000</u>		

Exhibit 9-6

The House of Books
Performance Report

Measurement of Nonfinancial Performance

In recent years, many organizations have developed a new awareness of the importance of controlling aspects of nonfinancial performance. For example, sales organizations follow up on customers to ensure their satisfaction, and manufacturers track manufacturing defects and product performance. We first examine individual examples of nonfinancial performance measures such as quality, cycle time, and productivity. Then, we discuss the balanced scorecard, a popular approach that integrates financial and nonfinancial performance measures tied to the organization’s fundamental strategy.

Control of Quality

Many companies use performance metrics that measure the quality of their products or services. **Quality control** is the effort to ensure that products and services perform to customer requirements. Customer needs define quality. For example, customers judge the quality of an automobile

Objective 6

Measure performance against nonfinancial performance measures such as quality, cycle time, and productivity.

quality control

The effort to ensure that products and services perform to customer requirements.

relative to their needs for reliability, performance, styling, safety, image, and other attributes. Defining quality in terms of customer requirements is only half the battle. There remains the problem of reaching and maintaining the desired level of quality.

The traditional approach to controlling quality in the United States was to inspect products after completing them and reject or rework those that failed the inspections. Because testing is expensive, companies often inspected only a sample of products. They judged the process to be in control as long as the number of defective products did not exceed an acceptable quality level. This meant that some defective products could still make their way to customers. When a company does not discover defects until the product reaches the customer, it is costly to repair products already in use by a customer or to win back a dissatisfied customer. IBM's former CEO John Akers was quoted in the *Wall Street Journal* as saying, "I am sick and tired of visiting plants to hear nothing but great things about quality and cycle time—and then to visit customers who tell me of problems."

cost of quality report

A report that displays the financial impact of quality.

A **cost of quality report** displays the financial impact of quality. The quality cost report shown in Exhibit 9-7 measures four categories of quality costs:

1. Prevention—costs incurred to prevent the production of defective products or delivery of substandard services including engineering analyses to improve product design for better manufacturing, improvements in production processes, increased quality of material inputs, and programs to train personnel
2. Appraisal—costs incurred to identify defective products or services including inspection and testing
3. Internal failure—costs of defective components and final products or services that are scrapped or reworked; also costs of delays caused by defective products or services
4. External failure—costs caused by delivery of defective products or services to customers, such as field repairs, returns, and warranty expenses

Exhibit 9-7 shows that internal or external failures caused most of the costs incurred by Eastside Manufacturing Company. These costs almost certainly are understated, however, because they omit opportunity costs of internal delays and lost sales. For example, quality problems in American-built automobiles in the 1980s caused sales to drop for many years. The opportunity cost of these lost future sales were much more significant than the immediate tangible costs measured in any quality cost report.

In recent years, more U.S. companies have moved away from the traditional approach to achieve quality by "inspecting it in." Many companies have discovered that it is more cost effective to prevent defects rather than inspect and correct them. The resources consumed to detect defective products do not add value. Further, if the company must scrap the defective product, it wastes the resources that were consumed to produce it. Even when the company can correct the product defects, it wastes the resources required for rework.

Many companies have adopted an approach first espoused by an American, W. Edwards Deming, and embraced by Japanese companies decades ago: **total quality management (TQM)**. Following the old adage "an ounce of prevention is worth a pound of cure," it focuses on prevention of defects and on achievement of customer satisfaction. The TQM approach builds on the assumption that an organization minimizes the cost of quality when it achieves high quality levels. TQM is the application of quality principles to all of the organization's endeavors to satisfy customers. TQM has significant implications for organization goals, structure, and management control systems.

To implement TQM, an organization trains employees to prepare, interpret, and act on quality-control charts, such as that shown in Exhibit 9-8. The **quality-control chart** is a statistical plot of measures of various product quality dimensions or attributes. This plot helps detect process deviations and identify excessive variation in product dimensions or attributes that process or design engineers should address. The chart in Exhibit 9-8 shows that, except for a brief period near the end of April, the Eastside Manufacturing Company generally is not meeting its defects objective of 0.6% defects. Managers looking at this chart would know that they should take corrective action.

The most recent trend in quality control is Six Sigma, defined in Chapter 1 as a data-driven approach to eliminating defects and improving quality. The name Six Sigma comes from the idea of an extremely low defect rate of fewer than 3.4 defects per million (far lower than the objective

total quality management (TQM)

An approach to quality that focuses on prevention of defects and on customer satisfaction.

quality-control chart

The statistical plot of measures of various product quality dimensions or attributes.

Month			Quality Cost Area	Year to Date		
Actual	Plan	Variance		Actual	Plan	Variance
1. Prevention Cost						
3	2	1	A. Quality—administration	5	4	1
16	18	(2)	B. Quality—engineering	37	38	(1)
7	6	1	C. Quality—planning by others	14	12	2
5	7	(2)	D. Supplier assurance	13	14	(1)
31	33	(2)	Total prevention cost	69	68	1
5.5%	6.1%		Percentage of total quality cost	6.2%	6.3%	
2. Appraisal cost						
31	26	5	A. Inspection	55	52	3
12	14	(2)	B. Test	24	28	(4)
7	6	1	C. Inspection & test of purchased materials	15	12	3
11	11	0	D. Product quality audits	23	22	1
3	2	1	E. Maintenance of inspection & test equipment	4	4	0
2	2	0	F. Materials consumed in inspection & testing	5	4	1
66	61	5	Total appraisal cost	126	122	4
11.8%	11.3%		Percentage of total quality cost	11.4%	11.3%	
3. Internal failure cost						
144	140	4	A. Scrap & rework—manufacturing	295	280	15
55	53	2	B. Scrap & rework—engineering	103	106	(3)
28	30	(2)	C. Scrap & rework—supplier	55	60	(5)
21	22	(1)	D. Failure investigation	44	44	0
248	245	3	Total internal failure cost	497	490	7
44.3%	45.4%		Percentage of total quality cost	44.9%	45.3%	
345	339	6	Total internal quality cost (1 2 3)	692	680	12
61.6%	62.8%		Percentage of total quality cost	62.6%	62.8%	
4. External failure quality cost						
75	66	9	A. Warranty expense—manufacturing	141	132	9
41	40	1	B. Warranty expense—engineering	84	80	4
35	35	0	C. Warranty expense—sales	69	70	(1)
46	40	6	D. Field warranty cost	83	80	3
18	20	(2)	E. Failure investigation	37	40	(3)
215	201	14	Total external failure cost	414	402	12
38.4%	37.2%		Percentage of total quality cost	37.4%	37.2%	
560	540	20	Total quality cost	1,106	1,082	24
9,872	9,800	72	Total product cost	20,170	19,600	570
5.7%	5.5%		Total quality cost as percentage of total production cost	5.5%	5.5%	

*Adapted from Allen H. Seed III, *Adapting Management Accounting Practice to an Advanced Manufacturing Environment* (Montvale, NJ: National Association of Accountants, 1988), Table 5-2, p. 76.

*Adapted from Allen H. Seed III, *Adapting Management Accounting Practice to an Advanced Manufacturing Environment* (Montvale, NJ: National Association of Accountants, 1988), Table 5-2, p. 76.

Exhibit 9-7

Eastside Manufacturing Company
Quality Cost Report* (thousands of dollars)

of less than 6 defects per thousand in the Eastside Manufacturing example). However, the Six Sigma approach has broadened into a general approach to defining, measuring, analyzing, and improving a production process to minimize errors. The focus is on measuring how many defects a company has in its process because, once a company measures the defects, it can take steps to eliminate them. Developed by **Motorola**, Six Sigma is making large impacts at companies such as **General Electric**, **Dow Chemical**, and **3M**. At Dow, each Six Sigma project has created an average of \$500,000 in savings.

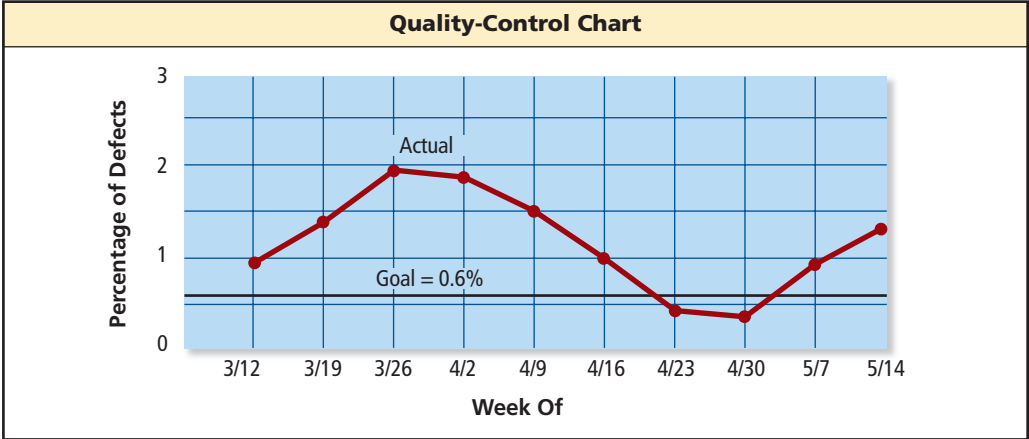
Control of Cycle Time

Reducing cycle time is a key to improving quality. **Cycle time**, or **throughput time**, is the time it takes to complete a product or service. It is a summary measure of efficiency and effectiveness and is also an important cost driver. You may find it surprising that faster cycle times often lead to higher quality and lower defect rates. A faster cycle time requires smooth-running processes and high quality. It also creates increased flexibility and brings products or services to customers more quickly, which increases customer satisfaction.

cycle time (throughput time)

The time taken to complete a product or service.

Exhibit 9-8
Eastside Manufacturing Company
Quality-Control Chart



One way to measure cycle time is to attach an identifier such as a bar code or RFID (radio-frequency identification) tag to each component or product and use a scanner to read the code at the end of each stage of completion. Cycle time for each stage is the time between readings of the identifier tag. Tagging also permits effective tracking of materials and products for inventories, scheduling, and delivery.

Exhibit 9-9 is a sample cycle-time report showing that Eastside Manufacturing Company is meeting its cycle-time objectives at two of its five production process stages. This report is similar to the flexible budget reports of Chapter 8, but note that the variances here are measured in units of time, rather than in dollars of revenue or cost. Explanations for the variances in the right column indicate that poor-quality materials and poor design led to extensive rework and retesting.

Control of Productivity

More than half the companies in the United States measure and manage productivity as part of the effort to improve their competitiveness. **Productivity** is a measure of outputs divided by inputs. The fewer inputs needed to produce a given output, the more productive the organization. This simple definition, however, raises difficult measurement questions. How should the company measure outputs and inputs? Specific management control issues usually determine the most appropriate measures. Labor-intensive organizations, especially service organizations, focus on increasing the productivity of labor, so labor-based measures are appropriate. Highly automated companies focus on machine use and productivity of capital investments, so capacity-based measures, such as the percentage of time machines are available, may be most important to them. Manufacturing companies, in general, monitor the efficient use of materials. For them, measures of material yield (a ratio of material outputs over material inputs) may be useful indicators of productivity.

Exhibit 9-10 shows 12 examples of productivity measures. As you can see from these examples, measures vary widely according to the type of resource that management wishes

Exhibit 9-9
Eastside Manufacturing Company
Cycle Time Report for the Second Week of May

Process Stage	Actual Cycle Time*	Standard Cycle Time	Variance	Explanation
Materials processing	2.1	2.5	0.4 F	Poor-quality materials caused rework Engineering change required rebuilding all power units
Circuit board assembly	44.7	28.8	15.9 U	
Power unit assembly	59.6	36.2	23.4 U	
Product assembly	14.6	14.7	0.1 F	Software failure in test procedures required retesting
Functional and environmental test	53.3	32.0	21.3 U	

F Favorable. U Unfavorable.
 *Average time per stage over the week.

productivity
 A measure of outputs divided by inputs.

Exhibit 9-10

Measures of Productivity

Resource	Possible Outputs (Numerator)		Possible Inputs (Denominator)
Labor	Standard direct-labor hours allowed for good output	÷	Actual direct-labor hours used
	Sales revenue	÷	Number of employees
	Sales revenue	÷	Direct-labor costs
	Bank deposit/loan activity (by a bank)	÷	Number of employees
	Service calls	÷	Number of employees
	Customer orders	÷	Number of employees
Materials	Weight of output	÷	Weight of input
	Number of good units	÷	Total number of units
Equipment, capital, physical capacity	Time (e.g., hours) used	÷	Time available for use
	Time available for use	÷	Time (e.g., 24 hours per day)
	Expected machine hours for good output	÷	Actual machine hours
	Sales revenue	÷	Direct-labor cost

to use efficiently. In all cases, a measure of the resource that management wishes to control is in the denominator (the input) and a measure of the objective of using the resource is in the numerator (the output).

Choice of Productivity Measures

Which productivity measures should a company choose to manage? The choice determines the incentives created by the management control system. For example, if top management evaluates subordinates' performance based on direct-labor productivity, lower-level managers will focus on improving that specific measure.

The challenge in choosing productivity measures is to avoid motivating decisions that improve one dimension of performance but hurt another dimension. For example, measuring and rewarding productivity per machine would provide incentives for longer production runs. However, longer production runs might result in excessive inventory handling and holding costs. As another example, measuring labor productivity might motivate workers to produce more units per hour. However, spending less time on each unit produced may cause a higher rate of product defects.

Use of a single measure of productivity is unlikely to result in overall improvements in performance. The choice of performance measures requires anticipating the trade-offs that employees will make. Many organizations implement management controls for all of the most important activities, including nonfinancial measures such as quality and customer satisfaction, and use multiple measures to monitor the actual benefits of improvements in these activities.

Productivity Measures Over Time

Be careful when comparing productivity measures over time. Changes in the process or in the rate of inflation can make results misleading. For example, consider labor productivity at **Adobe Systems**. One measure of productivity is sales revenue per employee.

	2010	2020	Percent Increase
Total revenue (billions)	\$ 3.8	\$ 12.87	238.684%
Employees	÷ 9,117	÷ 22,517	146.978%
Revenue per employee (unadjusted for inflation)	<u>\$416,803</u>	<u>\$571,568</u>	<u>37.13%</u>

By this measure, Adobe appears to have achieved a 37% increase in the productivity of labor because the number of employees grew more slowly than total revenue. However, total revenue has not been adjusted for the effects of inflation. Because of inflation, each 2010 dollar was equivalent to 1.19 dollars in 2020. Therefore, Adobe's 2010 sales revenue, expressed in 2020

Business First

Balanced Scorecard Hall of Fame

Robert Kaplan and David Norton created the balanced scorecard (BSC) in 1992. The **Balanced Scorecard Hall of Fame** honors organizations that have achieved execution excellence through the use of the BSC. To be selected for the Hall of Fame, a company must apply one or more of the following five principles to create a strategy-focused organization: “mobilize change through executive leadership; translate the strategy into operational terms; align the organization around its strategy; make strategy everyone’s job; and make strategy a continual process.” By 2020, the Balanced Scorecard Collaborative had more than 200 corporations, government entities, and non profits from nearly 40 countries in their Hall of Fame.

In 2012, **Qatar Steel Company** (QSC) joined the Hall of Fame as one of the leading industrial companies in manufacturing and supplying steel. The then Director and General Manager of QSC, Ali Bin Hassan Al-Muraikhi, said that the company had introduced the Balanced Scorecard back in 2003 and nearly 10 years on was delighted that the company was the first ever Qatari business and the first from the steel industry to be inducted. QSC was set up in 1974 and started commercial production in 1978. In the early 2000s, the company decided to re-evaluate its growth and management approach and introduced Balanced Scorecard methodologies to help it. It was able to see sustained growth and improved financial performance and could achieve a more advantageous competitive position in the marketplace.

The Norwegian state-owned company **Avinor** was inducted in 2016. It is largely involved in operating traffic control towers at airports. It introduced the Balanced Scorecard in 2013. Prior to this, the business that had been operating since 1947 (renamed Avinor in 2003) was rather fragmented and the change sought to bring the disparate strands of the business together. In just three years from 2013, it was able to reduce its emissions per passenger by 20% and increase earnings by over 60%. It also managed to reduce customer waiting

times to pass through airport security, brought down occupational injuries by 32%, and cut back on stressful overtime hours for its navigation employees.

In 2017, the Chilean meat producer **Agrosuper**, with revenues in excess of \$2.5 billion, was inducted into the Hall of Fame. It had started its Balanced Scorecard journey in 2012 with the aim of expansion in the Chilean market and into the global market. Its revenue increased by nearly 100% and earnings before tax by 261%. In Chile, it went from being the seventh-ranked supplier of meat to the supermarket industry to the top supplier. Its productivity improvements lead to an increase in the kilograms of meat produced per hour by 10%.

A seemingly odd entrant to the Hall of Fame in 2016 was the City Government of Balanga in the Philippines. Balanga is the capital of the province of Bataan and home to 100,000 people across 25 neighborhoods. It began using the Balanced Scorecard in 2007 at a time when there was little business activity in the city, unemployment and lack of opportunities were causing several young people to leave the city, and general apathy about the future was galore. In around 10 years, the city saw the number of businesses operating in the area double and their combined sales increase by nearly 530%. The education sector has thrived with the number of students increasing by 90%. The city has also been able to attract huge public investments to improve infrastructure and opportunities.

In 2016, **Wanxin Media**, based in the Anhui province of China, was a state-owned business facing some serious problems following government reforms in 2008 regarding liberalization of the markets and changes in the ways in which customers consumed reading material. It began using the Balanced Scorecard approach in 2011 and within three years its revenue had increased by nearly 60% and customer satisfaction levels had topped 95%.

Sources: Qatar Steel Web site (<https://www.qatarsteel.com.qa/qs-inducted-into-palladium-balanced-scorecard/>); The Palladium Group Web site (<https://thepalladiumgroup.com/awards-program>).

dollars (so we can compare it with 2020 sales revenue), is $\$3.8 \text{ billion} \times 1.19 = \$4.552$. The adjusted 2010 sales revenue per employee is as follows:

	2010 (adjusted)	2020	Percent Increase
Total revenue (billions)	\$ 4.552	\$ 12.87	182.73%
Employees	÷ 9,117	÷ 22,517	146.978%
Revenue per employee (adjusted for inflation)	<u>\$499,287</u>	<u>\$571,568</u>	<u>14.47%</u>

Adjusting for the effects of inflation reveals that Adobe’s labor productivity has actually grown by 14.7% rather than the more spectacular looking 37%.

The Balanced Scorecard

A **balanced scorecard (BSC)** is a system that strikes a balance between financial and nonfinancial measures in the performance measurement process, links performance to rewards, and gives explicit recognition to the link between performance measurement and organizational goals and objectives. The balanced scorecard focuses management attention on measures that drive an organization to achieve its goals. About 50% of the 1,000 largest U.S. firms use some version of the

Objective 7

Use a balanced scorecard to integrate financial and nonfinancial measures of performance.

Financial	Processes
Economic profit realized	Percentage reduction in process cycle time
Income from operations	Number of engineering changes
Working capital	Capacity utilization
Operational cash flow	Order response time
Inventory turns	Process capability
Customers	Competence
Rank in customer survey	Leadership competence
Market share	Percentage of patent-protected turnover
Repeat order rate	Training days per employee
Complaints	Quality improvement team participation
Brand index	

Exhibit 9-11

Performance Indicators for
Philips Electronics' Balanced
Scorecard

balanced scorecard, including **Microsoft**, **American Express**, **ExxonMobil**, **Allstate**, and **Apple Computer**. Government and nonprofit agencies, such as the U.S. Department of Transportation and the United Way of America, also use the balanced scorecard. We describe some of the more successful organizations that use the balanced scorecard in the Business First box on p. 388.

The balanced scorecard helps line managers understand the relationship between nonfinancial measures and organizational goals. The balanced scorecard identifies performance measures from each of the four components of the successful organization shown in Exhibit 9-3 on p. 376. Links between the measures and organizational objectives help managers throughout the organization understand how their actions support the organization's goals.

What does a balanced scorecard look like? The classic balanced scorecard developed by Robert Kaplan and David Norton includes **key performance indicators**—measures that drive the organization to meet its goals—grouped into four categories: (1) financial, (2) customers, (3) internal business processes, and (4) innovation and learning. Some companies use other terminology and some include additional categories—the most common are additional categories for employees or other stakeholders.

All balanced scorecards develop performance measures for each objective within each category. For example, **Philips Electronics** uses the categories and performance indicators in Exhibit 9-11. Most companies that use a balanced scorecard specify the categories that each business segment will use but allow the segments to choose the relevant performance measures for each category. For example, every Microsoft division has measures for financial, customer, internal processes, and learning perspectives, but the Latin American division has different measures in each category than does the Seattle headquarters. The balanced scorecard should not be a straightjacket; rather it is a flexible framework for motivating and measuring performance.

balanced scorecard (BSC)

A performance measurement and reporting system that strikes a balance between financial and nonfinancial measures, links performance to rewards, and gives explicit recognition to the link between performance measurement and organizational goals and objectives.

key performance indicators

Measures that drive the organization to achieve its goals.

Making Managerial Decisions

The balanced scorecard emphasizes the connections between performance measures and financial and nonfinancial goals. Indicate where each of the following goals of **Whirlpool** fits with the four components of a successful organization shown in Exhibit 9-3 on p. 376, and explain how these components relate to one another:

- People commitment
- Total quality
- Customer satisfaction
- Financial performance
- Growth and innovation

Answer

The components listed in Exhibit 9-3 depict the causal links from organizational learning to business process improvement,

to customer satisfaction, and finally to financial strength. The five goals set by top managers at Whirlpool suggest the following links among the goals:

If Whirlpool makes a solid commitment to its people and invests in growth and innovation, the company will make progress in organizational learning. This will lead to business process improvements that decrease costs, increase efficiency, and increase the total quality of its products, which will then lead to increased customer satisfaction. The ultimate result of satisfied customers is improved financial performance. Sustainable financial strength should allow Whirlpool to repeat the cycle and continue to invest in both organizational learning and internal business processes.

Management Control Systems in Service, Government, and Nonprofit Organizations

Objective 8

Describe the difficulties of management control in service and nonprofit organizations.

Many service organizations face substantial difficulty implementing management control systems. Why? Because the outputs of service organizations are difficult to measure. For example, what is a good measure of output for a bank's call center (where service representatives answer customers' questions)? Number of calls or total time spent on calls? The measure "number of calls" might motivate many short calls that do not provide thorough answers to customers. The measure "total time spent on calls" might motivate long, time-wasting calls. It is often difficult to know the quality, or sometimes even the quantity, of the service provided until long after the organization delivers the service. When quality and quantity of output are hard to measure, developing timely measures of input/output relationships is nearly impossible.

The keys to successful management control in any organization are proper training and motivation of employees to achieve the organization's strategic objectives, accompanied by consistent monitoring of measures chosen to fit with these objectives. These keys are equally important in service-oriented organizations. **MBNA America**, a large issuer of bank credit cards, works hard to measure the amount and quality of its service. It identifies customer retention as its most important key success factor. MBNA trains its customer representatives carefully. Each day it measures and reports performance on 14 objectives consistent with customer retention, and it rewards every employee based on those 14 objectives. Measures include answering every call by the second ring, keeping the computer up 100% of the time, and processing credit-line requests within 1 hour. Employees earn bonuses as high as 20% of their annual salaries by meeting those objectives.

Government and nonprofit organizations face additional difficulties. When for-profit organizations confront conflicting goals, the appropriate trade-off is determined by the net effect on the financial "bottom line." When government and nonprofit organizations face conflicting goals as to when, where, and to whom they will provide services, the relevant trade-offs are often unclear. Because they have no precisely defined objective function that specifies how to make these trade-offs, it is difficult to determine the "right" incentives to be incorporated in the management control system.

Further, the design of management control systems in nonprofit organizations is complicated by the fact that many people in these organizations seek primarily nonmonetary rewards. For example, typical starting salaries for UK-based roles with non-governmental organizations are \$24,000 to \$33,000, much lower than those for comparable work in the private sector. Thus, monetary incentives are generally less effective in nonprofit organizations.

In summary, management control systems in nonprofit organizations probably will never be as highly developed as are those in profit-seeking firms because of the following:

1. Organizational goals and objectives are less clear. Moreover, there are often multiple goals and objectives, requiring difficult trade-offs.
2. Professionals (for example, teachers, attorneys, physicians, scientists, economists) tend to dominate nonprofit organizations. Because of their perceived professional status, they are often less receptive to the installation of formal control systems.
3. Measurements are more difficult because
 - a. there is no profit measure, and
 - b. there are heavy amounts of discretionary fixed costs, which make the relationships of inputs to outputs difficult to specify and measure.
4. There is less competitive pressure from other organizations or "owners" to improve management control systems. As a result, many cities in the United States and in the United Kingdom are "privatizing" some essential services, such as sanitation, by contracting with private firms.
5. The role of budgeting, instead of being a rigorous planning process, is often more a matter of playing bargaining games with sources of funding to get the largest possible authorization.
6. Motivations and incentives of employees may differ from those in for-profit organizations.

Making Managerial Decisions

Study Exhibit 9-3 again. Use the same four general components, but rearrange them to reflect a framework that might help managers of a successful governmental or nonprofit organization.

Answer

For governmental and nonprofit organizations, the ultimate objective is not to focus on financial results but to deliver the maximum benefits to customers (or citizens) based on

an available pool of financial resources. Thus, the causal relationships might be as follows:

Organizational learning → process improvements in delivering programs → improved fiscal or financial strength → greater program benefits for citizens or clients

Future of Management Control Systems

As organizations mature and as environments change, managers expand and refine their management control tools. The management control techniques that were satisfactory 10 or 20 years ago are not adequate for many organizations today.

A changing environment often means that organizations adjust their goals or key success factors. New goals require different benchmarks for evaluating performance. The management control system must evolve, too, or the organization may not manage its resources effectively or efficiently. A summary of management control principles that will always be important and can guide the redesign of systems follows:

1. Always expect that individuals will be pulled in the direction of their own self-interest. You may be pleasantly surprised that some individuals will act selflessly, but management control systems should be designed to take advantage of more typical human behavior. Also, be aware that managers in different cultures may perceive self-interest differently.
2. Design incentives so that individuals who pursue their own self-interest also achieve the organization's objectives. Because there are usually multiple objectives, multiple incentives are appropriate. Do not underestimate the difficulty of balancing multiple incentives.
3. Evaluate actual performance relative to planned performance. Where appropriate, revise planned performance to reflect actual output achieved. You can apply the concept of flexible budgeting to many goals and actions, both financial and nonfinancial.
4. Consider nonfinancial performance to be an important determinant of long-term success. In the short run, a manager may be able to generate good financial performance while neglecting nonfinancial performance, but it is not likely over the long haul.
5. Array performance measures across the entire value chain of the company to ensure that the management control system incorporates all activities that are critical to the long-run success of the company.
6. Periodically review the success of the management control system. Is the organization achieving its overall goals? Do the actions motivated by the management control system lead to goal achievement? Do individuals understand the management control system and effectively use the information it provides?
7. Learn from the management control successes (and failures) of competitors around the world. Despite cultural differences, human behavior is remarkably similar. Managers can learn from successful applications of new technology and management controls by reading books or attending courses that describe management control systems at other companies.

Highlights to Remember

1. **Describe the relationship of management control systems to organizational goals.**
The starting point for designing and evaluating a management control system is the identification of organizational goals as specified by top management.
2. **Explain the importance of evaluating performance and describe how it impacts motivation, goal congruence, and employee effort.** The way an organization measures and evaluates performance affects individuals' behavior. The more that it ties rewards to performance measures, the more incentive there is to improve the measures. Poorly designed measures may actually work against the organization's goals.
3. **Develop performance measures and use them to monitor the achievements of an organization.** A well-designed management control system measures both financial and nonfinancial performance. Superior nonfinancial performance usually leads to superior financial performance in time. The performance measures should tell managers how well they are meeting the organization's goals.
4. **Use responsibility accounting to define an organizational subunit as a cost center, a profit center, or an investment center.** Responsibility accounting assigns revenue and cost objectives to the management of the subunit that has the greatest influence over them. Cost centers focus on costs only, profit centers on both revenues and costs, and investment centers on profits relative to the amount invested.
5. **Prepare segment income statements for evaluating profit and investment centers using the contribution margin and controllable-cost concepts.** The contribution approach to measuring a segment's income aids performance evaluation by separating a segment's costs into those controllable by the segment management and those beyond management's control. It allows separate evaluation of a segment as an economic investment and the performance of the segment's manager.
6. **Measure performance against nonfinancial performance measures such as quality, cycle time, and productivity.** Measuring performance in areas such as quality, cycle time, and productivity causes employees to direct attention to those areas. Achieving goals in these nonfinancial measures can help meet long-run financial objectives.
7. **Use a balanced scorecard to integrate financial and nonfinancial measures of performance.** The balanced scorecard helps managers monitor actions that are designed to meet the various goals of the organization. It integrates key performance indicators that measure how well the organization is meeting its goals.
8. **Describe the difficulties of management control in service and nonprofit organizations.** Management control in service and nonprofit organizations is difficult because of a number of factors, including a relative lack of clearly observable outcomes and, for many nonprofit organizations, the lack of a clearly defined objective function.

Accounting Vocabulary

balanced scorecard (BSC),
p. 388
controllable cost, p. 378
cost center, p. 378
cost of quality report, p. 384
cycle time, p. 385
goal congruence, p. 373
investment center, p. 379
key performance indicators,
p. 389

key success factor, p. 372
management control system,
p. 371
managerial effort, p. 373
motivation, p. 374
productivity, p. 386
profit center, p. 378
quality control, p. 383
quality-control chart,
p. 384

responsibility accounting,
p. 378
responsibility center,
p. 378
segments, p. 379
throughput time, p. 385
total quality management
(TQM), p. 384
uncontrollable cost, p. 378

Fundamental Assignment Material

MyLab Accounting

9-A1 Responsibility of Purchasing Agent

Excel Electronics Company, a privately held enterprise, has a subcontract from a large aerospace company in Chicago. Although Excel was a low bidder, the aerospace company was reluctant to award the business to the company because it was a newcomer to this kind of activity. Consequently, Excel assured the aerospace company of its financial strength by submitting its audited financial statements. Moreover, Excel agreed to pay a penalty of \$5,000 per day for each day of late delivery for whatever cause.

Amy Greer, the Excel purchasing agent, is responsible for acquiring materials and parts in time to meet production schedules. She placed an order with an Excel supplier for a critical manufactured component. The supplier, who had a reliable record for meeting schedules, gave Greer an acceptable delivery date. Greer checked up several times and was assured that the component would arrive at Excel on schedule.

On the date specified by the supplier for shipment to Excel, Greer was informed that the component had been damaged during final inspection. It was delivered 10 days late. Greer had allowed 4 extra days for possible delays, but Excel was 6 days late in delivering to the aerospace company and so had to pay a penalty of \$30,000.

What department should bear the penalty? Why?

9-A2 Contribution Approach to Responsibility Accounting

Joe Albright owns and operates a small chain of convenience stores in Waterloo and Cedar Rapids. The company has five stores including a downtown store and a Sumner store in the Waterloo division, and a downtown store, a Solon store, and an airport store in the Cedar Rapids division. There is also a separate administrative staff that provides market research, personnel, and accounting and finance services.

The company had the following financial results for 20X1 (in thousands):

Sales revenue	\$8,000
Cost of merchandise sold	3,500
Gross margin	4,500
Operating expenses	2,200
Income before income taxes	<u>\$2,300</u>

The following data about 20X1 operations were also available:

1. All five stores used the same pricing formula; therefore, all had the same gross margin percentage.
2. Sales were largest in the two downtown stores, with 30% of the total sales volume in each. The Solon and airport stores each provided 15% of total sales volume, and the Sumner store provided 10%.
3. Variable operating costs at the stores were 10% of revenue for the downtown stores. The other stores had lower variable and higher fixed costs. Their variable operating costs were only 5% of sales revenue.
4. The fixed costs over which the store managers had control were \$125,000 in each of the downtown stores, \$180,000 at Solon and airport, and \$40,000 at Sumner.
5. The remaining \$910,000 of operating costs consisted of
 - a. \$210,000 controllable by the Cedar Rapids division manager but not by individual stores,
 - b. \$100,000 controllable by the Waterloo division manager but not by individual stores, and
 - c. \$600,000 controllable by the administrative staff.
6. Of the \$600,000 spent by the administrative staff, \$350,000 directly supported the Cedar Rapids division, with 20% for the downtown store, 30% for each of the Solon and airport stores, and 20% for Cedar Rapids operations in general. Another \$140,000 supported the Waterloo division, 50% for the downtown store, 25% for the Sumner store, and 25% supporting Waterloo operations in general. The other \$110,000 was for general corporate expenses.

Prepare an income statement by segments using the contribution approach to responsibility accounting. Use the format of Exhibit 9-4, p. 379. Column headings should be as follows:

Company as a whole	Breakdown into Two Divisions		Breakdown of Waterloo Division			Breakdown of Cedar Rapids Division			
	Waterloo	Cedar Rapids	Not allocated	Downtown	Sumner	Not allocated	Downtown	Solon	Airport

9-A3 Comparison of Productivity

Forsythe and Sorteberg are manufacturing companies. Comparative data for 20X1 and 20X7 are as follows:

		Forsythe	Sorteberg
Sales revenue	20X1	\$4,720,000,000	\$7,997,000,000
	20X7	\$6,500,000,000	\$9,007,000,000
Number of employees	20X1	53,600	77,900
	20X7	57,800	78,200

Assume that inflation has totaled 18% during these 6 years so that each 20X1 dollar is equivalent to 1.18 dollars in 20X7, due to inflation.

1. Compute 20X1 and 20X7 productivity measures in terms of revenue per employee for Forsythe and Sorteberg.
2. Compare the change in productivity between 20X1 and 20X7 for Forsythe with that for Sorteberg.

9-B1 Responsibility Accounting

The Kephart Company produces precision machine parts. Kephart uses a standard cost system, calculates standard cost variances for each department, and reports them to department managers. Managers use the information to improve their operations. Superiors use the same information to evaluate managers' performance.

Liz Elder was recently appointed manager of the assembly department of the company. She has complained that the system as designed is disadvantageous to her department. Included among the variances charged to the departments is one for rejected units. The inspection occurs at the end of the assembly department. The inspectors attempt to identify the cause of the rejection so that the department where the error occurred can be charged with it. Not all errors can be easily identified with a department, however. The nonidentified units are totaled and apportioned to the departments according to the number of identified errors. The variance for rejected units in each department is a combination of the errors caused by the department plus a portion of the unidentified causes of rejects.

1. Is Elder's complaint valid? Explain the reason(s) for your answer.
2. What would you recommend that the company do to solve its problem with Elder and her complaint?

9-B2 Divisional Contribution, Performance, and Segment Margins

The president of Reading Railroad wants to obtain an overview of the company's operations, particularly with respect to comparing freight and passenger business. He has heard about "contribution" approaches to cost allocations that emphasize cost behavior patterns and contribution margins, contributions controllable by segment managers, and contributions by segments. The president has hired you as a consultant to help him. He has given you the following information.

Total revenue in 20X3 was \$80 million, of which \$72 million was freight traffic and \$8 million was passenger traffic. Forty percent of the passenger revenue was generated by division 1, 50% by division 2, and 10% by division 3.

Total variable costs were \$40 million, of which \$36 million was caused by freight traffic. Of the \$4 million allocable to passenger traffic, \$2.1, \$1.6, and \$.3 million could be allocated to divisions 1, 2, and 3, respectively.

Total separable discretionary fixed costs were \$8 million, of which \$7.6 million applied to freight traffic. For the remaining \$400,000 applicable to passenger traffic, \$80,000 could not be allocated to specific divisions, while \$200,000, \$100,000, and \$20,000, were allocable to divisions 1, 2, and 3, respectively.

Total separable committed costs, which were not regarded as being controllable by segment managers, were \$25 million, of which 80% was allocable to freight traffic. Of the 20% traceable to passenger traffic, divisions 1, 2, and 3 should be allocated \$3 million, \$700,000, and \$300,000, respectively; the balance was unallocable to a specific division.

The common fixed costs not clearly allocable to any part of the company amounted to \$800,000.

1. The president asks you to prepare statements, dividing the data for the company as a whole between the freight and passenger traffic and then subdividing the passenger traffic into three divisions.
2. Some competing railroads actively promote a series of one-day sightseeing tours on summer weekends. Most often, these tours are timed so that the cars with the tourists are hitched on with regularly scheduled passenger trains. What costs are relevant for making decisions to run such

tours? Other railroads, facing the same general cost structure, refuse to conduct such sightseeing tours. Why?

3. Suppose that the railroad has petitioned government authorities for permission to drop division 1. What would be the effect on overall company net income for 20X4, assuming that the figures are accurate and that 20X4 operations are expected to be in all respects a duplication of 20X3 operations?

9-B3 Balanced Scorecard for a Law Firm

Young, Martinez, and Cheung (YMC) is a law firm in Chicago. The firm has had a very loose and relaxed management style that has served it well in the past. However, more aggressive law firms have been winning new clients faster than YMC has. Thus, the managing partner, Jerry Martinez, recently attended an ABA seminar on performance measurement in law firms, where he learned about the balanced scorecard. He thought it might be a good tool for YMC, one that would allow the firm to keep its culture yet still more aggressively seek new clients.

Martinez identified the following strategic objectives that fit with the firm's core values and provide a framework for assessing progress toward the firm's goals:

Financial

- a. Steadily increase the firm's revenues and profits.

Customer

- a. Understand the firm's customers and their needs.
- b. Value customer service over self-interest.

Internal Business Process

- a. Encourage knowledge sharing among the legal staff.
- b. Communicate with each other openly, honestly, and often.
- c. Empower staff to make decisions that benefit clients.

Organizational Learning

- a. Maintain an open and collaborative environment that attracts and retains the best legal staff.
- b. Seek staff diversity.

1. Develop at least one measure for each of the strategic objectives listed.
2. Explain how YMC can use this balanced scorecard to evaluate staff performance.
3. Should staff compensation be tied to the scorecard performance measures? Why or why not?

Additional Assignment Material

MyLab Accounting

QUESTIONS

9-1 What is a management control system?

9-2 What are the purposes of a management control system?

9-3 What are the major components of a management control system?

9-4 What is a key success factor?

9-5 "Goals are useless without performance measures." Do you agree? Explain.

9-6 "There are corporate goals other than to improve profit." Name three.

9-7 How does management determine its key success factors?

9-8 Give three examples of how managers may improve short-run performance to the detriment of long-run results.

9-9 Name three kinds of responsibility centers.

9-10 How do profit centers and investment centers differ?

9-11 List five characteristics of a good performance measure.

9-12 List four nonfinancial measures of performance that managers find useful.

9-13 "Performance evaluation seeks to achieve goal congruence and managerial effort." Explain what is meant by this statement.

9-14 How is responsibility accounting helpful in discharging effective management control in any organization?

9-15 "The distinction between controllable and uncontrollable costs is used in evaluating the performance of a manager." Do you agree? Explain.

9-16 "The challenge in choosing productivity measures is to avoid motivating decisions that improve one dimension of performance but hurt another dimension." Explain.

9-17 Give four examples of segments.

9-18 "Always try to distinguish between the performance of a segment and its manager." Why?

9-19 "The contribution margin approach to performance evaluation is flawed because focusing on only the contribution margin ignores important aspects of performance." Do you agree? Explain.

9-20 What is a balanced scorecard and why are more companies using one?

9-21 What are key performance indicators?

9-22 There are four categories of cost in the quality cost report; explain them.

9-23 Why are companies increasing their quality control emphasis on the prevention of defects?

9-24 “Nonfinancial measures of performance can be controlled just like financial measures.” Do you agree? Explain.

9-25 Identify three measures of labor productivity, (a) one using all physical measures, (b) one using all financial measures, and (c) one that mixes physical and financial measures.

9-26 Discuss the difficulties of comparing productivity measures over time.

9-27 “Control systems in nonprofit organizations will never be as highly developed as in profit-seeking organizations.” Do you agree? Explain.

CRITICAL THINKING EXERCISES

9-28 Management Control Systems and Innovation

The president of a fast-growing, high-technology firm remarked, “Developing budgets and comparing performance with the budgets may be fine for some firms. But we want to encourage innovation and entrepreneurship. Budgets go with bureaucracy, not innovation.” Do you agree? How can a management control system encourage innovation and entrepreneurship?

9-29 Municipal Responsibility Accounting

After barely avoiding bankruptcy, New York City established one of the most sophisticated budgeting and reporting systems of any municipality. The Integrated Financial Management System (IFMS) “clearly identifies managers in line agencies and correlates allocations and expenditures with organizational structure. . . . In addition, managers have more time to take corrective measures when variances between budgeted and actual expenditures start to develop.” (*FE—The Magazine for Financial Executives*, 1, no. 8, p. 26.)

Discuss how a responsibility accounting system such as IFMS can help manage a municipality such as New York City.

9-30 Control Systems and Customer Service Function of the Value Chain

Companies increasingly use nonfinancial measures to supplement financial measures of performance. One of the most important areas of nonfinancial performance is customer service. The last decade has brought an increased focus on the customer, and this focus is reflected in many companies’ management control systems, where companies use “customer-value metrics.” That is, they develop measures that monitor how well the company is meeting its customers’ interests. What customer-value metrics might a company such as **Volvo**, the Swedish automobile company, use in its management control system?

9-31 Control Systems and the Production Function of the Value Chain

In recent years, many organizations have focused on the value of controlling nonfinancial performance as a key to improved productivity. In particular, to gain and maintain a competitive edge, companies focus on quality and cycle time. Discuss how quality, cycle time, and productivity are related.

9-32 Key Performance Indicators

Critics of performance management advocate that identification and monitoring of the factors that are most closely linked to an organization’s success are key for an organization to compete effectively. A key performance indicator is a measure that drives organizational success. For each of the following companies, identify two possible key performance indicators.

1. **British Airways**
2. **Amazon**
3. **Sony Corporation**
4. **Regional Passport Offices under the Ministry of External Affairs, India**

EXERCISES

9-33 Responsibility for Stable Employment Policy

PCC Jewelers is a Kolkata-based jeweler that has been manufacturing customized gold and silver jewelry over 80 years and has an industry-wide reputation for state-of-the-art designs and quality standards. Due to the seasonal demand during the months from September to February, the company maintains a policy to lay off some goldsmiths as soon as there is insufficient work to keep all of them busy and to rehire them when demand warrants. Because of this lay-off policy, the company now has poor labor relations and finds it difficult to hire good goldsmiths. Consequently, the quality of the products has been declining steadily.

The production manager has proposed that the goldsmiths, who earn ₹5,000 per month, be retained during the slow periods as production assistants cum intra-departmental security personnel, for which the company pays ₹3,000 per month per person hired from an outside agency.

You, as controller, must decide the most appropriate accounting procedure to handle the wages of the goldsmiths doing the alternative work. What department(s) should be charged with this cost, and at what rate? Discuss the implications of your plan.

9-34 Salesclerk's Compensation Plan

You are the manager of a department store in Tokyo. Sales are subject to month-to-month variations, depending on the individual salesclerk's efforts and other factors. A new salary-plus-bonus plan has been in effect for 4 months, and you are reviewing a sales performance report. The plan provides for a base salary of ¥50,000 per month, a ¥68,000 bonus each month if the salesclerk meets the monthly sales quota, and an additional commission of 5% of all sales over the monthly quota. Each month, the quota is reset at approximately 3% above the previous month's sales to motivate clerks to continually increase sales. The monthly quotas and actual amounts for the first 4 months of the plan are shown in the following sales report (in thousands):

		Salesclerk A	Salesclerk B	Salesclerk C
January	Quota	¥4,500	¥1,500	¥7,500
	Actual	1,500	1,500	9,000
February	Quota	¥1,545	¥1,545	¥9,270
	Actual	3,000	1,545	3,000
March	Quota	¥3,090	¥1,590	¥3,090
	Actual	5,250	750	9,000
April	Quota	¥5,400	¥ 775	¥9,270
	Actual	1,500	780	4,050

1. Compute the compensation for each salesclerk for each month.
2. Evaluate the compensation plan. Be specific. What changes would you recommend?

9-35 Common Measures on a Balanced Scorecard

Listed next are common performance measures appearing on balanced scorecards. Indicate whether the listed measure is primarily associated with the financial, customer, internal process, or learning and growth perspective. (Note that some measures might reasonably be associated with more than one perspective.)

- Return on sales
- Retention of target customers
- Net cash flow
- Training hours
- Employee turnover rate
- Materials handling cost per unit
- Market share
- Product-development cycle time
- Revenue growth in segments
- Occupational injuries and illness
- Day's sales in inventory
- Average cost per invoice

9-36 Goals and Objectives at Bharti Net

Bharti Airtel provides telecom services in many parts of India and also in other countries including East, West, and Central Africa and Bangladesh through its subsidiaries. As a leading telecom company with millions of subscribers, Airtel strives to provide quality services at competitive prices.

Prepare a goal and one measure for assessing achievement of such a goal in each of the following key areas:

- Coverage and speed
- Usage
- Operational efficiency
- Customer satisfaction
- Overall financial performance

9-37 Performance Evaluation

Daniel Merrill & Co. is a stock brokerage firm that evaluates its employees on sales activity generated. Recently, the firm also began evaluating its stockbrokers on the number of new accounts generated.

Discuss how these two performance measures are consistent and how they may conflict. Do you believe that these measures are appropriate for the long-term goal of profitability?

9-38 Simple Controllable Costs

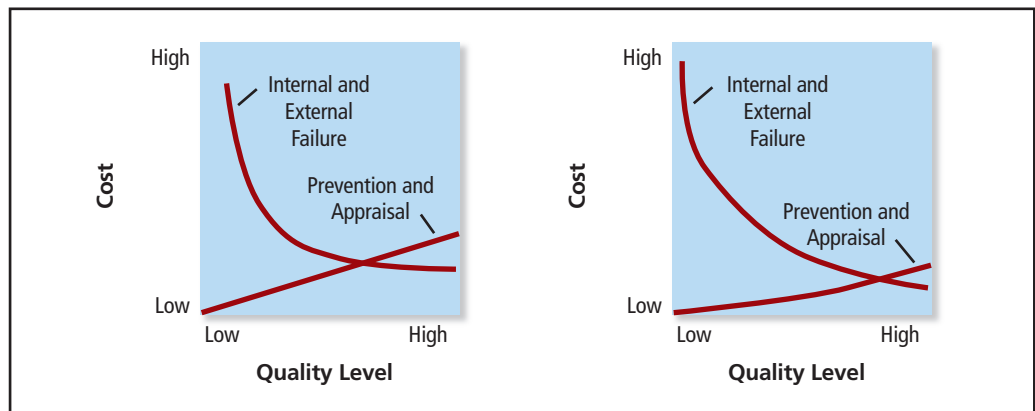
Customers' Delight is a well-known confectionery shop in Chester. The shop has a branch in Coventry, opened only 2 years ago. Both the shops are owned by Henry Brown, who retired recently from the active management of the individual shops due to health reasons. The shops are now managed by newly-appointed managers. In 2020, each had sales of £600,000. The Coventry shop is still pricing lower than the Chester shop to establish a customer base. Variable expenses run 65% of sales for the Chester shop and 70% of sales for the Coventry shop.

Each manager is responsible for rent and some other fixed costs for his or her shop. These costs amounted to £55,000 for the Chester shop and £37,500 for the one in Coventry. The difference is due to lower rent in Chester. In addition, several costs, such as advertising, legal services, accounting, and personnel services, were centralized. The managers had no control of these expenses, but some of them directly benefited the individual shops. Of the £172,500 cost in this category, £50,000 related to Chester and £92,500 to Coventry, where most of the additional cost in Coventry is due to the cost of extra advertising to build up its customer base. The remaining £30,000 was general corporate overhead.

1. Prepare income statements for each shop and for the company as a whole. Use a format that allows easy assessment of each manager's performance and each shop's economic performance.
2. Using only the information given in this exercise, do the following:
 - a. Evaluate each shop as an economic investment.
 - b. Evaluate each manager.

9-39 Quality Theories Compared

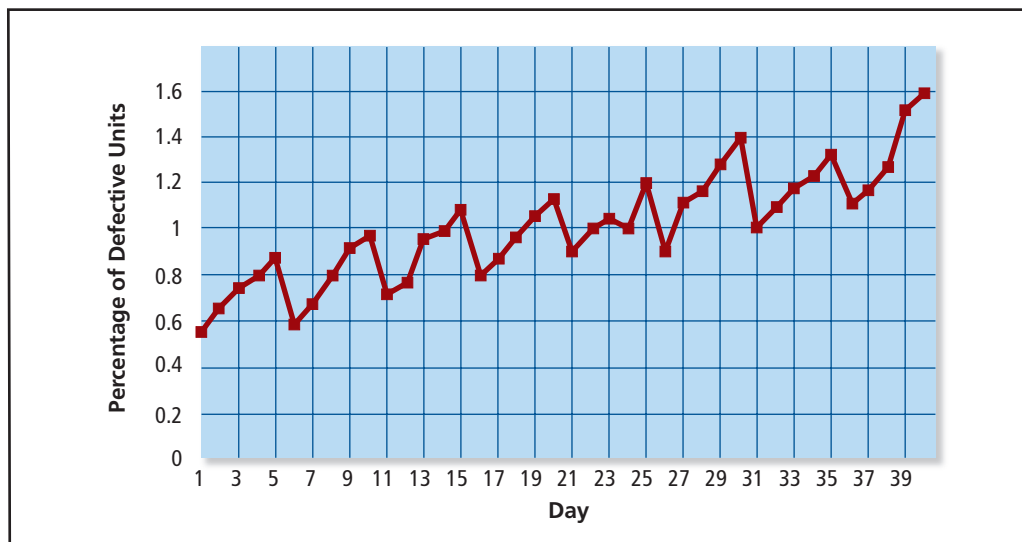
Examine the following two graphs. Compare the total quality management approach to the traditional theory of quality. Which theory do you believe represents the current realities of today's global competitive environment? Explain.



9-40 Quality-Control Chart

San Angelo Manufacturing Company was concerned about a growing number of defective units being produced. At one time, the company had the percentage of defective units down to less than five per thousand, but recently rates of defects have been near, or even above, 1%. The company decided to graph its defects for the last 8 weeks (40 working days), beginning Monday, September 1 through Friday, October 24. The graph is shown in Exhibit 9-12.

1. Identify two important trends evident in the quality-control chart.
2. What might management of San Angelo do to deal with each trend?

**Exhibit 9-12**

San Angelo Manufacturing Company
Quality-Control Chart for September 1 Through October 24

9-41 Cycle-Time Reporting

The Pierre plant of Global Electronics produces computers. The plant monitors its cycle time closely to prevent schedule delays and excessive costs. The standard cycle time for the manufacture of printed circuit boards for one of its computers is 26 hours. Consider the following cycle-time data from the past 6 weeks of circuit board production:

Week	Units Completed	Total Cycle Time
1	564	14,108 hours
2	544	14,592
3	553	15,152
4	571	16,598
5	547	17,104
6	552	16,673

Analyze circuit board cycle time performance in light of the 26-hour objective.

PROBLEMS**9-42 Multiple Goals and Profitability**

The following multiple goals were identified by **General Electric**:

- Profitability
- Market position
- Productivity
- Product leadership
- Personnel development
- Employee attitudes
- Public responsibility
- Balance between short-range and long-range goals

General Electric is a huge, highly decentralized corporation. At the time it developed these goals, GE had approximately 170 responsibility centers called departments, but that is a deceptive term. In most other companies, these departments would be called divisions. For example, some GE departments had sales of more than \$500 million.

Each department manager's performance was evaluated annually in relation to the specified multiple goals. A special measurements group was set up to devise ways of quantifying accomplishments in each of the areas. In this way, the evaluation of performance would become more objective as the various measures were developed and improved.

1. How would you measure performance in each of these areas? Be specific.
2. Can the other goals be encompassed as ingredients of a formal measure of profitability? In other words, can profitability per se be defined to include the other goals?

9-43 Responsibility Accounting, Profit Centers, and Contribution Approach

Glacial Refrigeration Inc., Germany, had the following data for its global operations in 2020:

Sales of refrigerators	€3,720,000
Sales of parts and service	€ 600,000
Cost of refrigerators sold	€2,976,000
Parts and service materials	€ 120,000
Parts and service labor	€ 240,000
Parts and service overhead	€ 48,000
General overhead	€ 216,000
Advertising of refrigerators	€ 120,000
Sales commissions, refrigerators	€ 186,000
Sales salaries, refrigerators	€ 105,600

The management's traditional policy was to regard the markup on material and labor for the parts and service activity as the amount that is supposed to cover all parts and service overhead plus some general overhead of the company. In other words, the parts and service department is viewed as a cost-recovery operation, while the sales of refrigerators is viewed as the income-producing activity.

1. Prepare a departmentalized operating statement that harmonizes with the existing views of the management.
2. Prepare an alternative operating statement that would reflect a different view of the company operations. Assume that €36,000 and €106,800 of the €216,000 general overhead can be allocated with confidence to the parts and service department and to sales of refrigerators, respectively. The remaining €73,200 cannot be allocated except in some highly arbitrary manner.
3. Comment on the relative merits of numbers 1 and 2.

9-44 Incentives in Planned Economies

Often government-owned companies in planned economies reward managers based on nonfinancial measures. For example, the government might give managers a bonus for exceeding a 5-year-planned target for production quantities. A problem with this method is that managers tend to predict low volumes so that officials will set the targets low. This makes it easier for the managers to meet the targets, but it severely hinders planning because managers do not provide accurate information about production possibilities.

The former Soviet Union developed an alternative performance measurement and reward system. Suppose F is the forecast of production, A is actual production, and X , Y , and Z are positive constants set by top officials, with $X, Y, Z > 0$. The following performance measure was designed to motivate both high production and accurate forecasts.

$$\begin{aligned} \text{performance measure} &= (Y \times F) + [X \times (A - F)] \text{ if } F \leq A \\ &= (Y \times F) - [Z \times (F - A)] \text{ if } F > A \end{aligned}$$

Assume that Cuba adopted this measure at a time when Soviet influence was great. Consider the Havana Television Manufacturing Company (HTMC). During 19X3, the factory manager, Che Chavez, had to predict the number of TVs that HTMC could produce during the next year. He was confident that at least 700,000 TVs could be produced in 19X4, and most likely they could produce 800,000 TVs. With good luck, they might even produce 900,000. Government officials told him that the new performance evaluation measure would be used, and that $X = 0.50$, $Y = 0.80$, and $Z = 1.00$ for 19X4 and 19X5.

1. Suppose Chavez predicted production of 800,000 TVs and HTMC actually produced 800,000. Calculate the performance measure.
2. Suppose again that HTMC produced 800,000 TVs. Calculate the performance measure if Chavez had been conservative and predicted only 700,000 TVs. Also calculate the performance measure if he had predicted 900,000 TVs.
3. Now suppose it is November 19X4, and it is clear that HTMC cannot achieve the 800,000 target. Does the performance measure motivate continued efforts to increase production? Suppose it is clear that HTMC will easily meet the 800,000 target. Will the system motivate continued efforts to increase production?

9-45 Balanced Scorecard

Indianapolis Pharmaceuticals Company (IPC) recently revised its performance evaluation system. The company identified four major goals and several objectives required to meet each goal. Kris Nordmark, controller of IPC, suggested that a balanced scorecard be used to report on progress toward meeting the objectives. At a recent meeting, she told the managers of IPC that listing the objectives was only the first step in installing a new performance measurement system. Each objective has to be accompanied by one or more measures to monitor progress toward achieving the objectives. She asked the help of the managers in identifying appropriate measures.

The goals and objectives determined by the top management of IPC are as follows:

1. Maintain strong financial health.
 - a. Keep sufficient cash balances to assure financial survival.
 - b. Achieve consistent growth in sales and income.
 - c. Provide excellent returns to shareholders.
2. Provide excellent service to customers.
 - a. Provide products that meet the needs of customers.
 - b. Meet customer needs on a timely basis.
 - c. Meet customer quality requirements.
 - d. Be the preferred supplier to customers.
3. Be among the industry leaders in product and process innovations.
 - a. Bring new products to market before competition.
 - b. Lead competition in production process innovation.
4. Develop and maintain efficient, state-of-the-art production processes.
 - a. Excel in manufacturing efficiency.
 - b. Meet or beat product introduction schedules.

Propose at least one measure of performance for each of the objectives of IPC.

9-46 Quality Cost Report

The production division of Green Star Inc., Bangladesh, produces different varieties of consumer durables, including air conditioners, air purifiers, air coolers, and water purifiers. The company prepares monthly reports on quality costs. The CEO of the company wants you, the controller, to prepare a comparative statement of quality costs in 2020 vis-à-vis 2018, considering the total annual numbers of these two years. You have prepared the following report (figures in thousands of Bangladeshi Taka, BDT):

Quality Cost Area	2018 (BDT)	2020 (BDT)
1. Prevention cost	3,600	8,560
Percentage of total quality cost	3.3%	12.4%
2. Appraisal cost	9,920	10,560
Percentage of total quality cost	9.1%	15.2%
3. Internal failure cost	40,240	29,440
Percentage of total quality cost	36.9%	42.5%
Total internal quality cost (1+2+3)	53,760	48,560
Percentage of total quality cost	49.3%	70.1%
4. External failure cost	55,280	20,720
Percentage of total quality cost	50.7%	29.9%
Total quality cost	109,040	69,280
Total product cost	1,773,440	1,876,960

1. For each of the four quality cost areas, explain what types of costs are included and how those costs have changed between 2018 and 2020.
2. Assess the overall quality performance in 2020 compared with 2018. What do you suppose has caused the changes observed in quality costs?

9-47 Six Sigma, Mean, and Variance

A major objective of Six Sigma quality-control programs is to better meet customers' needs. One place companies have applied Six Sigma is to order delivery times. They have directed efforts at reducing both the mean (average) time to delivery and the variance or standard deviation (dispersion) of the delivery times. Customers want to get their products sooner, as reflected in the mean. But they also want assurance that the product will arrive when promised. This requires delivery schedules to have little random variance.

Exhibit 9-13

Red Lake Enterprises
Quality Cost Report (thousands
of dollars)

Quality Cost Area	20X4 Cost	20X6 Cost
1. Prevention cost	45	107
Percentage of total quality cost	3.3%	12.4%
2. Appraisal cost	124	132
Percentage of total quality cost	9.1%	15.2%
3. Internal failure cost	503	368
Percentage of total quality cost	36.9%	42.5%
Total internal quality cost (1 + 2 + 3)	672	607
Percentage of total quality cost	49.3%	70.1%
4. External failure cost	691	259
Percentage of total quality cost	50.7%	29.9%
Total quality cost	1,363	866
Total product cost	22,168	23,462

Consider the following experience with the implementation of Six Sigma at a major manufacturing company:

Order Delivery Times (Days)	
Before Six Sigma	After Six Sigma
28	16
10	21
13	12
7	7
24	16
21	4
22	5
24	16
28	11
43	2

Compute the mean and standard deviation of order-delivery time before and after implementation of Six Sigma. From a customer's perspective, how would you view the results of this application of Six Sigma?

9-48 Productivity

In early 2020, Trio Communications, an India-based wireless broadband service provider, acquired the controlling stake in Excel Web, a cable broadband service provider in semi-urban areas of southern India. A key productivity measure monitored by Trio is the number of broadband subscribers per employee. Consider the following data for Trio Communications for 2020:

	2020 Standalone	2020 Consolidated	2019
Number of broadband subscribers	7,685,000	10,730,000	7,393,500
Number of employees	36,250	58,000	34,875
Subscriptions per employee	212	185	212

1. What are Trio's 2019 productivity and 2020 productivity without Excel Web?
2. What are Excel Web's 2020 productivity and Trio's 2020 productivity with Excel Web?
3. What difficulties do you foresee if Trio brings Excel Web's productivity in line?

9-49 Productivity Measurement

Exclusive Handicrafts Company produces handcrafted luxury leather wallets. The company had the following results in 2018 and 2020:

	2018	2020
Number of wallets produced	213,000	225,750
Sales revenue	£10,350,000	£15,360,000
Direct labor hours worked	6,750	67,675
Direct labor cost	£ 4,770,000	£ 6,000,000

The company used the same facilities in 2020 as in 2018. During the past three years, however, the company put more effort into training its employees. The manager of Exclusive Handicrafts was curious about whether the training had increased labor productivity.

1. Compute a measure of labor productivity for 2020 based entirely on physical measures. Do the same for 2018. That is, from the given data, choose measures of physical output and physical input, and use them to compare the physical productivity of labor in 2020 with that in 2018.
2. Compute a measure of labor productivity for 2020 on financial measures. Do the same for 2018. That is, from the given data, choose measures of financial output and financial input, and use them to compare the financial productivity of labor in 2020 with that in 2018.
3. Suppose the following productivity measure was used:

$$\text{Productivity} = \frac{\text{Sales revenue}}{\text{Direct labor hours worked}}$$

Because of inflation, each 2018 pound is equivalent to 1.13 pounds in 2020. Compute appropriate productivity numbers for comparing 2020 productivity with 2018 productivity.

CASES

9-50 Trade-Offs Among Objectives

Computer Data Services (CDS) performs routine and custom information systems services for many companies in a large midwestern metropolitan area. CDS has built a reputation for high-quality customer service and job security for its employees. Quality service and customer satisfaction have been CDS's primary subgoals—retaining a skilled and motivated workforce has been an important factor in achieving those goals. In the past, temporary downturns in business did not mean layoffs of employees, though some employees were required to perform other than their usual tasks. In anticipation of growth in business, CDS leased new equipment that, beginning in August, added \$10,000 per month in operating costs. Three months ago, however, a new competitor began offering the same services to CDS customers at prices averaging 19% lower than those of CDS. Rico Estrada, the company founder and president, believes that a significant price reduction is necessary to maintain the company's market share and avoid financial ruin, but he is puzzled about how to achieve it without compromising quality, service, and the goodwill of his workforce.

CDS has a productivity objective of 20 accounts per employee. Estrada does not think that he can increase this productivity and still maintain both quality and flexibility to customer needs. CDS also monitors average cost per account and the number of customer satisfaction adjustments (resolutions of complaints). The average billing markup rate is 25% of cost. Consider the following data from the past 6 months:

	June	July	August	September	October	November
Number of accounts	797	803	869	784	723	680
Number of employees	40	41	44	43	43	41
Average cost per account	\$ 153	\$ 153	\$ 158	\$ 173	\$ 187	\$ 191
Average salary per employee	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000

1. Discuss the trade-offs facing Rico Estrada.
2. Can you suggest solutions to his trade-off dilemma?

9-51 Six Sigma

The chapter mentions four companies that use Six Sigma for measuring and controlling quality: **Motorola**, **General Electric**, **3M**, and **Dow Chemical**. Go to the Web site for each of these companies and find what each says about its Six Sigma efforts.

9-52 Review of Chapters 1–9

William Whitebear, general manager of the Kamloops Division of Canada Enterprises, is preparing for a management meeting. His divisional controller provided the following information:

1. The master budget for the fiscal year ended June 30, 20X4, follows:

Sales (50,000 units of A and 70,000 units of B)	\$870,000
Manufacturing cost of goods sold	740,000
Manufacturing margin	<u>\$130,000</u>
Selling and administrative expenses	120,000
Operating income	<u><u>\$ 10,000</u></u>

2. The standard variable manufacturing cost per unit follows:

	Product A		Product B	
Direct materials	10 pieces at \$0.25	\$2.50	5 pounds at \$0.30	\$1.50
Direct labor	1 hour at \$3.00	3.00	0.3 hour at \$2.50	0.75
Variable overhead	1 hour at \$2.00	2.00	0.3 hour at \$2.50	0.75
Total		<u><u>\$7.50</u></u>		<u><u>\$3.00</u></u>

3. All budgeted selling and administrative expenses are common, fixed expenses; 60% are discretionary expenses.
4. The actual income statement for the fiscal year ended June 30, 20X4, follows:

Sales (53,000 units of A and 64,000 units of B)	\$861,000
Manufacturing cost of goods sold	749,200
Manufacturing margin	<u>\$111,800</u>
Selling and administrative expenses	116,000
Operating income	<u><u>\$ (4,200)</u></u>

5. The budgeted sales prices for products A and B were \$9 and \$6, respectively. Actual sales prices equaled budgeted sales prices.
6. The schedule of the actual variable manufacturing cost of goods sold by product follows (actual quantities in parentheses):

Product A:	Materials	\$134,500	(538,000 pieces)
	Labor	156,350	(53,000 hours)
	Overhead	108,650	(53,000 hours)
Product B:	Materials	102,400	(320,000 pounds)
	Labor	50,000	(20,000 hours)
	Overhead	50,000	(20,000 hours)
Total		<u><u>\$601,900</u></u>	

7. Products A and B are manufactured in separate facilities. Of the budgeted fixed manufacturing cost, \$130,000 is separable as follows: \$45,000 to product A and \$85,000 to product B. Ten per cent of these separate costs are discretionary. All other budgeted fixed manufacturing expenses, separable and common, are committed.
8. There are no beginning or ending inventories.

During the upcoming management meeting, it is quite likely that some of the information from the controller will be discussed. In anticipation you set out to prepare answers to possible questions.

1. Determine the firm's budgeted break-even point in dollars, overall contribution-margin ratio, and contribution margins per unit by product. Assume no change in product mix.
2. Considering products A and B as segments of the firm, find the budgeted "contribution by segments" for each.

3. It is decided to allocate the budgeted selling and administrative expenses to the segments (in number 2) as follows: committed costs on the basis of budgeted unit sales mix and discretionary costs on the basis of actual unit sales mix. What are the final expense allocations? Briefly appraise the allocation method.
4. How would you respond to a proposal to base commissions to salespersons on the sales (revenue) value of orders received? Assume all salespersons have the opportunity to sell both products.
5. Determine the firm's actual "contribution margin" and "contribution controllable by segment managers" for the fiscal year ended June 30, 20X4. Assume no variances in committed fixed costs.
6. Determine the "sales-activity variance" for each product for the fiscal year ended June 30, 20X4.
7. Determine and identify all variances in variable manufacturing costs by product for the fiscal year ended June 30, 20X4.

NIKE 10-K PROBLEM

9-53 Strategy at Nike

Find "Item 7 Management's Discussion and Analysis of Financial Condition and Results of Operations" near the beginning of the **Nike** 10-K report in Appendix C.

1. In June 2020, Nike announced a new digitally empowered phase of its Consumer Direct Offense strategy: Consumer Direct Acceleration. What three specific areas will this strategic acceleration focus on?
2. What are Nike's long-term financial goals?
3. List some nonfinancial goals that Nike might use in a BSC.

EXCEL APPLICATION EXERCISE

9-54 Wages for New Salary-Plus-Bonus Plan

Goal: Create an Excel spreadsheet to calculate the impact on employee wages of a new salary-plus-bonus plan established to motivate salesclerks to increase sales. Use the results to answer questions about your findings.

Scenario: As the department store manager, you must determine if the new plan is the best way to motivate salesclerks and meet the objective of increasing sales. The background data for the compensation plan appear in Exercise 9-34. Use only data for salesclerk A and salesclerk B to prepare your spreadsheet.

When you have completed your spreadsheet, answer the following questions:

1. Which salesclerk has the highest average total salary over the four-month period?
2. What part of the compensation plan had the most impact on the salesclerks' salaries? The least impact?
3. Do you see any problems with this compensation plan? Explain.

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
 Row 1: Chapter 9 Decision Guideline
 Row 2: Tokyo Department Store
 Row 3: Salary-Plus-Bonus Plan Analysis
 Row 4: Today's Date
3. Merge and center the four heading rows across columns A–H.
4. In column A, create the following row headings:
 Row 7: Salesclerk A
 Row 8: Month
 Row 9: January
 Row 10: February
 Row 11: March
 Row 12: April
 Skip three rows.
 Row 16: Salesclerk B
 Row 17: Month
 Row 18: January
 Row 19: February
 Row 20: March
 Row 21: April

5. Change the format of salesclerk names (rows 7, 16) to bold-faced, underlined headings.
6. Change the format of month (rows 8, 17) to bold-faced headings.
7. In rows 8 and 17, create the following bold-faced, right-justified column headings:
 Column B: Quota
 Column C: Sales
 Column D: Over Quota
 Column E: Base Salary
 Column F: Quota Bonus
 Column G: Commission
 Column H: Total Salary

Note: Adjust column widths as necessary.

8. In column G, create the following right-justified cell headings:
 Row 14: Average:
 Row 23: Average:
9. Use the scenario data to fill in quota, sales, and base salary amounts from January–April for each salesclerk.
10. Use the appropriate IF statements to calculate over quota and quota bonus amounts when the salesclerks' sales met or exceeded their respective quotas (negative commissions should not be calculated).

= IF (formula > 0,formula,0)

For Over Quota only.

= IF (formula < 0,0,68000) OR = IF (formula > 0,68000,0)

For Quota Bonus only.

Hint: Go to the "Help" text and type "copy formulas" in the search area to obtain instructions for copying formulas from one cell to another. If done correctly, you should have to type in each of the formulas only once.

11. Use appropriate formulas to calculate commission and total salary amounts for each month, as well as an average amount for the January–April period for each salesclerk.
12. Format all amounts as follows:

Number tab:

Category:	Currency
Decimal places:	0
Symbol:	None
Negative numbers:	Black with parentheses

13. To format specific amounts to display with a yen symbol, do the following:
 - a. In an empty cell, hold down the Alt key and enter 0165 from the numeric keypad. When you stop holding the Alt key down, a yen sign will be displayed.
 Note: If your keyboard does not have a numeric keypad, use the shift and NumLk keys to activate the imbedded numeric keypad. Then, follow the instructions in part a. Use the shift and NumLk keys to turn the feature off.
 - b. Highlight the yen character you have just created, select Edit, Cut. This will paste the yen sign to the clipboard. To see the clipboard, select View, Toolbars, Clipboard.
 - c. Select the average amount for salesclerk A and open the Format, Cells. . . . dialog box.
 - d. Select the custom category on the number tab. Scroll down toward the bottom of the type list and highlight the type shown next.

Type: (\$#, ##0); (\$#, ##0); (\$" - "); (@)

Change the data between the quotation marks in the third grouping from "-" to "0."

Paste the yen sign over EACH occurrence of the dollar sign.

Hint: Highlight the \$ sign; press "Ctrl" and "V." This will paste the yen sign from the clipboard over the \$ sign that has been highlighted in the Type field.

- e. Click the OK button.
- f. Utilize the custom format, which should now be at the bottom of the type list, to print the yen sign for all January amounts for both clerks and the average amount for salesclerk B.
14. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

9-55 Goals, Objectives, and Performance Measures

There is increasing pressure on colleges and universities to develop measures of accountability. The objective is to specify goals and objectives and to develop performance measures to assess the achievement of those goals and objectives.

Form a group of four to six students to be a consulting team to the accounting department at your college or university. (If you are not using this book as part of a course in an accounting department, select any department at your college or university.) Based on your collective knowledge of the department, its mission, and its activities, formulate a statement of goals for the department. From that statement, develop several specific objectives, each of which can be measured. Then, develop at least one measure of performance for each objective.

An optional second step in this exercise is to meet with a faculty member from the department, and ask him or her to critique your objectives and performance measures. To the department member, do the objectives make sense? Are the proposed measures feasible, and will they correctly measure attainment of the objectives? Will they provide proper incentives to the faculty? If the department has created objectives and performance measures, compare them to those your group developed.

INTERNET EXERCISE

9-56 Management Control System at Procter & Gamble

Setting up management control systems and determining measurement methods and who should be responsible for particular revenues, costs, and information can be a large task. The structure of the organization plays a part in how well a particular measure is likely to work. Ensuring that the goals of the organization are in concert with the management control system is also an important factor. It is not possible to evaluate a company's management control system from an Internet site. What we can do, however, is to use a site as an example and apply some of the concepts of the chapter to measures and tools that would be possibilities for a firm.

1. A well-known and well-established company with worldwide acceptance is **Procter & Gamble (P&G)**. Log on to the company's Web site at www.pg.com. Locate the most recent annual report by following the links under the "Partners & Investors" tab to "Investors" and "Financial Reporting." Examine the "Letter to Shareholders" section of the annual report. What does P&G consider to be the most important factors that drive their growth strategy? How does P&G ensure that managers meet the company's objectives?
2. The company has numerous products, and the Web site divides them into different categories and brands to help customers find relevant product information. Click on "Our Brands" and then "Brands." What are the major categories of brands listed on the Web site? Click on the "Home Care" category. What are some of the brands in this category that you are familiar with? How could a system be set up to help measure the success of the firm's goal to build brands in the "Home Care" category? What would be three possible financial measures? What about three nonfinancial measures?

Management Control in Decentralized Organizations

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Define *decentralization* and identify its expected benefits and costs.
2. Distinguish between responsibility centers and decentralization.
3. Explain how the linking of rewards to responsibility-center performance metrics affects incentives and risk.
4. Compute return on investment (ROI), economic profit, and economic value added (EVA).
5. Compare the incentives created by income, ROI, and economic profit (or EVA) performance measures.
6. Define *transfer prices* and identify their purpose.
7. State the general rule for transfer pricing and use it to assess alternative transfer prices based on total costs, variable costs, or market prices.
8. Identify the factors affecting multinational transfer prices.
9. Explain how controllability and management by objectives (MBO) aid the implementation of management control systems.

► NIKE

Since its inception, **Nike** has become the largest sports and fitness company in the world. It has grown from a small Beaverton, Oregon, company into a global giant with a presence in many different sports. For example, in the world of soccer, Nike was only a minor factor 20 years ago. Now Nike has placed itself at the center of attention for soccer fans worldwide. Nike has endorsement arrangements with the Italian and French national teams, as well as Manchester United, FC Barcelona, Inter Milan, and PSV Eindhoven. Further, its visibility continues to grow. Nike was the official sponsor and supplier for Chinese athletes for the 2008 Beijing Olympic Games.

From 1986 to 2021, Nike's revenues increased from \$1 billion to \$44.538 billion. During this same period, the percentage of non-U.S. revenues increased from 25% to 57%. Nike now has more stores outside the United States than inside. While footwear still accounts for more than half of Nike's sales, apparel sales now account for nearly one-third. A sampling of endorsements (promotional contracts with famous sports teams, individuals, and organizations) in addition to the soccer teams previously listed gives another perspective on the company's global presence. Tennis stars Roger Federer, Rafael Nadal, Maria Sharapova, Serena Williams; basketball stars Kobe Bryant, LeBron James, and Kevin Durant; and golf's Trevor Immelman, Anthony Kim, and Paul Casey have all had endorsement deals with Nike. Watch almost any sports event on television, and you are likely to see the Nike "swoosh" logo.

Nike made a conscious decision to go global—a process that has generated substantial financial rewards. What are some of the keys to success when a company like Nike decides to significantly expand its operations abroad? To manage and coordinate widely dispersed operations, Nike needs information. Increasing sophistication of communications—Internet, e-mail, and worldwide cellular phone coverage—means that geographical separation no longer implies lack of access to information. While communications technology can help Nike and others get information quickly, the information they receive is determined by their management control system.

This chapter focuses on the role of management control systems in decentralized organizations such as Nike. We discuss how companies use performance metrics to motivate managers of separate units, including various ways of measuring performance to encourage actions by managers that are in the company's best interests. Finally, we address the special problems created when one segment of an organization charges another for providing goods or services. ■



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Nike is a globally decentralized company. Customers throughout the world recognize its “swoosh” trademark. Achieving the appropriate balance between autonomy at the local level and efficiencies at the corporate level is a challenge when designing Nike’s management control system.

Centralization Versus Decentralization

As organizations grow and undertake more diverse and complex activities, they face decisions about how much decision-making authority to delegate to lower levels of the organization. Concentration of decision-making authority only at the highest levels of the organization is **centralization**. Delegation of decision-making authority to lower levels is **decentralization**. Note that centralization or decentralization is a matter of degree, depicted as a choice along the continuum shown in Exhibit 10-1. The lower in the organization that authority is delegated, the greater the decentralization.

Nike has delegated a great deal of decision-making authority to the local-market level. For example, local Nike managers in Germany made the decision to sign an endorsement contract with world-champion racecar driver Michael Schumacher. According to former CEO Philip Knight, “[Previously] it would have taken a move from within the company headquarters to strike such a deal. . . . But this time it was a decision made in country.” The local German manager knew that Schumacher was extremely relevant to the German market and that this would be a “profit driven, culturally significant, and brand enhancing move.” Knight credits this move toward decentralization for Nike’s rapid increase in international sales: “It is a great example of what we are trying to do: Make decisions on the ground in faraway places.”

The best choice along the continuum between centralization and decentralization is seldom obvious. In fact, organizations and industries seem to cycle from increasing decentralization to increasing centralization, and back again. For example, more than a decade ago most airlines, such as **South China Airlines**, **Iberia Airlines**, and **Air France**, decentralized. In contrast, at the same time, **Sabena**, Belgium’s state-owned airline until its bankruptcy in 2001, undertook a centralization effort. In the insurance industry, **Aetna** decentralized at the same time **AXA Equitable** was centralizing. Let’s take a look at some of the factors companies consider as they choose their position along the centralization/decentralization continuum.

Objective I

Define *decentralization* and identify its expected benefits and costs.

centralization

Concentration of decision-making authority only at the highest levels of an organization.

decentralization

The delegation of decision-making authority to lower levels of the organization. The lower in the organization that authority is delegated, the greater the decentralization.

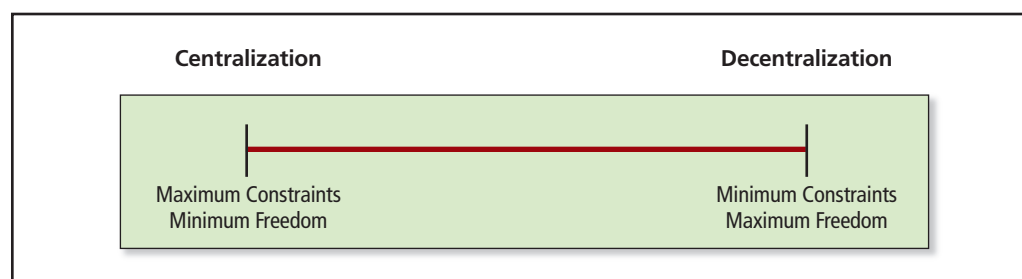


Exhibit 10-1

Centralization Versus Decentralization

Costs and Benefits of Decentralization

Most organizations realize benefits from some level of decentralization. Managers of lower-level units (which we will refer to as “local” managers), often have the best information concerning local conditions and, therefore, are able to make faster and better decisions on local issues than higher-level managers (which we will refer to as “central” managers). By delegating decision-making authority to local managers, central managers free up time to deal with larger issues and fundamental strategy. In addition, decentralization gives local managers an opportunity to develop their decision-making ability and other management skills, ensuring that the organization develops future leaders. Finally, local managers who are given more authority often have greater motivation and job satisfaction.

Decentralization also has its costs. Local managers may make decisions that are not in the organization’s best interests. Why? Either because they act to improve their own segment’s performance at the expense of the organization or because they do not fully understand the effects of their decisions on other segments and the organization as a whole. In a decentralized organization, innovative ideas to improve performance are less likely to be shared across units. Local managers in decentralized organizations also tend to duplicate services that might be less expensive if centralized (e.g., accounting, advertising, and personnel). Furthermore, costs of accumulating and processing information frequently rise under decentralization because top management needs additional accounting reports to learn about and evaluate decentralized units and their managers. Finally, managers in decentralized units may waste time negotiating with other units about goods or services that are being transferred between units. You can see some of the costs and benefits of decentralization in the Business First box on p. 411.

Decentralization is more popular in profit-seeking organizations (where accountants can more easily measure outputs and inputs) than in nonprofit organizations (where it is more difficult to find reliable performance measures, so granting managers freedom is more risky). Central management can give local managers more freedom when it can more easily measure the results of their decisions and thereby hold local managers accountable for the results. In a profit-seeking firm, poor decisions become apparent from the inadequate profit generated.

Middle Ground

The optimal choice along the centralization/decentralization continuum is likely to differ from one company to the next. For every **Nike** that finds the benefits of increased decentralization exceeding the costs, another company finds the costs exceeding the benefits. In fact, the optimal choice for one part of the organization may differ from the optimal choice for another part. For example, many companies decentralize much of the controller’s problem-solving and attention-directing functions and handle them at lower levels. In contrast, they generally centralize income tax planning and mass scorekeeping functions such as accounting for payroll.

Decentralization is more successful when an organization’s segments are relatively independent of one another—that is, when the decisions of a manager in one segment will not affect other segments. When segments do much internal buying or selling, much buying from the same outside suppliers, or much selling to the same outside markets, they are candidates for more centralization.

In Chapter 9, we stressed that managers should consider cost-benefit tests, goal congruence, and managerial effort when designing a management control system. If management has decided in favor of heavy decentralization, then **segment autonomy**—the delegation of decision-making power to managers of segments of an organization—is also crucial. For decentralization to work, however, this autonomy must be real, not just “lip service.” Top managers must be willing to abide by decisions made by segment managers in most circumstances.

Responsibility Centers and Decentralization

Design of a management control system should consider two separate dimensions of control: (1) the responsibilities of managers and (2) the amount of autonomy they possess. Some managers confuse these two dimensions by assuming that profit-center managers always have more decentralized decision-making authority than cost-center managers. This is not necessarily the case. Some profit-center managers, such as those at **General Electric**, possess vast freedom to make decisions concerning labor contracts, supplier choices, equipment purchases, personnel decisions, and so on. In contrast, profit-center managers at other companies need top-management

segment autonomy

The delegation of decision-making power to managers of segments in an organization.

Objective 2

Distinguish between responsibility centers and decentralization.

Singapore's Office Decentralization

In 2019, the Government of Singapore introduced a new scheme to try and convince the owners of older properties in the Central Business District (CBD) to convert office blocks into hotels, homes, and amenity hubs. Redevelopment in the CBD also requires owners to create open spaces within the footprint of any new office building.

Back in 2010, the Singaporean property developer Ho Bee Land bought a commercial site near the one-north Mass Rapid Transport (MRT) station and the Star Vista mall. It was situated outside the CBD and seen as quite a risk, but the developer was convinced it would be ideal for multinational businesses due to its proximity to a university and an established research and development area of the city. The net result in 2013 was the creation of The Metropolis, which has been fully occupied since it became available.

In a city that often struggles to find space for enterprises within the aging building stock of the CBD, this decentralization of office space was one of the many projects arising out of the government's desire to encourage businesses to set up outside of the city center. To kick start this approach, new economic gateways are being planned for the north, east, and west and a specific CBD in the Jurong Lake District.

Decentralization of offices has been very successful; the Westgate Tower became the new home of Daimler in 2015. The automotive company had moved from the Centennial Tower in the CBD, attracted by rents that were barely two-thirds of what they had been paying.

It has taken some time for businesses to decentralize outside of the CBD, with some preferring to downsize in the CBD and having their main operations outside the city center, a purer

form of decentralization rather than full relocation. The Government of Singapore has been careful to balance the two parts of its decentralization policy. On the one hand they tightened the controls and the requirements for development in the CBD, making it less attractive and financially viable to create pure office spaces; at the same time they released new land outside the city with looser controls and requirements.

In 2007, the rental differential between the CBD and out of city areas was around 56%; this has narrowed since 2019 to 32%, slowing down the decentralization. It is suggested that the figure needs to be around 50% to spark interest from businesses in the CBD.

Decentralization has also been an issue for employees, particularly those that have been working in CBD offices for some years. They have often located their homes close to connecting transport and joined fitness clubs near their offices. Companies that have successfully managed the decentralization have tended to involve their employees at an early stage and given them time to understand the move and make any necessary transitions. Companies have also offered incentives to employees for decentralizing, including paying relocation costs, setting up childcare provision, and, in collaboration with the developers at the new location, good quality on-site facilities such as dining, crèches, and fitness clubs. The non-CBD office owners are as keen to offer incentives to relocate as the businesses actually relocating.

Sources: F. Mokhtar, "How Singapore's \$50 Billion Financial District Will Change After COVID-19," *Bloomberg*, October 7, 2021; Y. Ong, "Beyond the Core: Singapore's Office Decentralisation," *The Business Times*, March 30, 2019; and the Urban Redevelopment Authority website.

approval for almost all the decisions just mentioned. Similarly, cost centers may be more heavily decentralized than profit centers. The fundamental question in deciding between using a cost center or a profit center for a given segment is not whether heavy decentralization exists. Instead, the fundamental question is, for whatever level of decentralization that exists, "Will a profit center or a cost center better solve the problems of goal congruence and management effort?"

The management control system should be designed to achieve the best possible alignment between local manager decisions and the actions central management seeks. For example, a plant may seem to be a "natural" cost center because the plant manager has no influence over decisions concerning the marketing of its products. Nevertheless, some companies insist on evaluating a plant manager by the plant's profitability. Why? Because they believe this broader evaluation base will positively affect the plant manager's behavior. Instead of being concerned solely with running an efficient cost center, the system motivates the plant manager to consider quality control more carefully and react to customers' special requests more sympathetically. In designing accounting control systems, top managers must consider the system's impact on behavior desired by the organization.

Performance Metrics and Management Control

A major factor in designing decentralized management control systems is how the system's performance metrics affect managers' incentives. **Incentives** are the rewards, both implicit and explicit, for managerial effort and actions. A **performance metric** is a specific measure of management accomplishment. Organizations should choose performance metrics that improve the alignment of manager incentives with organizational objectives. The organization wants managers to use decision-making autonomy to meet the company's objectives, not to pursue

Objective 3

Explain how the linking of rewards to responsibility-center performance metrics affects incentives and risk.

incentives

Rewards, both implicit and explicit, for managerial effort and actions.

performance metric

A specific measure of management accomplishment.

agency theory

A theory that deals with relationships where one party (the principal) delegates decision-making authority to another party (the agent).

other goals. For example, Nike executives wanted the company's manager of German operations to sign auto-racer Michael Schumacher to a contract only if it would create additional profits for Nike, not to provide an entree for the manager into the inner circles of auto racing.

Agency Theory, Performance, and Rewards

Agency theory provides a model to analyze relationships where one party (the principal) delegates decision-making authority to another party (the agent). Agency theory is useful to analyze situations where there is imperfect alignment between the principal's and agent's 1) information and 2) objectives. As discussed earlier, it is common for local managers to have better information about their units than do higher-level central managers. Because the local managers have different information than central managers, they make different decisions. Similarly, as discussed in Chapter 9, it is common for the objectives of local managers to differ from central organizational objectives. Agency theory provides a framework to analyze these differences in designing a management control system.

Exhibit 10-2 shows how the design of a management control system affects the actions of managers. Managers have beliefs about how alternative action choices will lead to outcomes for their unit, and the management control system specifies how outcomes translate into unit performance metrics and into both explicit and implicit rewards. Managers' preferences motivate them to select actions that generate outcomes measured and rewarded by a company's management control system. The manager's understanding of how the control system links outcomes, performance metrics, and rewards influences the manager's choice of actions. Thus, the right metrics and rewards motivate actions that are in the company's best interests.

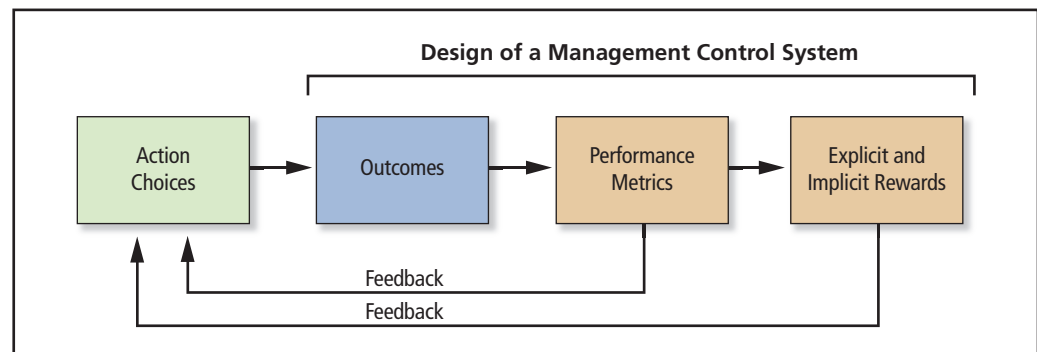
The links between outcomes and performance metrics and rewards are critical features of the management control system. While the importance of explicit links is clear, implicit links may also be important. For example, the management control system might include an explicit link that specifies the amount of bonus that will be paid for different levels of profit, but there may be an additional implicit link between performance and promotions. Similarly, it is important to recognize that rewards may be monetary or nonmonetary. Examples of monetary rewards include pay raises and bonuses. Examples of nonmonetary rewards include praise, better offices, and other perquisites. Thus, while we often focus on explicit monetary rewards, remember that implicit and nonmonetary rewards associated with outcomes and metrics play important roles in the management control system.

One important rule for performance measurement is clear: *You get what you measure.* Managers focus on areas where an organization measures managerial performance, even when the management control system does not include explicit rewards tied to the measures. Therefore, it is important to choose accounting measures that provide objective and easy-to-understand evaluations of performance, where managers believe there is a clear connection between their action choices and the performance metric.

Agency Theory and Risk

Ideally, companies should reward managers based on their individual performance, but often an organization cannot directly measure a manager's performance. For example, a company may not be able to separate the manager's effect on responsibility-center results from the effect of other factors beyond a manager's control. The greater the influence of noncontrollable factors

Exhibit 10-2
Design of a Management
Control System



on responsibility-center results, the more problems there are in using the results to measure and reward a manager's performance.

Consider a particular Niketown store. Suppose its profits increased dramatically. The following factors all contributed to the increase in profits:

- A lengthy strike by employees of a competitor resulted in many customers switching to Nike.
- The store implemented a new cost management system resulting in a significant reduction in the costs of handling merchandise.
- Overall population growth in the store's region has been much higher than in other Niketown locations.
- Labor costs in the region have not increased as much as in most Niketown locations.
- Employee turnover is lower than the system average. Employees cite their excellent relationship with fellow employees and management as the reason for their high level of job satisfaction.

From the factors listed, it is likely that a significant portion of the store's profit increase was due to factors the store manager could not control (the competitor's strike, population growth, and regional labor costs). Nonetheless, it is also likely that a portion of the profit increase was due to factors the manager could control (adopting the cost-management system and creating a productive working environment for all employees). How should Nike evaluate the performance of the store manager? Should it measure the manager's performance by comparing profit across other Niketown stores? What other measures could Nike use?

An ideal performance metric would measure and reward the manager for controllable factors and neither reward nor punish the manager for uncontrollable factors. Although this ideal is hard to achieve, agency theory can guide the design of a system to link performance metrics and rewards. When an organization hires a manager, the employment contract details performance metrics and how they will affect rewards. However, not all rewards are explicitly specified. For example, a company can reward a manager with a promotion, but the contract will probably not explicitly specify the requirements for promotion.

According to agency theory, employment contracts must balance three factors:

1. **Incentive:** The more a manager's reward depends on a performance metric, the more incentive the manager has to take actions that maximize that measure. Top management should define the performance metric to promote goal congruence and base enough reward on it to achieve managerial effort.
2. **Risk:** The more uncontrollable factors affect a manager's reward, the more risk the manager bears. People generally avoid risk, so a company must pay managers more if it expects them to bear more risk. Creating incentive by linking rewards to responsibility-center results, which is generally desirable, has the undesirable side effect of imposing risk on managers if noncontrollable factors affect some part of the center's results.
3. **Cost of measuring performance:** The incentive versus risk trade-off is not necessary if a manager's controllable performance can be perfectly measured. Why? Because managers completely control their own performance, perfect measurement of controllable performance would eliminate risk to the manager. With perfect performance measurement, a manager could be paid a fixed amount if he or she performs as agreed, and nothing otherwise. But perfectly measuring controllable performance is usually inordinately expensive if not outright impossible. The cost-benefit criterion therefore leads companies to rely on imperfect but low-cost measures. Unfortunately, these measures frequently confound the manager's controllable performance with uncontrollable factors.

Consider the example of a promoter hired by a group of investors to promote and administer an outdoor concert. Suppose the investors offer the promoter a contract with part guaranteed pay and part bonus based on total attendance. A larger bonus portion compared with the guaranteed portion creates more incentive, but it also creates more risk for the promoter. For example, what happens if it rains? The promoter could do an outstanding job promoting the concert but the weather might keep fans away. To compensate the promoter for added risk, the expected total payment to the promoter will have to be higher for a contract where a higher portion of the total payment is based on attendance. The investors must decide on the optimal trade-off between the benefit from the added incentive created by a larger bonus and the extra total payment

necessary to compensate for the added risk. Note that these contracting issues would not arise if the investors could directly measure the promoter's effort and judgment, rather than basing the bonus on attendance at the concert, a low-cost and readily available measure that unfortunately is also influenced by factors outside the control of the promoter.

Measures of Segment Performance

Objective 4

Compute return on investment (ROI), economic profit, and economic value added (EVA).

It is hard to find a company that does not include some measure of profitability among its segment performance metrics. For example, companies that use performance measurement systems such as the balanced scorecard (discussed in Chapter 9) almost always include a profitability measure among their multiple metrics. The trouble is that there are many ways to measure profitability, and it is not clear which is the best measure. Is it income? Is it income before or after interest and taxes? Is it an absolute amount? A percentage? If a percentage, is it a percentage of revenue or of investment? In this section, we consider how alternative profitability measures affect managers' incentives.

Income Measures

Measures of income are readily available from the financial reporting system at any level of the organization for which a company can identify revenues and expenses, such as a subsidiary, a division, or a business unit. Moreover, accountants can easily customize income measures to exclude factors that the company considers to be outside the control of the manager. For example, earnings before interest and taxes (EBIT) excludes the effects of interest and taxes, while earnings before interest, taxes, depreciation, and amortization (EBITDA) also excludes the effects of depreciation and amortization.

However, income measures can create incentives to focus too narrowly on income without considering the resources required to generate income. For example, suppose a manager is considering an investment that will generate \$1,000 of income. If the manager is evaluated only on income, the incentive is to make this investment, whether the required investment is \$5,000 or \$500,000. Thus, performance evaluation based on income measures can lead managers to focus only on income and ignore the investment required to generate that income.

Similarly, income measures can provide misleading performance comparisons. Suppose a company has two divisions, A, with operating income of \$200,000, and B, with operating income of \$150,000. Further suppose the investment in division A is \$20 million while the investment in division B is \$1 million. The operating income measure obviously provides an incomplete comparison of the performance of the two divisions. Although division A is generating slightly higher operating income than division B, division A requires a far larger investment. Division B is generating much higher income relative to the resources used to generate the income—\$150,000 of income using \$1 million of investment is far better performance than \$200,000 of income using \$20 million of investment.

Return on Investment (ROI)

A more comprehensive measure of profitability that takes into account the investment required to generate income is the **return on investment (ROI)**. ROI is income divided by the investment required to generate that income. For a given amount of investment (and holding risk constant), the investor wants the maximum income.

ROI facilitates the comparison of a unit's performance with other segments within the company or with similar units outside the company. Why? Because, unlike income alone, ROI takes into account the investment required to generate the income. Further, ROI is a return per unit of investment and does not depend on the size of the segments being compared. In the preceding example, division A has a much lower ROI than division B:

$$\begin{aligned}\text{ROI} &= \frac{\text{income}}{\text{investment}} \\ \text{ROI division A} &= \frac{\$200,000}{\$20,000,000} = 1\% \\ \text{ROI division B} &= \frac{\$150,000}{\$1,000,000} = 15\%\end{aligned}$$

return on investment (ROI)

A measure of income divided by the investment required to obtain that income.

	ROI	$\frac{\text{Income}}{\text{Invested Capital}}$	=	$\frac{\text{Income}}{\text{Revenue}}$	×	$\frac{\text{Revenue}}{\text{Invested Capital}}$
Present Outlook	20%	$\frac{16}{80}$	=	$\frac{16}{100}$	×	$\frac{100}{80}$
Alternative:						
1. Increase return on sales by reducing expenses relative to sales.	25%	$\frac{20}{80}$	=	$\frac{20}{100}$	×	$\frac{100}{80}$
Alternative:						
2. Increase capital turnover by decreasing investment.	25%	$\frac{16}{64}$	=	$\frac{16}{100}$	×	$\frac{100}{64}$

Exhibit 10-3**Return on Investment as the Product of Return on Sales and Capital Turnover**

Every dollar invested in division B is generating income of \$0.15, compared to the \$0.01 generated by every dollar invested in division A.

ROI as the Product of Return on Sales and Investment Turnover

As shown in the following equations, we can write ROI as the product of two items: **return on sales** (income divided by revenue) and **capital turnover** (revenue divided by invested capital).

return on sales

Income divided by revenue.

capital turnover

Revenue divided by invested capital.

$$\begin{aligned}
 \text{return on investment} &= \frac{\text{income}}{\text{invested capital}} \\
 &= \frac{\text{income}}{\text{revenue}} \times \frac{\text{revenue}}{\text{invested capital}} \\
 &= \text{return on sales} \times \text{capital turnover}
 \end{aligned}$$

This expression shows that increasing either return on sales or capital turnover will increase ROI. Exhibit 10-3 shows an example where either of two alternatives could increase ROI to 25% from its current value of 20%. Alternative 1 improves return on sales by decreasing expenses relative to sales without increasing investment. Alternative 2 increases capital turnover by decreasing investment without reducing sales. Increasing capital turnover by decreasing investment means using fewer assets, such as cash, receivables, inventories, or equipment, for each dollar of revenue generated.

Increasing turnover is one of the advantages of implementing the just-in-time (JIT) philosophy (see Chapter 1). Many companies implementing JIT purchasing and production systems are able to lower inventory levels while maintaining the return on sales, resulting in dramatic improvements in ROI.

Measuring Investment

To understand what an ROI measure implies for a particular company, you must first determine how the company defines its components: income and investment. We discussed alternative definitions of segment income in Chapter 9, pp. 378–381, so we will not repeat them here. In this section, we discuss alternative definitions of investment.

Definitions of Investment

Consider the following balance sheet:

Current assets	\$ 400,000	Current liabilities	\$ 200,000
Property, plant, and equipment, net	900,000	Long-term liabilities	400,000
		Stockholders' equity	700,000
Total assets	<u>\$1,300,000</u>	Total liabilities and stockholders' equity	<u>\$1,300,000</u>

Possible definitions of investment in this example are as follows:

1. Stockholders' equity: This definition considers only the investment by the stockholders, \$700,000.
2. Stockholders' equity and long-term liabilities, $\$700,000 + \$400,000 = \$1,100,000$. This definition encompasses not only the investment by stockholders but also the investment by debt investors. The combination of stockholders' equity and long-term liabilities is sometimes described as long-term invested capital. Note that because of the accounting identity $\text{total assets} = \text{short-term liabilities} + \text{long-term liabilities} + \text{stockholders' equity}$, this can alternatively be computed as total assets less short-term liabilities, $\$1,300,000 - \$200,000 = \$1,100,000$.
3. Stockholders' equity, long-term liabilities, and current liabilities, \$1,300,000: This definition encompasses all sources of financing for the firm. Because of the accounting identity, this is also equal to total assets.

Each of these alternative measures of investment paired with a measure of income yields a specific ROI measure. For example, net income divided by the first measure, investment by stockholders, is return on equity (ROE) while net income divided by the third measure, total assets, is return on assets (ROA).

For measuring segment performance, firms usually rely on ROA because it is impossible to measure investment by stockholders separately for segments. Further, ROA focuses on how well the division manager is using assets without regard to how they were financed.

Valuation of Assets

When firms use ROA measures, two additional issues arise related to the valuation of total assets. First, companies could value assets contained in the investment base at either **gross book value** (the original cost of an asset) or **net book value** (the original cost of an asset less any accumulated depreciation). Second, they could value assets at either historical cost or some version of current cost. Practice is overwhelmingly in favor of using net book value based on historical costs, which are measures consistent with the numbers reported in the financial statements. However, the following three sections explain when gross book value or current cost might provide a better measure of performance to achieve desired incentives, and how to decide whether to measure assets at beginning-of-the-period values, end-of-the-period values, or at the average value during the period.

HISTORICAL OR CURRENT COST? Most companies favor historical cost over any measure of current cost such as replacement cost or liquidation values. Yet, critics maintain that historical cost provides a faulty basis for decision making and performance evaluation. Historical costs may be far from what a company might pay to purchase the asset today or the amount it could get from selling it—the values relevant to decisions affecting the asset. Despite these criticisms, managers have been slow to depart from historical cost.

Why is historical cost so widely used? Some critics would say that sheer ignorance is the explanation. But a more persuasive answer comes from cost-benefit analysis. Accounting systems are costly. Companies must keep historical records for many legal purposes, so historical records are already in place. A company spends no additional money evaluating performance based on historical costs. Many top managers believe that improvements in collective operating decisions that would result from using current cost are not large enough to warrant the added expense.

PLANT AND EQUIPMENT: GROSS OR NET? In valuing assets, we need to distinguish between net and gross book values. Most companies use net book value in calculating their investment base. However, a significant minority uses gross book value. The proponents of gross book value maintain that it facilitates comparisons between years and between plants or divisions. Under gross values, performance evaluations depend only on what assets are in use, not on the depreciation assumptions or how old the assets are.

Consider an example of a \$600,000 piece of equipment with a 3-year life and no residual value.

gross book value

The original cost of an asset before deducting accumulated depreciation.

net book value

The original cost of an asset less any accumulated depreciation.

Year	Operating Income Before Depreciation	Depreciation	Operating Income	Average Net Book Value*	Net BV Rate of Return	Gross Book Value	Gross BV Rate of Return
1	\$260,000	\$200,000	\$60,000	\$500,000	12%	\$600,000	10%
2	260,000	200,000	60,000	300,000	20	600,000	10
3	260,000	200,000	60,000	100,000	60	600,000	10

* $(\$600,000 + \$400,000) \div 2$; $(\$400,000 + \$200,000) \div 2$; and so on.

Notice that operating income does not change in the example, yet the rate of return on net book value increases as the equipment ages. In contrast, the rate of return on gross book value is unchanged. Proponents of using gross book value for performance evaluation maintain that a performance metric should not improve simply because assets are getting older. On the other hand, advocates maintain that using net book value is less confusing because it is consistent with the assets shown on the conventional balance sheet and with net income computations.

When choosing between net and gross book value, companies should focus on the effect on managers' incentives. Managers evaluated using gross book value will tend to replace assets sooner than will managers in firms using net book value. Consider a division of **Nike** that has a 4-year-old machine with an original cost of \$1,000 and net book value of \$200. The division can replace the machine with a new one that also costs \$1,000. The choice of net or gross book value does not affect net income. However, if Nike uses the net book value for measuring the investment base, replacement will increase the investment base from \$200 to \$1,000. In contrast, if Nike uses gross book value, the base is \$1,000 irrespective of whether the asset is replaced. In summary, to maximize ROI, managers in firms using net book value have incentives to keep old assets with their low book value because the lower book value implies a lower measured investment. Managers in firms using gross book value have less incentive to keep old assets. Therefore, using gross book value will motivate managers to use more state-of-the-art production technology.

ASSET VALUES: BEGINNING, ENDING, OR AVERAGE? If investment does not change throughout the year, it will not matter whether we measure assets at the beginning, the end, or average for the year. However, if investment changes throughout the year, we should measure invested capital as an average for the period. Why? Because income is a flow of resources over a period of time, and we should measure the effect of the flow on the average amount invested. The most accurate measures of average investment take into account the amount invested month-by-month, or even day-by-day. However, a simple average of the beginning and ending balances often provides nearly the same result without going to the trouble required to produce greater accuracy. Suppose division B had \$800,000 of investment at the beginning of the year and the flow of income gradually increased it to \$1,200,000 by the end of the year. The average of the beginning and ending investment amounts is $(\$800,000 + \$1,200,000) \div 2 = \$1,000,000$.

SUMMARY There are no universally correct answers with respect to such controversial issues as historical values versus current values, or gross versus net asset values, or beginning versus average versus ending values. Each organization must design its management control system to achieve the best possible decision making, taking into account the cost-benefit trade-off. This approach is not concerned with "truth" or "perfection" by itself. Instead, the design should ask questions such as the following: Will improvements in the system be worth the added cost? Will a different system achieve better goal congruence and managerial effort? Or, will our existing imperfect system provide about the same set of decisions at lower cost?

Incentives from ROI

Although evaluation based on ROI causes managers to consider both income and investment in their decisions, it still may not align the incentives for the manager with the goals of the firm. ROI-based performance evaluation may provide inappropriate incentives for managers to reject profitable investment opportunities or accept unprofitable investment opportunities. Consider a company with two divisions A and B, where currently division A has an

ROI of 5% and division B has an ROI of 15%. Suppose that the target return on investments is 10%—the corporate goal is to make investments where the return is 10% or more and reject investments where the return is less than 10%. If the company evaluates division managers based on ROI, their incentives will not be aligned with this corporate goal. For example, the division A manager has an incentive to adopt any investment that increases the division A return above its current value of 5%, including investments with returns between 5% and 10%, below the corporate target of 10%. Similarly, the division B manager has an incentive to reject any investment that decreases the division B return below its current value of 15%, including investments with returns between 10% and 15%, which are above the corporate target of 10%. The following sections explain how this issue is addressed by performance measures such as economic profit.

Economic Profit and Economic Value Added (EVA)

**economic profit
(residual income)**
 After-tax operating income
 less a capital charge.

**net operating profit
after-tax (NOPAT)**
 Income before interest expense
 but after tax.

capital charge
 Company's cost of capital ×
 average invested capital.

cost of capital
 The cost of long-term liabilities
 and stockholders' equity
 weighted by their relative size.

**economic value
added (EVA)**
 Adjusted after-tax
 operating income minus the
 weighted-average cost of capital
 multiplied by the adjusted
 average invested capital.

Economic profit, also called **residual income**, is defined as net operating profit after-tax (NOPAT) less a capital charge. **Net operating profit after-tax (NOPAT)** is income before interest expense but after tax. The **capital charge** is the company's weighted-average cost of capital multiplied by the average invested capital, where the **cost of capital** is the after-tax cost of long-term liabilities and stockholders' equity weighted by their relative size. For example, a division with net operating profit after-tax of \$250,000, average invested capital for the year of \$1,000,000, and after-tax cost of capital of 10% has economic profit of \$150,000:

Divisional net operating profit after-tax	\$250,000
Minus charge for average invested capital (.10 × \$1,000,000)	100,000
Equals economic profit (or residual income)	<u>\$150,000</u>

Economic profit tells you the amount by which after-tax operating income exceeds the cost of the capital employed to generate that income. In the example, divisional income exceeds the cost of capital by \$150,000.

Suppose a corporation has a goal to earn a return on investment greater than the cost of capital. Economic profit aligns incentives for individual managers with this corporate goal. Investments that earn a return in excess of the cost of capital will have positive economic profit while investments that earn a return below the cost of capital will have negative economic profit. Therefore, managers evaluated based on economic profit have incentives to make an investment if, and only if, its return exceeds the corporate cost of capital.

There are different ways to calculate measures of economic profit, depending on exactly how a company chooses to define the terms used. One popular variant developed and marketed by the consulting firm **Stern Stewart & Co.** is **economic value added (EVA)**. In formula form, Stern Stewart defines EVA as

$$\text{EVA} = \text{adjusted NOPAT} - (\text{weighted-average cost of capital} \times \text{adjusted average invested capital})$$

Stern Stewart's EVA measure incorporates adjustments to NOPAT and to invested capital. These adjustments are designed to convert after-tax operating income into a closer approximation of cash income and invested capital into a closer approximation of the cash invested in the economic resources the company uses to create value. Examples of these adjustments include the following:

- Use taxes paid rather than tax expense.
- Capitalize (rather than expense) research and development costs as an asset.
- Use FIFO for inventory valuation (thus companies using LIFO must add back the LIFO reserve to invested capital and add the increase or deduct the decrease in the LIFO reserve to after-tax operating income).
- If a company deducts interest expense in computing operating income, it must add back after-tax interest expense to find NOPAT.

Year	EP Operating Income	EVA Operating Income	EP Average Capital [†]	EVA Average Capital [†]	EP Capital Charge at 10% [‡]	EVA Capital Charge at 10% [§]	Economic Profit	Economic Value Added
Year 1	\$ 8	$8 + 4 - 1 = \$11^*$	\$42	\$42	\$ 4.2	\$ 4.2	\$ 3.8	\$ 6.8
Year 2	12	$12 - 1 = 11$	50	53	5.0	5.3	7.0	5.7
Year 3	12	$12 - 1 = 11$	62	64	6.2	6.4	5.8	4.6
Year 4	12	$12 - 1 = 11$	74	75	7.4	7.5	4.6	3.5
Total	<u>\$44</u>	<u>\$44</u>			<u>\$22.8</u>	<u>\$23.4</u>	<u>\$21.2</u>	<u>\$20.6</u>

[†]Income flows are assumed to occur at the end of each year so average capital for each year is equal to beginning capital. Beginning capital in year 1 is \$42. In subsequent years, beginning capital increases by the corresponding income from the previous year. For example, year 2 EP beginning capital is $\$42 + 8 = 50$ and year 2 EVA beginning capital is $\$42 + 11 = 53$.

[‡] $10\% \times \text{EP average capital}$.

[§] $10\% \times \text{EVA average capital}$.

*Accounting operating income + R&D expense – R&D amortization = $\$8 + \$4 - \$1 = \$11$.

All amounts in this Exhibit are in millions of dollars.

Exhibit 10-4

Comparison of Economic Profit (EP) and Economic Value Added (EVA)

Exhibit 10-4 compares economic profit and EVA for an example where EVA incorporates an adjustment for research and development (R&D). Assume a division of Nike starts with invested capital of \$42 (all amounts in this example are in millions of dollars) and ends each year with invested capital equal to beginning invested capital plus the income for the year. Further, to simplify the average capital calculations, assume that income flows do not increase invested capital during the year but instead are added to capital at the very end of the year. Under this assumption, average capital is simply the beginning capital. Finally, assume the division's operating income before accounting for R&D is \$12 each year and that Nike's cost of capital is 10%. For simplicity, we ignore income taxes in our example, but remember that EVA uses after-tax numbers.

Suppose the division spent \$4 during year 1 for R&D of a new shoe with a product life cycle of 4 years and there are no subsequent expenditures for R&D. Economic profit calculated according to U.S. financial reporting rules would show an expense equal to the entire \$4 of R&D in the first year, and no subsequent expense for R&D, resulting in income after R&D for the 4 years of \$8, \$12, \$12, and \$12. Invested capital would grow by corresponding amounts from \$42 at the beginning of year 1 to \$50, \$62, \$74, and finally to \$86 at the end of year 4. In contrast, EVA companies look upon R&D as a capital investment. For purposes of calculating EVA, Nike's division capitalizes R&D expenditures and expenses the \$4 total cost as \$1 of expense each year of the product's 4-year life cycle, resulting in income after R&D of \$11, \$11, \$11, and \$11. Invested capital would grow from \$42 to \$53, \$64, \$75, and \$86 at the end of year 4. Thus, total operating income across the 4 years is \$44 for either economic profit or EVA, and invested capital amounts at the beginning and at the end of the four-year example are the same under either economic profit or EVA. However, the timing of the recognition of income and the corresponding timing of the increases in capital during the four years of the example differ between EP and EVA, and therefore the capital charge differs between EP and EVA.

Economic profit over the 4 years is \$21.2, or \$44 less a capital charge of \$22.8. EVA reflects the fact that capital is adjusted upward by \$3 at the beginning of the second year (\$4 investment in R&D less the \$1 amortized in year 1) to reflect the capitalized investment in R&D and then declines by \$1 per year as the company amortizes the remaining R&D. These adjustments in EVA imply a larger capital charge of \$.3 in the second year, \$.2 in the third year, and \$.1 in the fourth year, so over the 4 years EVA deducts an additional \$.6 capital charge for the capital invested in R&D and $\text{EVA} = \$44 - \$23.4 = \$20.6$. After learning about present value in Chapter 11, you will also be able to show that although total EP and total EVA differ, the present value of the streams of EP and EVA discounted at the cost of capital are the same.

Stern Stewart has identified more than 160 different adjustments such as the adjustment illustrated for R&D but usually recommends only a few for a specific client. Many companies using economic profit for performance evaluation develop their own set of adjustments to income and capital, but all companies use the basic concept of net operating profit after-tax less a capital charge.

Economic profit and EVA have received much attention recently as scores of companies are adopting them as financial performance metrics. **AT&T**, **Coca-Cola**, **CSX**, **FMC**, and **Quaker Oats** claim that using EVA motivated managers to make decisions that increased shareholder value. Because EVA explicitly recognizes the cost of the capital deployed, it helps managers in these companies make better capital allocation decisions. Further, some investment companies,

such as Manhattan-based broker-dealer **Matrix USA**, use economic profit to rate stocks for their investment clients.

Many companies are convinced that EVA has played a large role in their success. James M. Cornelius, chairman of **Guidant Corporation**—a medical device company, owned by Boston Scientific and Abbot Labs, that is focused on cardiovascular disease—paid tribute to EVA on Stern Stewart’s Web site:

From day one at Guidant, we linked management bonuses to EVA performance targets. . . . If a target acquisition isn’t EVA positive here, we don’t do it. We pay EVA performance bonuses to Guidant technologists who develop new products within specified time frames, and we are seeing product innovation here that we’ve never seen before. All of our employees . . . are performing at levels we’ve never before experienced. I’m convinced these results are largely because of EVA. [Employees] keep looking for ways to improve our business because at the end of the day a significant share of their annual cash bonuses are tied to EVA improvement. . . . All that they have accomplished couldn’t have been done without EVA.

Siemens Corporation, Europe’s largest electronics and electrical engineering firm and Stern Stewart’s first EVA client in Europe, reported in its annual report that “Siemens focuses on EVA as the yardstick by which we measure the success of our efforts. The EVA performance standard encourages our people to be efficient, productive and proactive in thinking about our customers and their customers. These attributes translate into profitable growth and higher returns.” Examples of actions taken by Siemens to improve EVA include the sale of **Siecor**, the fiber-optic cable business, to **Corning**, and the sale of its retail and banking business. As stated by Siemens, “Divesting selected businesses has generated funds for more strategic investments.”

Making Managerial Decisions

One company that improved its EVA performance dramatically over two decades is **IBM**. In 1993, its EVA was a negative \$13 billion. By 2000, the company improved its EVA to \$2.2 billion. Like most companies, the economic downturn in the early 2000s hurt its EVA, dropping it into the negative range by 2002. By 2005, IBM again had a positive EVA at just under \$1 billion, and it remained positive through 2010.

Compute the EVA for IBM for 2011 using the following data (in billions of dollars) without any of the specific adjustments recommended by Stern Stewart. As a manager, how would you explain the past history of EVA and the current EVA to investors?

	2011
Net operating profit after tax	\$ 16.3
Invested capital	74
Cost of capital (assumed)	10%

Answer

Amounts are in billions as follows:

$$\begin{aligned}
 \text{EVA} &= \text{Net operating profit after tax} - \text{cost-of-capital} \\
 &\quad \text{percentage} \times \text{capital invested} \\
 &= \$16.3 - 0.10 \times \$74 \\
 &= \$16.3 - \$7.4 = \$8.9 \text{ billion}
 \end{aligned}$$

The improvement from 1993 to 2000 was dramatic as IBM moved from large negative EVA to positive EVA of \$2.2 billion. The company continued to show strong improvements as EVA rose to \$8.9 billion by 2011.

Objective 5

Compare the incentives created by income, ROI, and economic profit (or EVA) performance measures.

Incentives from Income, ROI, or Economic Profit

We have already discussed the main advantage of ROI relative to income measures—ROI provides incentives for segment managers to take into account the cost of resources used to generate income. But why do some companies prefer economic profit (or EVA) to ROI? After all, both take into account the cost of resources used to generate income. As explained

	Without Project		With Project	
	Division X	Division Y	Division X	Division Y
Net after-tax operating income	\$ 200,000	\$ 40,000	\$ 275,000	\$ 96,000
Invested capital	\$1,000,000	\$800,000	\$1,500,000	\$1,600,000
ROI (net operating income $\div$ invested capital)	20%	5%	18.3%	6%
Capital charge (10% $\times$ invested capital)	\$ 100,000	\$ 80,000	\$ 150,000	\$ 160,000
Economic profit (net operating income – capital charge)	\$ 100,000	\$ (40,000)	\$ 125,000	\$ (64,000)

Exhibit 10-5**ROI and Economic Profit for Divisions X and Y**

on p. 414, ROI can motivate segment managers to make investment decisions that are not in the best interests of the company as a whole. In contrast, when a company uses economic profit (or EVA) as a performance metric, managers have incentive to invest only in projects earning more than the cost of capital because only those projects increase the division's economic profit.

Consider two divisions of a company, division X with operating income of \$200,000 and division Y with operating income of \$40,000. Division X has average invested capital of \$1 million and division Y has average invested capital of \$800,000. Assume that the company's cost of capital is 10%, and, for simplicity, ignore taxes. Suppose each division is considering a new proposed project. Division X is considering Project A that will earn 15% annually on a \$500,000 investment, or \$75,000 a year. Division Y is considering Project B that will earn 7% annually on an \$800,000 investment, or \$56,000 a year. Exhibit 10-5 shows ROI and economic profit with and without the project for the two divisions.

Suppose performance evaluation is based on ROI. Would the manager of division X invest in Project A? No. Even though Project A earns a return of 15% (which is above the 10% cost of capital), it would decrease ROI for division X from 20% to 18.3%. Would the manager of division Y invest in Project B? Yes. Even though Project B earns a return of 7% (below the 10% cost of capital), it would increase ROI for division Y from 5% to 6%. In general, the ROI profitability metric provides an incentive for divisions to invest in new projects that earn a return in excess of their current return, rather than an incentive to invest in new projects with a return in excess of the cost of capital. Thus, performance evaluation based on ROI leads division X to reject a project with a 15% return and division Y to accept a project with a 7% return.

Now suppose performance evaluation is based on economic profit. For division X, investing in Project A would change economic profit from \$100,000 to \$125,000. This \$25,000 increase in economic profit is the \$75,000 annual return from the new project less the \$50,000 annual cost of capital for the new project. In contrast to the decision under ROI, the manager of division X would accept Project A. For division Y, investing in Project B would change economic profit from \$–40,000 to \$–64,000. This \$24,000 decrease is the \$56,000 annual return from the new project less the \$80,000 annual cost of capital for the new project. Thus, the manager of division Y would reject Project B. Evaluation based on economic profit motivates both managers to invest only in projects that earn a return in excess of the cost of capital, whereas evaluation based on ROI leads both managers to incorrect decisions—division A rejecting a desirable project and division B accepting an undesirable one. In general, use of economic profit or EVA will promote goal congruence and lead to better decisions than using ROI.

Despite the success of economic profit and EVA, many companies still use ROI. Why? Perhaps because it is simpler to compute, more readily understandable by managers, and easier to compare across divisions. Furthermore, in some cases, top management minimizes the dysfunctional incentives from ROI by emphasizing that managers should compare project ROI to the cost of capital, rather than to their existing ROI. Remember that companies try to choose a profitability measure to use in performance evaluation that aligns managers' incentives with organizational goals without being overly complex or too expensive to apply.

Summary Problem for Your Review

PROBLEM

Suppose a division of **Google** has assets of \$2,000,000, invested capital of \$1,800,000, and net operating income of \$600,000. Ignore taxes.

1. What is the division's ROI?
2. If the weighted-average cost of capital is 14%, what is the EVA?
3. Suppose management uses ROI as a performance metric. What effects on management behavior do you expect?
4. Suppose management uses economic profit as a performance metric. What effects on management behavior do you expect?

SOLUTION

1. $\text{ROI} = \$600,000 \div \$1,800,000 = 33\%$.
2. $\text{EVA} = \$600,000 - 0.14 (\$1,800,000) = \$600,000 - \$252,000 = \$348,000$.
3. If the company uses ROI, the division manager has an incentive to reject new projects that do not earn an ROI of at least 33%, the division's current ROI. From the viewpoint of the organization as a whole, this is undesirable if the cost of capital is only 14%. If a division is enjoying a high ROI, it is less likely to expand if top management evaluates performance using ROI than if it evaluates performance using EVA.
4. If the company uses EVA, the manager is inclined to accept all projects whose expected rate of return exceeds the weighted-average cost of capital. The manager is more likely to expand the division because his or her goal is to maximize a dollar amount rather than a rate.

Objective 6

Define *transfer prices* and identify their purpose.

Transfer Pricing

When all the segments of a decentralized organization are independent of one another, segment managers can focus only on their own segments because what is best for their segment is generally best for the organization as a whole. In contrast, when segments interact, such as buying or selling in the same markets, there is a possibility that what helps one segment hurts another segment badly enough to have a negative net effect on the entire organization. For example, two **Nike** sales divisions may compete for the same customer by cutting prices, thereby reducing the company's overall margin on sales to the customer. The more customers (and suppliers) two segments have in common, the more a company should consider combining the two segments into one to minimize dysfunctional incentives for one segment to gain at the expense of the other.

Other potential interactions between segment and organizational interests occur when one segment sells products or services to another segment of the same organization for a price called the **transfer price**. For example, when one segment produces a component and sells it to another segment that then incorporates the component in a final product, a transfer price is required. Transfer prices also apply to services, such as when a product manager buys advertising services from the marketing support segment. The transfer price for the component or service is revenue to the producing segment and a cost to the acquiring segment. Thus, transfer prices allocate profit among segments—a change in the transfer price increases the computed profit for one segment and decreases the profit for the other segment—without affecting profit for the firm as a whole.

Transfer pricing policies are especially important in decentralized companies where top management believes that segment autonomy has important benefits. In such companies, segment managers decide how many products or services will be transferred from one segment to another. Delegating these decisions to segment managers creates benefits when the segment managers, being “closer to the action,” have better information than top management about

transfer price

The price at which one segment of an organization sells products or services to another segment of the same organization.

the items being transferred. The challenge to such companies is to design a transfer pricing policy that motivates segment managers to transfer the quantity of products and services that both maximizes the segment's profitability metric and is also in the best interests of the company as a whole. There is seldom a perfect transfer pricing policy, so decentralization inevitably leads to some dysfunctional transfer decisions. But companies that adhere to a decentralization philosophy believe that the benefits of decentralization and the preservation of segment autonomy exceed the costs of occasional dysfunctional decisions.

When there is little information advantage at the segment level, companies generally centralize decisions and have top management dictate the quantity and price of products and services transferred between segments. This ensures that segment managers cannot make a decision to transfer an amount of a product or service that is not in the company's best interests.

Purposes of Transfer Pricing

What does a decentralized company want from its transfer pricing system? Ideally, it wants to ensure that managers who make decisions to improve their segment's performance also increase the performance of the company as a whole. Therefore, a company wants profitability metrics that reward the segment manager for decisions that increase the profitability of the entire company. For example, transfer prices should guide managers to make the best possible decisions regarding whether to buy or sell products and services inside or outside the total organization. Decisions by the buying and selling segment managers, acting without top-management intervention, should be the best decisions for their segment and for the entire organization. In other words, decisions that increase a segment's profitability metric should lead to increased profitability for the company as a whole.

Organizations use a variety of transfer prices. They use cost-based prices for some transfers, market-based prices for other transfers, and negotiated prices for others. Therefore, do not expect to find a single, universally applicable answer to the problem of transfer pricing. There is no perfect transfer-pricing system. Almost every manager in a decentralized organization has had experience with transfer-pricing systems that seem less than ideal. For example, a manager at **Weyerhaeuser**, a large wood-products firm, called transfer pricing his firm's most troublesome management control issue.

A General Rule for Transfer Pricing

Although no single rule always meets the goals of transfer pricing, a general rule can provide guidance:

$$\text{transfer price} = \text{outlay cost} + \text{opportunity cost}$$

As described earlier on p. 422, outlay costs require a cash disbursement. They are essentially the additional amount the producing segment must pay to produce the product or service. Opportunity cost is the contribution to profit that the producing segment forgoes by transferring the item internally. For example, if capacity constraints prevent a segment from producing enough to meet both external demand and internal demand from the other segment, the opportunity cost is the contribution margin the producing segment could have received from selling in the external market rather than transferring internally.

Why does this rule provide incentives for segment decisions that also maximize profitability for the firm as a whole? Consider the following example of two hypothetical Nike divisions. The fabric division (the producing division) is considering transferring the fabric required for a golf shirt to the sportswear division (the buying division), as shown in Exhibit 10-6.

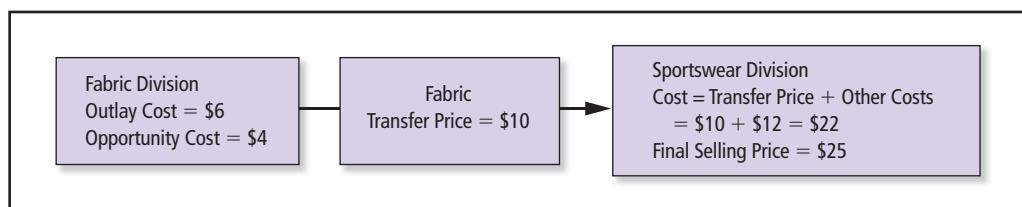


Exhibit 10-6
Transfer Pricing Example

Objective 7

State the general rule for transfer pricing and use it to assess transfer prices based on total costs, variable costs, and market prices.

Suppose the fabric division’s \$4 opportunity cost arises because it can get \$10 by selling the fabric to a buyer outside the company. Thus, the foregone contribution by not selling to the outside buyer is $\$10 - \$6 = \$4$. At any transfer price less than \$10, the producing division is better off selling the fabrics to the outside buyer rather than transferring it. Thus, the minimum transfer price the fabric division would accept is $\$6 + \$4 = \$10$.

Now consider how much the item is worth to the sportswear division. For the fabric to be profitable to the sportswear division, it must be able to sell the final product for more than the transfer price plus the other costs it must incur to finish and sell the product. Because it can sell the golf shirt for \$25 and its other costs are \$12, the maximum price the sportswear division would be willing to pay is $\$25 - \$12 = \$13$. At any higher price, the sportswear division would choose not to produce the shirt at all. But there is a second constraint: The sportswear division will not pay more to the fabric division than it would have to pay an outside supplier. Thus, the largest transfer price acceptable to the sportswear division is the lesser of (1) \$13 or (2) the cost charged by an outside supplier.

Now consider the transfer decision from the company’s point of view. Transfer is desirable whenever (1) the total cost to the company for producing the fabric internally (\$10, including opportunity cost, as determined by the fabric division) is less than its value to the company (\$13 as determined by the sportswear division), and (2) the fabric division’s costs (again including opportunity costs) are less than the price the sportswear division would have to pay to an outside supplier. The first criterion guarantees that the company does not decide to produce a product where the total cost to produce exceeds the final selling price to the end user. The second guarantees that it does not pay more to produce the fabric internally than it would have to pay to buy it in the marketplace. The only transfer price that will always meet these criteria is \$10, the fabric division’s outlay cost plus opportunity cost. Why? Any price between \$10 and \$13 meets the first criterion. However, only \$10 meets the second because any transfer price above \$10 opens the possibility that the sportswear division will buy the fabric externally when the company would be better off producing and transferring it from the fabric division.

Exhibit 10-7 summarizes the division’s decision and the effect on Nike as a whole when an outside supplier offers the fabric at either greater than \$10 or less than \$10. At a \$10 transfer price, regardless of what price outside suppliers offer, the division managers, acting independently, make the decision that is most profitable for the company as a whole. Any other transfer price creates a possibility of a manager making the decision that is best for his or her segment but not for the company as a whole. The fabric division would reject the transfer at less than \$10 regardless of how much profit it creates for the sportswear division. The sportswear division would reject the transfer whenever the transfer price is greater than the price from alternative sources.

Note that any transfer price greater than the \$10 price specified by the general rule runs the risk of the sportswear division purchasing outside the company even when the internal cost is lower. For example, with a transfer price of \$12 and an outside purchase cost of \$11, the sportswear division would pay \$11 to the outside supplier when the company could have spent only \$10 (including opportunity cost) to produce the fabric in the fabric division.

This general rule doesn’t always provide a unique transfer price. For example, suppose there is no outside supplier for the fabric (but continue to assume there is an outside customer that will buy from the producing division for \$10). Then the general rule tells us only that the transfer

Exhibit 10-7
 Effects of a \$10 Transfer
 Price on Decisions

Outside Supplier Price	Best Decision for Division	Best Decision for Company
Less than \$10	Do not transfer—buying division rejects transfer because buying internally will reduce its profits	Do not transfer—buy from outside supplier because it is cheaper for the company as a whole
Greater than \$10	If value to buying division is greater than \$10: Transfer at \$10—both divisions benefit	Transfer—cost of internal production is less than cost of buying externally
	If value to buying division is less than \$10: Do not transfer—buying division rejects transfer	Do not transfer—value of the fabric to the company is less than its cost

price must be greater than \$10 (the outlay cost plus opportunity cost for the producing division) and less than \$13 (the final selling price minus the outlay costs for the sportswear division). Thus, the rule does not specify a specific price within this range. As another example, suppose that when selling the fabric to the outside buyer, there is a \$0.75 shipping and handling cost that is saved if the fabric is transferred internally. The general rule does not tell us how to allocate the \$0.75 savings between the two divisions.

Because transfer-pricing systems have multiple goals, there is no universally optimal transfer price. Nonetheless, the general rule provides a good benchmark by which to judge transfer-pricing systems. We analyze the following transfer-pricing systems, the most popular systems in practice, by examining how close the transfer price comes to the benchmark of outlay cost plus opportunity cost:

1. Market-based transfer prices
2. Cost-based transfer prices
 - a. Variable cost
 - b. Full cost (possibly plus profit)
3. Negotiated transfer prices

In addressing these transfer-pricing systems, we will assume that a company has multiple divisions that transfer items to one another, and that the company wants to preserve segment autonomy in a decentralized operation.

Market-Based Transfer Prices

When there is a ready market for an item or service transferred from one segment to another, transfer pricing policies are straightforward. The common maxim is “if a market price exists, use it.” The more competitive the market, the better the maxim applies.

If there is a competitive market for the product or service being transferred internally, using the market price as a transfer price will generally lead to goal congruence. Why? Because the market price equals the variable cost plus opportunity cost.

$$\begin{aligned}
 \text{transfer price} &= \text{variable cost} + \text{opportunity cost} \\
 &= \text{variable cost} + (\text{market price} - \text{variable cost}) \\
 &= \text{market price} + \text{variable cost} - \text{variable cost} \\
 &= \text{market price}
 \end{aligned}$$

If the selling division avoids some marketing and delivery costs when selling internally, many companies deduct these costs from the market price when computing the transfer price. That is, the transfer price is the net amount the selling division would receive selling the item on the market after deducting marketing and delivery costs.

To illustrate market-based transfer prices, reconsider the two hypothetical divisions of Nike. The fabric division makes fabrics it sells directly to external customers as well as to other Nike divisions, such as the sportswear division. The fabric division makes a particular fabric for an outlay cost of \$6 and can sell it to external customers for \$10. The sportswear division can buy that same fabric on the market for \$10 and use it to make a golf shirt, spending an extra \$12 in production costs. The golf shirt sells for \$25. Should the sportswear division obtain the fabric from the fabric division of Nike or purchase it from an external supplier?

Assume for the moment that the fabric division can sell its entire production to external customers without incurring any marketing or shipping costs. The manager of the fabric division will not sell the fabric for less than \$10. Why? Because he or she can sell it on the market for \$10, so any price less than \$10 will reduce the manager’s division’s profit. Furthermore, the sportswear division manager will refuse to pay a transfer price greater than \$10 for the fabric for each golf shirt. Why? Because if the transfer price is greater than \$10, he or she will purchase the fabric from the external supplier for the lower price of \$10 in order to maximize his or her division’s profit. The only transfer price that allows both managers to maximize their division’s profit is \$10, the market price. If the managers had autonomy to make decisions, at any transfer price other than \$10 one of the managers would decline the internal transfer of the fabric.

Now suppose the fabric division incurs a \$0.75 per square yard marketing and shipping cost that it can avoid by transferring the fabric to the sportswear division instead of marketing it to outside customers. Most companies would then use a transfer price of \$9.25, often called a

“market-price-minus” transfer price. The fabric division would get the same net amount from the transfer (\$9.25 with no marketing or shipping costs) as from an external sale (\$10 less \$0.75 marketing and shipping costs), whereas the sportswear division saves \$0.75 per shirt. The fabric division will produce and transfer the fabric only if the transfer price is at least \$9.25, and the sportswear division will buy the fabric internally only if it costs less than \$10 and is worth at least \$9.25 to the division. These criteria drive a decision to transfer only if it is in Nike’s overall best interests.

While market-based transfer prices generally provide the correct incentives, market prices are not always available. Therefore, we next discuss some other systems commonly used in the absence of market-based prices.

Transfers at Cost

When market prices don’t exist, most companies resort to cost-based transfer prices. In fact, about half the major companies in the world use a cost-based transfer-pricing system. However, there are many possible definitions of cost. Some companies use only variable cost, others use full cost, and still others use full cost plus a profit markup. Some use standard costs, and some use actual costs. Cost-based transfer prices are easy to understand and use, but they can easily lead to **dysfunctional decisions**—decisions in conflict with the company’s goals. The key to successful cost-based transfer prices is to minimize such dysfunctional decisions. Let’s examine some of these cost-based transfer-pricing systems.

dysfunctional decision
Any decision that is in conflict with organizational goals.

TRANSFERS AT VARIABLE COST Companies that transfer items at variable cost implicitly assume that the selling division has no opportunity cost. Why? Because the outlay cost is generally about equal to variable cost: transfer price = outlay (variable) cost + \$0. Therefore, a variable-cost transfer-pricing system is most appropriate when the selling division forgoes no opportunities when it transfers the item internally, for example when there is plenty of excess capacity in the selling division.

Variable-cost transfer prices cause dysfunctional decisions when the selling segment has significant opportunity costs. In our fabric division–sportswear division example, there are two ways this could happen. First, if there are positive opportunity costs, the fabric division manager would turn down any transfer, preferring to pursue the alternative opportunities, perhaps selling the fabric on the open market or using facilities to make a different, more profitable, fabric. This would be dysfunctional if the sportswear division could make more profit from its golf shirt than the fabric division makes from pursuing its alternative opportunities. Second, realizing the lack of incentive for the fabric division to transfer the fabric, top management might insist that the fabric division produce and transfer the fabric. This would be against the company’s interests if the fabric division passes up opportunities that yield more profit than the sportswear division’s golf shirt. In addition, this policy violates segment autonomy.

TRANSFERS AT FULL COST OR FULL COST PLUS PROFIT Full-cost transfer prices include not only variable cost but also an allocation of fixed costs. In addition, some companies also add a markup for profit. This implicitly assumes the allocated fixed costs (and, if included, the profit markup) is a good approximation of the opportunity cost. In cases of constrained capacity, where the selling division cannot satisfy all internal and external demand for its products, the opportunity cost is positive. As explained in the previous section, when the opportunity cost is positive, variable-cost transfer prices are problematic. While there is no guarantee that adding an allocation of fixed cost is a good approximation of the opportunity cost, it may be a better approximation than assuming a zero opportunity cost. Some companies believe that using activity-based costing improves cost-based transfer prices, as described in the Business First box on p. 429.

Dysfunctional decisions arise with full-cost transfer prices when the selling segment has opportunity costs that differ significantly from the allocation of fixed costs and profit. In our example, suppose the fabric division has excess capacity so that opportunity cost is zero. Nevertheless, it has large fixed costs so that the full cost of the transferred fabric includes \$8 of fixed cost in addition to the \$6 variable cost. At a transfer price of \$14, and assuming an external supplier either doesn’t exist or would also charge at least \$14, the sportswear division would refuse the transfer unless it could sell the golf shirt for at least $\$14 + \$12 = \$26$. Therefore, because the shirt sells for \$25, the sportswear division would decide not to produce it.

But this decision costs Nike a contribution margin of $\$25 - (\$6 + \$12) = \$7$. The decision not to produce the shirt is dysfunctional—that is, it conflicts with Nike’s goal of generating additional profit.

Cost-based transfer prices can create problems when a company uses actual cost rather than standard cost as a transfer price. Because the buying division will not know its actual cost in advance, it will not be able to accurately plan its costs. More importantly, a transfer price based on actual costs merely passes cost inefficiencies in the selling division along to the buying division. Therefore, the selling division lacks incentive to control its costs. Thus, we recommend using budgeted or standard costs instead of actual costs for cost-based transfer prices.

Finally, cost-based transfer prices can undercut segment autonomy and sometimes lead to conflicts between segment and organizational goals. Suppose managers believe it is best for the company to transfer an item internally rather than purchasing it externally but also believe that the transfer price is unfair to their segment. They may either do what they think top management wants but resent its negative effect on their segment, or they may do what is best for their segment, ignoring its negative impact on the organization as a whole. Neither alternative is desirable.

Supporters point out that cost-based transfer prices are easy to understand and inexpensive to implement. However, any cost-based transfer price can lead to dysfunctional decisions. Companies transferring goods or services in the absence of market prices must decide whether the effects of dysfunctional decisions are great enough to abandon cost-based transfer prices. One alternative is to give up decentralized decision making—essentially have top management dictate whether to transfer items internally or purchase them from external suppliers—but this also sacrifices the benefits of decentralization. Another alternative is negotiated transfer prices, which we discuss next.

Making Managerial Decisions

Consider the following data concerning a subassembly that Willamette Manufacturing Company produces in its fabricating division and uses in products assembled in its assembly division.

Fabricating Division	
Variable cost of subassembly	\$35
Excess capacity (in units)	1,000
Assembly Division	
Market price for buying the subassembly from external sources	\$50
Number of units needed	900

If you were the manager of the fabricating division, what is the lowest transfer price you would accept for the subassembly?

If you were the manager of the assembly division, what is the most you would be willing to pay for the subassembly? Is there a transfer price that would motivate production and transfer of the subassembly? If so, what is the price?

Answer

The fabricating division has excess capacity, so its manager would be willing to accept any price above the variable cost of \$35. The assembly division can buy the subassembly for \$50 on the external market, so its manager would be willing to pay no more than \$50 to buy it from the fabricating division. The transfer would take place at some price between \$35 and \$50.

Negotiated Transfer Prices

Companies heavily committed to segment autonomy often allow managers to negotiate transfer prices. The managers may consider both costs and market prices in their negotiations, though they are not required to do so. Supporters of negotiated transfer prices maintain that the managers involved have the best knowledge of what the company will gain or lose by producing and transferring the product or service, so open negotiation allows the managers to make optimal decisions. Critics of negotiated prices focus on the time and effort spent negotiating, an activity that adds nothing directly to the profits of the company.

Let’s look at how our fabric division and sportswear division managers might approach a negotiation of a transfer price. The sportswear division manager might look at the selling price of the golf shirt, \$25, less the additional cost the division incurs in making it, \$12, and decide to purchase fabric at any transfer price less than $\$25 - \$12 = \$13$. The sportswear division will add to its profit by making and selling the shirt if the transfer price is below \$13. At a transfer price above \$13, the sportswear division will choose to not make and sell the shirt, assuming there is no other supplier of fabric at a price below \$13.

Similarly, the fabric division manager will look at what it costs to produce and transfer the fabric. If there is excess capacity and thus no opportunity cost, any transfer price above \$6 will increase the fabric division's profit. Negotiation will result in a transfer if the maximum transfer price the sportswear division is willing to pay is greater than the minimum transfer price the fabric division is willing to accept. The fabric division manager is willing to accept any price above \$6 and the sportswear division manager will pay up to \$13. The exact transfer price will depend on the negotiating ability and power of the two division managers.

Now suppose there is no excess capacity in the fabric division and an outside customer is willing to pay \$10 for the fabric. Transferring the fabric internally causes the division to give up a contribution of \$4 as well as paying variable costs of \$6, so the minimum transfer price acceptable to the fabric division is now \$10. A transfer will take place at a price between \$10 and \$13.

If the opportunity cost had been more than \$7, a transfer would not occur. Why? Because the fabric division's minimum price of \$6 variable costs plus opportunity cost would now be greater than \$13 and the sportswear division's maximum price would be just \$13. This decision is exactly what Nike would prefer. When the fabric division's opportunity cost is less than \$7, the golf shirt is more profitable than the fabric division's other business, and the transfer should occur. When the fabric division's opportunity cost is greater than \$7, the additional contribution from the fabric division's other business will be greater than the sportswear division's contribution on the shirt, and the transfer should not occur. Therefore, the manager's decisions are congruent with the company's best interests.

What should top management of a decentralized organization do if it sees segment managers making dysfunctional decisions through their negotiations? As usual, the answer is, "It depends." Top management can step in and force the "correct" decision, but doing so undermines segment managers' autonomy and the overall notion of decentralization. It also assumes top management has the information necessary to determine the correct decision. Most important, frequent intervention results in recentralization. Indeed, if more centralization is desired, the organization might want to reorganize by combining segments.

Top managers who wish to encourage decentralization will often make sure that both producing and purchasing division managers understand all the facts and then allow the managers to negotiate a transfer price. Even when top managers suspect that the segments might make a dysfunctional decision, they may swallow hard and accept the segment manager's judgment as a cost of decentralization. (Repeated dysfunctional decision making may be a reason to change the organizational design or to change managers.)

Well-trained and informed segment managers who understand opportunity costs and the behavior of fixed and variable costs will often make better decisions than will top managers. The producing division manager knows best the various uses of its capacity, and the purchasing division manager knows best what profit can be made on the items to be transferred. In addition, negotiation allows segments to respond flexibly to changing market conditions when setting transfer prices. One transfer price may be appropriate in a time of idle capacity and another when demand increases and operations approach full capacity.

Multinational Transfer Pricing

So far, we have focused on how transfer-pricing policies affect the motivation of managers. However, in multinational companies, other factors may dominate. For example, multinational companies use transfer prices to minimize worldwide income taxes, import duties, and tariffs. For example, Nike might prefer to make its profits in Singapore, where the marginal corporate tax rate is less than half the rate in the United States.

Suppose a division in a high-income-tax-rate country produces a component for another division in a low-income-tax-rate country. By setting a low transfer price, the company can recognize most of the profit from the production in the low-income-tax-rate country, thereby minimizing taxes. Likewise, items produced by divisions in a low-income-tax-rate country and transferred to a division in a high-income-tax-rate country should have a high transfer price to minimize taxes.

Sometimes import duties offset income tax effects. Most countries base import duties on the price paid for an item, whether bought from an outside company or transferred from another division. Therefore, low transfer prices generally lead to low import duties.

Objective 8

Identify the factors affecting multinational transfer prices.

Activity-Based Costing and Transfer Pricing

Teva Pharmaceutical Industries Ltd. is a global healthcare company specializing in pharmaceuticals. It is headquartered in Israel and had sales of \$16.89 billion in 2019. Teva entered the lucrative generic drug market in the mid-1980s. Each of the marketing divisions purchases generic drugs from the manufacturing division. As part of its strategy, the company decentralized its pharmaceutical business into cost and profit centers. Prior to decentralization, each marketing division was a revenue center. With the new organizational structure, management had to decide how to measure marketing division costs because profits were now the key financial performance metric.

A key cost to the marketing divisions is the transfer price paid for drugs purchased from the manufacturing division. Management considered several alternative bases for the company's transfer prices. Market price was not a feasible basis for transfer pricing because there was no competitive market. Negotiated prices were rejected because management believed the resulting debates over the proper price would be lengthy and disruptive. Teva adopted variable cost (raw material and packaging costs) transfer pricing for a short time but eventually rejected it because it did not lead to congruent decisions—managers did not differentiate products using many scarce resources from those using few. Further, when a local source for the drug did exist, the market price was always above the variable-cost transfer price. Thus, managers in Teva's manufacturing division had little incentive to keep costs low.

Management also rejected traditional full cost that did not capture the actual cost structure of the manufacturing division. Specifically, the traditional full-cost system undercosted

the low-volume products and overcosted the large-volume products. The system traced only raw materials directly to products. It divided the remaining manufacturing costs into two cost pools and allocated them based on labor hours and machine hours. One problem with the traditional system was its inability to capture and correctly allocate the non-value-added cost of setup activity. Management did not know the size of the errors in product cost, but the lack of confidence in the traditional cost system led to rejection of full cost as the transfer-pricing base.

Then Teva's management adopted an activity-based costing (ABC) system to improve the accuracy of its product costs. The ABC system has five activity centers and related cost pools: receiving, manufacturing, packaging, quality assurance, and shipping. Because of the dramatic increase in costing accuracy, management was able to adopt full activity-based cost as the transfer price.

Teva's managers are pleased with their transfer-pricing system. The benefits include increased confidence that the costs being transferred are closely aligned with the actual short- and long-run costs being incurred, increased communication between divisions, and an increased awareness of the costs of low-volume products and the costs of capacity required to support these products. They believe their activity-based costs are the best approximation to outlay cost plus opportunity costs because the allocation of the fixed costs is a good measure of the value (opportunity cost) of the resources being consumed.

Sources: Adapted from Robert Kaplan, Dan Weiss, and Eyal Desheh, "Transfer Pricing with ABC," *Management Accounting*, May, 1997, pp. 20–28; and Teva Pharmaceutical Industries Ltd. 2011 Annual Report.

Tax authorities also recognize the incentive to set transfer prices to minimize taxes and import duties. Therefore, most countries have restrictions on allowable transfer prices. U.S. multinationals must follow an Internal Revenue Code rule specifying that transfers be priced at "arm's-length" market values, or at the price one division would pay another if they were independent companies. Even with this rule, companies have some latitude in deciding an appropriate "arm's-length" price.

Consider a high-end running shoe produced by an Irish Nike division with a 12% income tax rate and transferred to a division in Germany with a 40% rate. In addition, suppose Germany imposes an import duty equal to 20% of the price of the item and that Nike cannot deduct this import duty for tax purposes. Suppose the full unit cost of a pair of the shoes (translated to U.S. dollars) is \$100, and the variable cost is \$60. If tax authorities allow either variable- or full-cost transfer prices, which should Nike choose? By transferring at \$100 rather than at \$60, the company gains \$3.20 per unit:

Effect of Transferring at \$100 Instead of at \$60

Income of the Irish division is \$40 higher; therefore, it pays $12\% \times \$40$ more income taxes	\$(4.80)
Income of the German division is \$40 lower; therefore, it pays $40\% \times \$40$ less income taxes	16.00
Import duty is paid by the German division on an additional $\$100 - \$60 = \$40$; therefore, it pays $20\% \times \$40$ more duty	(8.00)
Net savings from transferring at \$100 instead of \$60	<u>\$ 3.20</u>

Companies may also use transfer prices to avoid the financial restrictions imposed by some governments. For example, a country might restrict the amount of dividends paid to foreign owners. It may be easier for a company to get cash from a foreign division as payment for items transferred than as cash dividends.

In summary, transfer pricing becomes even more complex in a multinational company. Multinational companies try to achieve more objectives through transfer-pricing policies, and the objectives sometimes conflict with one another.

Summary Problem for Your Review

PROBLEM

Reconsider **Nike**'s fabric division and sportswear division described earlier on p. 408. In addition to the data there, suppose the fabric division has annual fixed manufacturing costs of \$800,000 and expected annual production of enough fabric to make 100,000 golf shirts. The "fully-allocated cost" of the material for one golf shirt is as follows:

Variable costs	\$ 6.00
Fixed costs, \$800,000 ÷ 100,000 shirts	<u>8.00</u>
Fully allocated cost of the material for one golf shirt	<u>\$14.00</u>

Assume that the fabric division has idle capacity. The sportswear division is considering whether to buy enough fabric for 10,000 golf shirts. It will sell each shirt for \$25. The additional processing and selling costs in the sportswear division to produce and sell one shirt are \$12. If Nike bases its transfer prices on fully-allocated cost, would the sportswear division manager buy? Explain. Would the company as a whole benefit if the sportswear division manager decided to buy? Explain.

SOLUTION

The sportswear division manager would not buy. The fully-allocated cost-based transfer price of \$14 would make the acquisition of the fabric unattractive to the sportswear division:

Sportswear Division:	
Sales price of final product	\$25
Deduct costs	
Transfer price paid to the fabric division (fully-allocated cost)	\$14
Additional processing and selling costs	<u>12</u>
Total costs to the sportswear division	<u>26</u>
Contribution to profit of the sportswear division	<u>\$ (1)</u>
Company as a whole:	
Sales price of final product	\$25
Deduct variable costs and opportunity costs	
Fabric department	\$ 6
Sportswear department	<u>12</u>
Total variable and opportunity costs	<u>18</u>
Contribution to company as a whole	<u>\$ 7</u>

The company as a whole would benefit by \$70,000 (10,000 shirts × \$7) if the fabric division produces and transfers the fabric.

The major lesson here is that transfer prices based on fully-allocated costs may induce the wrong decisions when there is idle capacity in the supplier division. Working in his or her own best interests, the sportswear division manager has no incentive to buy from the fabric division.

Keys to Successful Management Control Systems

Like management in general, management control systems are more art than science. A company such as **Nike** will certainly include many subjective factors as well as more objective measures of profitability in its performance-evaluation system. Intelligent use of the available information is as important as generating the information itself. Next, we briefly explore three factors that help managers interpret and use management control information.

Focus on Controllability

As Chapter 9 explained (see Exhibit 9-5, p. 380), companies should distinguish between the performance of the division manager and the performance of the division as an investment by the corporation. Top management should evaluate segment managers on the basis of their controllable performance. However, management should base decisions such as increasing or decreasing investment in a division on the economic viability of the division, not on the performance of its managers.

This distinction helps to clarify some vexing difficulties. For example, top management may use an investment base to gauge the economic performance of a retail store, but judge the store's manager by focusing on income and ignoring any investment allocations. The aim is to evaluate the manager on controllable factors, but controllability depends on what decisions managers can make. In a highly decentralized company such as **Johnson & Johnson** or **General Electric**, for instance, managers can influence investments in assets and can exercise judgment regarding the appropriate amount of short-term credit and some long-term credit. Investment decisions that managers do not influence should not affect their performance evaluations.

Management by Objectives and Setting Expectations

Management by objectives (MBO) describes the joint formulation by managers and their superiors of a set of goals and plans for achieving the goals for a forthcoming period. For our purposes here, the terms *goals* and *objectives* are synonymous. The plans often take the form of a responsibility accounting budget (together with supplementary goals, such as levels of management training and safety that managers may not incorporate into the accounting budget). The company then evaluates a manager's performance in relation to these agreed-on budgeted objectives. It is important that managers' expectations be consistent with those of their superiors.

An MBO approach tends to reduce complaints about lack of controllability because managers first agree on a reasonable budget. That is, a particular manager and his or her superior negotiate a budget for a particular period and a particular set of expected outside and inside influences. For example, by evaluating results compared to expectations, a manager may more readily accept an assignment to a less successful segment. Why? Because a manager can reasonably expect to meet goals that recognize that the segment is economically struggling. Thus, an MBO system is preferable to a system that emphasizes absolute profitability for its own sake. Unless evaluation focuses on meeting reasonable expectations, able managers will be reluctant to accept responsibility for segments that are in economic trouble. Whether using MBO or not, skillful budgeting and intelligent performance evaluation will go a long way toward overcoming the common lament, "I'm being held responsible for items beyond my control."

MBO is also especially useful in nonprofit organizations where financial goals may be less important than nonfinancial goals. Managers can set objectives that fit well with overall organizational objectives. The accompanying Business First box on p. 432 illustrates how an academic institution can use decentralization to further the university's financial and nonfinancial objectives.

Budgets, Performance Targets, and Ethics

Organizations can minimize many of the troublesome motivational effects of performance evaluation systems by the astute use of budgets. We cannot overemphasize the desirability of tailoring budgets to a particular manager. For example, either an ROI or an economic profit system can promote goal congruence and managerial effort if top management gets everybody to focus on what is currently attainable in the forthcoming budget period.

Objective 9

Explain how controllability and management by objectives (MBO) aid the implementation of management control systems.

management by objectives (MBO)

The joint formulation by managers and their superiors of a set of goals and plans for achieving the goals for a forthcoming period.

Decentralization in Academia

Corporations are not the only types of organizations that decentralize. Many nonprofit organizations, such as universities, hospitals, and churches, also decentralize by delegating decision-making authority to segments of the organization. It is important for each segment to set objectives consistent with the overall organizational goals.

An example of such an organization is Harvard University. Using a philosophy of “every tub on its own bottom,” Harvard is divided into 11 academic units: (1) Faculty of Arts and Sciences, which includes Harvard College, Graduate School of Arts and Sciences, and Division of Continuing Education; (2) Business School; (3) Design School; (4) Divinity School; (5) Graduate School of Education; (6) John F. Kennedy School of Government; (7) Law School; (8) Medical School; (9) Dental School; (10) School of Public Health; and (11) Radcliffe Institute for Advanced Study. At the head of each unit is a dean appointed by the president. The dean is directly responsible for his or her unit’s finances and organization. In essence, each unit functions like a division of a decentralized corporation. Although the units have a great deal of independence, they must still set financial and nonfinancial objectives that are consistent with Harvard’s goals, and their accomplishments will be measured against their objectives.

Because each unit at Harvard is responsible for its own revenues and expenses, many of the issues are similar to those of a for-profit corporation. The governing board that is responsible for the day-to-day operations at Harvard—called the Harvard Corporation and known formally as the President

and Fellows of Harvard College—is a seven-member board headed by the president. To effectively manage the university, the board needs information from the units, but it intentionally does not directly make decisions for the units—that is left to the deans. Only when reports indicate that something is awry does the board intervene.

To the extent that the units are independent of one another, decentralization works well. But, just as in a for-profit organization, difficulties can arise when there are real or potential interactions among units. For example, how is tuition divided among units when students admitted to one unit take classes in another? This is a classic transfer-pricing problem. Or what about two units (for example the Law School and the Business School) competing for a particular faculty member. How is the good of the entire university reflected in such hiring decisions? Or how does the university encourage cross-functional programs and research involving more than one unit? Or how does the university choose whether to invest scarce funds into the Dental School or the Divinity School? These are all issues that arise from decentralization.

Like any organization, Harvard must balance overall organizational objectives versus the advantages of local decision making and superior motivation of divisional authority. While Harvard is an example of decentralization, other universities favor a more centralized approach.

Source: “Harvard at a Glance” (<http://www.harvard.edu/Harvard-glance.html>).

Using budgets as performance targets also has its dangers. On pp. 292–294 of Chapter 7 we pointed out how misuse of budgets for performance evaluation can lead to lying and cheating. Companies that make meeting a budget too important when evaluating managers may motivate unethical behavior. Top management at companies such as **WorldCom** gave “making the numbers” such a high priority that when it became clear that a segment would not meet its goals, managers fabricated the accounting reports. At **Enron**, the consequences of poor performance evaluations were so great that managers played bookkeeping games and allegedly manipulated electricity prices to make their performance look better. The lesson is that “astute” use of budgets is good, but using budgets to put unreasonable pressure on managers can undermine the ethics of an organization.

As we said earlier in the chapter, “You get what you measure.” It is important to use measures that are consistent with organizational goals. Yet, measurement is only part of the management control system. Managers should also think hard about how they use the measures to achieve the organization’s objectives. Even good measures can lead to dysfunctional decisions when managers misuse them. A management control system is only as good as the managers who use it.

Highlights to Remember

1. **Define decentralization and identify its expected benefits and costs.** As companies grow, the ability of managers to effectively plan and control becomes more difficult because top managers are further removed from day-to-day operations. One approach to effective planning and control in large companies is to decentralize decision making. This means that top management gives mid- and lower-level managers the authority to make decisions that impact the subunit's performance. The more that decision-making authority is delegated, the greater the decentralization. Often, the subunit manager is most knowledgeable of the factors that management should consider in the decision-making process.
2. **Distinguish between responsibility centers and decentralization.** Top management must design the management control system so that it motivates managers to act in the best interests of the company. This is done through the choice of responsibility centers and the appropriate performance metrics and rewards. The degree of decentralization does not depend upon the type of responsibility center chosen. For example, a cost-center manager in one company may have more decision-making authority than does a profit-center manager in a highly centralized company.
3. **Explain how the linking of rewards to responsibility-center performance metrics affects incentives and risk.** It is generally a good idea to link managers' rewards to responsibility-center results to promote goal congruence. However, linking rewards to results creates risk for the manager. The greater the influence of uncontrollable factors on a manager's reward, the more risk the manager bears.
4. **Compute return on investment (ROI), economic profit, and economic value added (EVA).** It is typical to measure the results of investment centers using a set of performance metrics that include financial measures, such as return on investment (ROI), economic profit, or economic value added (EVA). ROI is any income measure divided by the dollar amount invested and is expressed as a percentage. Economic profit, or economic value added, is operating income less a capital charge based on the capital invested. It is an absolute dollar amount.
5. **Compare the incentives created by income, ROI, and economic profit (or EVA) performance measures.** Income performance measures create incentives to make decisions that increase income, without regard to the resources required. ROI creates incentives to adopt any and all projects with returns greater than existing ROI, rather than with returns greater than the cost of capital. EVA directly incorporates the cost of capital and provides incentives to adopt those projects with returns greater than the cost of capital.
6. **Define transfer prices and identify their purpose.** In large companies with many different segments, one segment often provides products or services to another segment. Deciding on the amount the selling division should charge the buying division for these transfers (the transfer price) is difficult. Companies use various types of transfer pricing policies. The overall purpose of transfer prices is to motivate managers to act in the best interests of the company, not just their segment.
7. **State the general rule for transfer pricing and use it to assess alternative transfer prices based on total costs, variable costs, or market prices.** As a general rule, transfer prices should approximate the outlay cost plus opportunity cost of the producing segment. Each type of transfer price has its own advantages and disadvantages. Each has a situation where it works best, and each can lead to dysfunctional decisions in some instances. When a competitive market exists for the product or service, transfer prices based on market prices usually lead to goal congruence and optimal decisions. When idle capacity exists in the segment providing the product or service, transfer prices based on variable cost usually lead to goal congruence. Cost-based transfer prices should usually be based on planned, rather than actual, costs. If a company uses actual costs, there is little incentive for the selling segment manager to minimize costs and the receiving segment manager does not know the cost in advance, which makes cost planning difficult.
8. **Identify the factors affecting multinational transfer prices.** Multinational organizations often use transfer prices as a means of minimizing worldwide income taxes, import duties, and tariffs.
9. **Explain how controllability and management by objectives (MBO) aid the implementation of management control systems.** Regardless of what measures a management control system uses, measures used to evaluate managers should focus on only the controllable aspects of performance. MBO can focus attention on performance compared to expectations, which is better than evaluations based on absolute profitability. Misuse of budgets and performance metrics can motivate managers to violate ethical standards.

Accounting Vocabulary

agency theory, p. 412	economic value added (EVA), p. 418	performance metric, p. 411
capital charge, p. 418	gross book value, p. 416	residual income, p. 418
capital turnover, p. 415	incentives, p. 411	return on investment (ROI), p. 414
centralization, p. 409	management by objectives (MBO), p. 431	return on sales, p. 415
cost of capital, p. 418	net book value, p. 416	segment autonomy, p. 410
decentralization, p. 409	net operating profit after-tax (NOPAT), p. 418	transfer price, p. 422
dysfunctional decisions, p. 426		
economic profit, p. 418		

MyLab Accounting

Fundamental Assignment Material

10-A1 ROI and Economic Profit Calculations

Consider the following data (in thousands):

	Division		
	Hubert	Duane	Louis
Average invested capital	\$2,000	\$ 600	\$1,800
Revenue	3,600	1,200	9,000
Income	180	84	216

1. For each division, compute the return on sales, the capital turnover, and the return on investment (ROI).
2. Which division is the best performer if evaluation is based on ROI? Explain.
3. Suppose each division is assessed a cost of capital of 10% on invested capital. Compute the economic profit for each division. Which division is the best performer based on economic profit? Explain.

10-A2 Transfer-Pricing Dispute

Zurich Équipement, SA, a Swiss transportation equipment manufacturer, is heavily decentralized. Each division head has full authority on all decisions regarding sales to internal or external customers. The Lucerne division has always acquired a certain equipment component from the Geneva division. The Geneva division recently acquired specialized equipment that is used primarily to make this component. The Geneva division has informed the Lucerne division that its fixed costs have increased by CHF 25 per unit because of the depreciation charges on the new equipment, so the unit price will be increased to CHF 325. However, the Lucerne division's management has now decided to purchase the component from outside suppliers at a price of CHF 300.

The Geneva division has supplied the following production cost data for this component:

Annual production of component (all for sale to Lucerne division)	3,000 units
Geneva's variable costs per unit	CHF 280
Geneva's fixed costs per unit	CHF 40

1. Suppose there are no alternative uses of the Geneva facilities and that fixed costs will continue if Geneva no longer produces the component for Lucerne. Will the company as a whole benefit if the Lucerne division buys from the outside suppliers for CHF 300 per unit? Show computations to support your answer.
2. Suppose there is an alternative use for the Geneva facilities. If the Geneva facilities are used to produce the component for the Lucerne division, the Geneva division will give up a contribution of CHF 85,000 from this alternative use. Should the Lucerne division purchase from outsiders at CHF 300 per unit?

3. Suppose that there are no alternative uses for Geneva's internal facilities and that the outsiders' selling price drops by CHF 50 to CHF 250. Should the Lucerne division purchase from outsiders?
4. As the president, how would you respond if the Geneva division manager requests that you require the Lucerne division to purchase the component from Geneva? Would your response differ depending on the specific situations described in numbers 1–3? Why?

10-A3 Transfer Pricing

Refer to problem 10-A2, number 1 only. Suppose the Geneva division could modify the component at an additional variable cost of CHF 25 per unit and sell the 3,000 units to other customers for CHF 330. Then, would the entire company benefit if the Lucerne division purchased the 3,000 components from outsiders at CHF 300 per unit?

10-A4 Rate of Return and Transfer Pricing

Consider the following data regarding budgeted operations for 20X7 of the Austin division of Texas Products:

Average total assets	
Receivables	\$ 220,000
Inventories	290,000
Plant and equipment, net	450,000
Total	<u>\$ 960,000</u>
Fixed overhead	<u>\$ 300,000</u>
Variable costs	\$.72 per unit
Desired rate of return on average total assets	20%
Expected volume	150,000 units

1. a. What average unit sales price does the Austin division need to obtain its desired rate of return on average total assets?
b. What would be the expected capital turnover?
c. What would be the return on sales?
2. a. If the selling price is as previously computed, what rate of return will the division earn on total assets if sales volume is 170,000 units?
b. If sales volume is 130,000 units?
3. Assume that the Austin division plans to sell 45,000 units to the Galveston division of Texas Products and that it can sell only 105,000 units to outside customers at the price computed in requirement 1a. The Galveston division manager has balked at a tentative transfer price of \$4. She has offered \$2.25, claiming that she can manufacture the units herself for that price. The Austin division manager has examined his own data. He had decided that he could eliminate \$60,000 of inventories, \$90,000 of plant and equipment, and \$22,500 of fixed overhead if he did not sell to the Galveston division and sold only 105,000 units to outside customers. Should the Austin division manager sell for \$2.25? Show computations to support your answer.

10-B1 ROI or Economic Profit

Melbourne Co. is a large integrated Australian conglomerate with shipping, metals, and mining operations throughout Asia. Melbourne is just starting a new manufacturing division and the newly appointed general manager plans to submit a proposed capital budget for 20X8 for inclusion in the company-wide budget.

The division manager has for consideration the following projects, all of which require an outlay of capital. All projects have equal risk.

Project	Investment Required	Income
1	\$4,800,000	\$1,200,000
2	1,900,000	627,000
3	1,400,000	182,000
4	950,000	152,000
5	650,000	136,500
6	300,000	90,000

The division manager must decide which of the projects to take. The company has a cost of capital of 20%. An amount of \$12 million is available to the division for investment purposes.

1. What will be the total investment, total return, return on capital invested, and economic profit of the rational division manager if
 - a. the company has a rule that managers should accept all projects promising a return on investment of at least 15%?
 - b. the company evaluates division managers on the return on capital invested (assume this is a new division so that invested capital will consist only of capital invested in new projects adopted by the manager)?
 - c. the division manager is expected to maximize economic profit computed using the 20% cost of capital?
2. Which of the three approaches will induce the most effective investment policy for the company as a whole? Explain.

10-B2 Computing EVA

A company that uses EVA reported the following results for 20X4 and 20X5 (in millions):

	20X4	20X5
Pretax operating income	\$6,105	\$6,100
Cash taxes	1,686	1,620

Average adjusted invested capital was \$16,125 million in 20X4 and \$18,110 million in 20X5, and the cost of capital was 14% in both 20X4 and 20X5.

1. Compute the company's EVA for 20X4 and 20X5.
2. Compare the company's performance in creating value for its shareholders in 20X5 with that in 20X4.

10-B3 Transfer Pricing

Spartan Enterprises runs a chain of drive-in ice cream stands in Lansing during the summer season. Managers of all stands are told to act as if they owned the stand and are judged on their profit performance. Spartan Enterprises has rented an ice cream machine for the summer for \$3,600 to supply its stands with ice cream. Spartan is not allowed to sell ice cream to other dealers because it cannot obtain a dairy license. The manager of the ice cream machine charges the stands \$4 per gallon. Operating figures for the machine for the summer are as follows:

Sales to the stands (16,000 gallons at \$4)		\$64,000
Variable costs, at \$2.00 per gallon	\$32,000	
Fixed costs		
Rental of machine	3,600	
Other fixed costs	10,000	45,600
Operating margin		<u>\$18,400</u>

The manager of the Okemos Drive-In, one of the Spartan drive-ins, is seeking permission to sign a contract to buy ice cream from an outside supplier at \$3.35 a gallon. The Okemos Drive-In uses 4,000 gallons of ice cream during the summer. Elizabeth Chuk, controller of Spartan, refers this request to you. You determine that the other fixed costs of operating the machine will decrease by \$900 if the Okemos Drive-In purchases from an outside supplier. Chuk wants an analysis of the request in terms of overall company objectives and an explanation of your conclusion. What is the appropriate transfer price?

10-B4 Rate of Return and Transfer Pricing

The Sendai division of Shusei Toy Company manufactures units of the game Shogi and sells them in the Japanese market for ¥7,350 each. The following data are from the Sendai division's 20X8 budget:

Variable cost	¥ 4,900 per unit
Fixed overhead	¥ 5,700,000
Total assets	¥16,000,000

Shusei has instructed the Sendai division to budget a rate of return on total assets (before taxes) of 24%.

- Suppose the Sendai division expects to sell 3,350 games during 20X8.
 - What rate of return will be earned on total assets?
 - What would be the expected capital turnover?
 - What would be the return on sales?
- The Sendai division is considering adjustments in the budget to reach the desired 24% rate of return on total assets.
 - How many units must be sold to obtain the desired return if no other part of the budget is changed?
 - Suppose sales cannot be increased beyond 3,350 units. How much must total assets be reduced to obtain the desired return? Assume that for every ¥1,000 decrease in total assets, fixed costs decrease by ¥100.
- Assume that only 2,950 units can be sold in the Japanese market. However, another 1,200 units can be sold to the European marketing division of Shusei. The Sendai manager has offered to sell the 1,200 units for ¥6,450 each. The European marketing division manager has countered with an offer to pay ¥6,150 per unit, claiming that she can subcontract production to an Italian producer at a cost equivalent to ¥6,150. The Sendai manager knows that if his production falls to 2,950 units, he could eliminate some assets, reducing total assets to ¥11 million and annual fixed overhead to ¥5.4 million. Should the Sendai manager sell for ¥6,150 per unit? Support your answer with the relevant computations. Ignore the effects of income taxes and import duties.

Additional Assignment Material

MyLab Accounting

QUESTIONS

10-1 “Decentralization has benefits and costs.” Name three of each.

10-2 Sophisticated accounting and communications systems aid decentralization. Explain how they accomplish this.

10-3 Why is decentralization more popular in profit-seeking organizations than in nonprofit organizations?

10-4 “The essence of decentralization is the use of profit centers.” Do you agree? Explain.

10-5 What is the importance of segment autonomy in decentralization?

10-6 What should be the feature of an ideal performance metric?

10-7 What is the major benefit of the ROI technique for measuring performance?

10-8 What two major items affect ROI?

10-9 How does economic profit differ from net income?

10-10 Define *economic value added (EVA)* and describe three ways a company can improve its EVA.

10-11 Division A’s ROI is 20%, and B’s is 10%. The company pays each division manager a bonus

based on their division’s ROI. Discuss whether each division manager would accept or reject a proposed project with a rate of return of 15%. Would either of them make a different decision if the company evaluated managers using economic profit with a capital charge of 11%? Explain.

10-12 Give three possible definitions of invested capital that we can use in measuring ROI or economic profit.

10-13 “Managers who use a historical-cost accounting system look backward at what something cost yesterday, instead of forward to what it will cost tomorrow.” Do you agree? Why?

10-14 Ross Company uses net book value as a measure of invested capital when computing ROI. A division manager has suggested that the company change to using gross book value instead. What difference in motivation of division managers might result from such a change? Do you suppose most of the assets in the division of the manager proposing the change are relatively new or old? Why?

10-15 Why do companies need transfer-pricing systems?

10-16 Describe two problems that can arise when using actual full cost as a transfer price.

10-17 How does the presence or absence of idle capacity affect the optimal transfer-pricing policy?

10-18 When is a market price-based transfer price ideal?

10-19 What is the major advantage of negotiated transfer prices? What is the major disadvantage?

10-20 Discuss two factors that affect multinational transfer prices but have little effect on purely domestic transfers.

10-21 Describe management by objectives (MBO).

10-22 How can performance measurement lead to unethical behavior by managers?

CRITICAL THINKING EXERCISES

10-23 Decentralization

Many companies implement organizational changes to centralize or decentralize operations only to follow with later changes in the opposite direction. Why might a company that at one time decentralizes decide later to centralize?

10-24 Comparing Financial Measures of Performance

“Both ROI and economic profit use profit and invested capital to measure performance. Therefore it really doesn’t matter which we use.” Do you agree? Explain.

10-25 Performance Metrics and Ethics

“Financial performance metrics cause managers to ignore ethics and focus just on meeting their profit targets. After all, look at what happened at **Enron**, **Global Crossing**, **WorldCom**, **Tyco**, **HealthSouth**, and several other companies.” Evaluate this quote. Can financial performance metrics be compatible with ethical behavior?

10-26 Transfer Pricing and Organizational Behavior

The principle reason for transfer-pricing systems is to communicate data that will lead to goal-congruent decisions by managers of different business units. When managers take actions that conflict with organizational goals, dysfunctional behavior exists. Why does top management sometimes accept a division manager’s judgments, even if the division manager appears to behave in a dysfunctional manner?

EXERCISES

10-27 Simple ROI Calculation

You are given the following data:

Sales	£455,000,000
Invested capital	£130,000,000
Net income	£ 18,200,000

Compute the following:

1. Turnover of capital
2. Return on sales
3. Return on investment (ROI)

10-28 Simple ROI Calculation

Fill in the blanks:

	Division		
	P	Q	R
Return on sales	5%	8%	___%
Capital turnover	4	___	3
Rate of return on invested capital	___%	16%	18%

10-29 Simple ROI and Economic Profit Calculations

Consider the following data:

	Division		
	X	Y	Z
Invested capital	\$1,050,000	\$ _____	\$1,200,000
Income	\$ _____	\$ 142,800	\$ 210,000
Revenue	\$2,310,000	\$2,856,000	\$ _____
Return on sales	3%	_____ %	_____ %
Capital turnover	_____	_____	3.5
Rate of return on invested capital	_____ %	10.5%	_____ %

1. Prepare a similar tabular presentation, filling in all blanks.
2. Suppose each division is assessed a capital charge based on a cost of capital of 10% of invested capital. Compute the economic profit for each division.
3. Which division is the best performer? Explain.

10-30 EVA

Hexa Electricals is one of the highly reputed players in the home UPS industry. According to the company's annual report, "At Hexa, we believe that the value of our company is enhanced only if the capital invested in its operations yields a cash return that is greater than that expected by the providers of capital."

The following data are from Hexa's annual report that incorporate EVA adjustments to operating profit and average invested capital (amounts in thousands of euros):

	2019	2020
Adjusted before tax operating profit	€119,000	€121,000
Cash taxes	30,750	33,900
Adjusted average invested capital	975,000	900,000
Cost of capital	9.6%	9.6%

1. Compute EVA for Hexa for 2019 and 2020.
2. Did Hexa's overall performance improve from 2019 to 2020? Explain.

10-31 Comparison of Asset and Equity Bases

Xenon Company has assets of \$6 million and long-term, 14% debt of \$2,480,000. Neon Company has assets of \$6 million and no long-term debt. The annual operating income (before interest) of both companies is \$1,380,000. Ignore taxes.

1. Compute the rate of return on
 - a. assets; and
 - b. stockholders' equity.
2. Evaluate the relative merits of each base for appraising operating management.

10-32 Finding Unknowns

Consider the following data:

	Division		
	J	K	L
Income	\$450,000	\$ _____	\$ _____
Revenue	\$ _____	\$ _____	\$ _____
Invested capital	\$ _____	\$5,000,000	\$20,000,000
Return on sales	_____ 5%	9%	_____ %
Capital turnover	6	_____	2
Rate of return on invested capital	_____ %	27%	16%
Cost of capital	7%	14%	_____ %
Economic profit	\$ _____	\$ _____	\$ 200,000

1. Prepare a similar tabular presentation, filling in all blanks.
2. Which division is the best performer? Explain.

10-33 Gross Versus Net Assets Value

The Detroit unit of Michigan Company just purchased an asset for \$180,000. The asset has a 3-year life. Michigan's top management evaluates Charlotte Anderson, manager of the Detroit unit, based on ROI of this asset. She can choose to measure the asset using either gross asset value or net asset value. Her operating income before depreciation each year is \$150,000.

1. What is the Detroit unit's ROI for each of the 3 years using gross asset value?
2. What is the Detroit unit's ROI for each of the 3 years using net asset value?
3. If Charlotte expects Michigan to transfer her to a different unit in about a year, which asset valuation policy would she prefer?

10-34 Variable Cost as a Transfer Price

At Exquisite Marbles, a leading supplier of quality marbles for flooring, marbles of different standard sizes are cut at the cutting division and then transferred to the finishing division for polishing to prepare ready-to-use marbles. A 2×2 ft marble's variable cost is £26 and its market value as a piece of unfinished marble is £32.5 at the transfer point from the cutting division to the finishing division. The finishing division's variable cost of polishing the marble is £13, and the selling price of the polished marble is £41.50.

1. Prepare a tabulation of the contribution margin per unit for the finishing division's performance and the overall company performance under the two alternatives of (a) selling to outsiders at the transfer point and (b) polishing and finishing the marble and then selling to the outsiders.
2. As finishing division manager, which alternative would you choose? Explain.

10-35 Maximum and Minimum Transfer Price

Sherwin Company makes bicycles. Various divisions make components and transfer them to the Dayton division for assembly into final products. The Dayton division can also buy components from external suppliers. The Toledo division makes the wheels, and it also sells wheels to external customers. All divisions are profit centers, and managers are free to negotiate transfer prices. Prices and costs for the Toledo and Dayton divisions are as follows:

Toledo Division	
Sales price to external customers	\$ 14
Internal transfer price	?
Costs	
Variable costs per wheel	\$ 10
Total fixed costs	\$320,000
Budgeted production	64,000 wheels*
*Includes production for transfer to Dayton	
Dayton Division	
Sales price to external customers	\$ 170
Costs	
Wheels, per bicycle	?
Other components, per bicycle	\$ 85
Other variable costs, per bicycle	\$ 45
Total fixed costs	\$640,000
Budgeted production	16,000 bicycles

Fixed costs in both divisions will be unaffected by the transfer of wheels from Toledo to Dayton.

1. Compute the maximum transfer price per wheel the Dayton division would be willing to pay to buy wheels from the Toledo division.

2. Compute the minimum transfer price per wheel at which the Toledo division would be willing to produce and sell wheels to the Dayton division. Assume that Toledo has excess capacity.

10-36 Multinational Transfer Prices

Princeton International has production and marketing divisions throughout the world. It produces one particular product in Ireland, where the income tax rate is 24%, and transfers it to a marketing division in Japan, where the income tax rate is 45%. Assume that Japan places an import tax of 13% on the product and that import duties are not deductible for income tax purposes.

The variable cost of the product is £500 and the full cost is £800. Suppose the company can legally select a transfer price anywhere between the variable and full cost.

1. What transfer price should Princeton International use to minimize taxes? Explain why this is the tax-minimizing transfer price.
2. Compute the amount of taxes saved by using the transfer price in requirement 1 instead of the transfer price that would result in the highest taxes.

PROBLEMS

10-37 Agency Theory

The Tamura International Trading Company plans to hire a manager for its division in Mexico City. Tamura International's president and vice president of personnel are trying to decide on an appropriate incentive employment contract. The manager will operate far from the Tokyo corporate headquarters, so evaluation by personal observation will be limited. The president insists that a large incentive to produce profits is necessary; he favors a salary of ¥150,000 and a bonus of 10% of the profits above ¥1,200,000. If operations proceed as expected, profits will be ¥4,600,000, and the manager will receive ¥490,000. But both profits and compensation might be more or less than planned.

The vice president of personnel responds that ¥490,000 is more than most of Tamura International's division managers make. She is sure that the company can hire a competent manager for a guaranteed salary of ¥400,000. She argued, "Why pay ¥490,000 when we can probably hire the same person for ¥400,000?"

1. What factors would affect Tamura International's choice of employment contract? Include a discussion of the pros and cons of each proposed contract.
2. Why is the expected compensation more with the bonus plan than with the straight salary?

10-38 Margins and Turnover

ROI is often expressed as a product of two components—capital turnover and return on sales. Your client, Benjamin Miller, wants you to advise on which of the following three companies to invest in. He provides the following information:

	Company		
	Prime	Quality	Rare
Sales	€10,200,000	€ 1,800,000	€34,800,000
Income	€ 918,000	€ 216,000	€ 216,000
Capital	€ 3,840,000	€14,400,000	€14,400,000

1. Why would you desire the breakdown of return on investment into return on sales and turnover on capital?
2. Compute the return on sales, turnover on capital, and ROI for three companies, and comment on the relative performance of the companies as thoroughly as the data permit.
3. Notice that Quality and Rare have the same income and capital but vastly different levels of sales. Discuss the types of strategies that Quality and Rare might be employing.

10-39 ROI by Business Segment

Hindustan Unilever does business in three different business segments: (1) beauty products, (2) beverages, and (3) oral care. The following are the results of the company in 2020 (figures are million Indian rupees, ₹)

	Revenues	Operating Income	Total Assets
Beauty Products	₹3,150	₹630	3,000
Beverages	₹2,100	₹420	4,200
Oral Care	₹3,180	₹795	2,544

1. Compute the following for each business segment:
 - a. Return on sales
 - b. Capital turnover
 - c. ROI
2. Comment on the differences in ROI among the business segments. Include reasons for the differences.

10-40 EVA Versus Economic Profit

As a performance measurement tool, EVA is oriented more toward cash flows than operating income. Therefore, while calculating EVA, several adjustments are made to operating income from the income statement and invested capital from the balance sheet. Common examples include adjustments for R&D, inventory valuation, warranty cost, and cash taxes instead of tax provision as per the income statement.

The following data were taken from the 2020 annual report of Megatron Inc. (thousands of dollars):

Income from operations	\$ 534,800
Provision for income taxes	114,910
Net EVA adjustments added to income from operations	10,796
Additional capital employed from EVA adjustments	468,318
Ending total shareholders' equity	1,691,264
Cash taxes	129,600
Ending total current liabilities	680,250
Ending total assets	3,668,912
Beginning total shareholders' equity	1,683,178
Beginning total current liabilities	943,718
Beginning total assets	3,778,642
Management's estimate of the cost-of-capital	11.3%

Prepare a schedule that calculates and compares EVA to economic profit for Megatron Inc.

10-41 EVA

The Jeske Company had the following financial results for two recent fiscal years (in millions):

	Year 2	Year 1
Revenues	\$4,463	\$4,510
Operating expenses	3,569	3,615
Cash income taxes	292	255
Average invested capital (total assets less current liabilities)	\$2,854	\$2,689

1. Suppose that Jeske's cost of capital is 11.5%. Compute the company's EVA for years 1 and 2. Assume definitions of after-tax operating income and invested capital as reported in Jeske's annual reports without adjustments advocated by Stern Stewart or others.
2. Discuss the change in EVA between years 1 and 2.

10-42 EVA and Cost of Capital

The Holt Company uses EVA to evaluate top management performance. In 20X8, Holt had net operating income of \$8,210 million, income taxes of \$1,395 million, and average noncurrent liabilities plus stockholders' equity of \$27,555 million. The company's capital is about 55% long-term debt and 45% equity. Assume that the after-tax cost of debt is 10% and the cost of equity is 12%.

1. Compute Holt's EVA. Assume definitions of after-tax operating income and invested capital as reported in Holt's annual reports without adjustments advocated by Stern Stewart.
2. Explain what EVA tells you about the performance of the top management of Holt in 20X8.

10-43 Evaluation of Divisional Performance

Burnard Kaiser, the CEO of Atlantis Inc., evaluates the information available on three of Atlantis's major product divisions (in thousands of euros):

Division	Average Net Assets Based On		Operating Income Based On*	
	Historical Cost	Replacement Cost	Historical Cost	Replacement Cost
Television	€45,000	€48,000	€7,800	€7,500
Air Conditioning	132,000	165,000	20,250	18,450
Microwave Oven	81,000	144,000	15,000	11,700

*The difference in operating income between historical cost and replacement cost are attributable to the differences in depreciation expenses.

1. Calculate for each division the rate of return on net assets and the economic profit based on historical cost and on replacement cost. For purposes of calculating economic profit, use 10% as the cost of capital
2. Rank the performance of each division under each of the four different measures computed in number 1.
3. What do these measures indicate about the performance of the divisions? Of the division managers? Which measures do you prefer? Why?

10-44 Use of Gross and Net Book Value of Fixed Assets

Delta Iron Works Inc. has adopted a responsibility accounting approach in evaluating the performance of its works managers. It has several workshops across the state. In one of such workshop, the manager acquired fixed assets worth \$260,000 with a useful life of 4 years and without any residual value. The workshop uses the straight-line method of charging depreciation on fixed assets. The workshop manager is evaluated based on the income in relation to the fixed assets of the workshop. Annual net income after deducting depreciation is \$10,000.

Assume that sales, and all expenses except depreciation, are on a cash basis. Dividends equal net income. Thus, cash in the amount of depreciation charge will accumulate each year. The workshop manager's performance is judged in relation to fixed assets because all current assets, including cash, are controlled centrally. Assume that any cash accumulated remains idle. Ignore taxes.

1. Prepare a comparative tabulation of the plant's rate of return and the company's overall rate of return based on
 - a. gross (i.e., original cost) assets.
 - b. net book value of assets.
2. Evaluate the relative merits of gross assets and net book value of assets as investment bases.

10-45 Role of Economic Value and Replacement Value

(This problem requires understanding of the concept of present values. See Appendix B.)

"To me, economic value is the only justifiable basis for measuring plant assets for purposes of evaluating performance. By economic value, I mean the present value of expected future services. Still, we do not even do this on acquisition of new assets—that is, we may compute a positive net present value, using discounted cash flow; but we record the asset at no more than its cost. In this way, the excess present value is not shown in the initial balance sheet. Moreover, the use of replacement costs in subsequent years is also unlikely to result in showing economic values. The replacement cost will probably be less than the economic value at any given instant of an asset's life.

"Market values are totally unappealing to me because they represent a second-best alternative value—that is, they ordinarily represent the maximum amount obtainable from an alternative that has been rejected. Obviously, if the market value exceeds the economic value of the assets in use, they should be sold. However, in most instances, the opposite is true; market values of individual assets are far below their economic value in use.

“The obtaining and recording of total present values of individual assets based on discounted-cash-flow techniques is an infeasible alternative. I, therefore, conclude that replacement cost (less accumulated depreciation) of similar assets producing similar services is the best practical approximation of the economic value of the assets in use. Of course, it is more appropriate for the evaluation of the division’s performance than the division manager’s performance.”

Critically evaluate these comments. Please do not wander; concentrate on the issues described by the quotation.

10-46 Profit Centers and Transfer Pricing

A large computer hardware manufacturing company in China is installing a responsibility accounting system. The company sells computers as per customer specification on some standardized parameters and has identified three profit centers: parts and service, new computers, and refurbished computers. The division managers have full autonomy in making decisions to sell outside. However, there are some interdepartmental dealings as well. For example,

- the parts and service department prepares new computers as per customer specification and refurbishes used computers prior to their resale.
- the refurbished computer division’s major source of inventory has been the computers exchanged against the new computers.

The CEO of the company requires Chen, the newly appointed manager of the company, to draft a company policy on transfer price with specific rules considering the above interdepartmental dealings. What can be the best policy on transfer pricing in this situation?

10-47 Transfer Pricing

The shocks and struts division of Transnational Motors Company produces strut assemblies for automobiles. It has been the sole supplier of strut assemblies to the automotive division and charges \$48 per unit, the current market price for very large wholesale lots. The shocks and struts division also sells to outside retail outlets, at \$61 per unit. Normally, outside sales amount to 30% of a total sales volume of 1 million strut assemblies per year. Typical combined annual data for the division follow:

Sales	\$51,900,000	
Variable costs, at \$38.50 per strut assembly		\$38,500,000
Fixed costs		<u>4,200,000</u>
Total costs	\$42,700,000	
Gross margin	<u>\$ 9,200,000</u>	

Flint Auto Parts Company, an entirely separate entity, has offered the automotive division comparable strut assemblies at a firm price of \$42.70 per unit. The shocks and struts division of Transnational Motors claims that it cannot possibly match this price because it could not earn any margin at the price Flint is offering.

- Assume that you are the manager of the automotive division of Transnational Motors. Comment on the shocks and struts division’s claim. Assume that normal outside volume cannot be increased.
- Now assume the shocks and struts division believes that it can increase outside sales by 700,000 strut assemblies per year by increasing fixed costs by \$2.5 million and variable costs by \$4.50 per unit while reducing the selling price to \$58. Assume that maximum capacity is 1 million strut assemblies per year. Should the division reject intracompany business and concentrate solely on outside sales?

10-48 Transfer-Pricing Concession

You are the divisional controller of the U.S. division of Samtech Electronics. Your division is operating at capacity. The Australian division has asked the U.S. division to supply a sound system (chip and speaker), which it will use in a new model Game Box that it is introducing. The U.S. division currently sells identical sound systems to outside customers at \$11.00 each.

The Australian division has offered to pay \$7.00 for each sound system. The total cost of the Game Box is as follows:

Purchased parts from outside vendors	\$28.10
Sound system from U.S. division	7.00
Other variable costs	17.50
Fixed overhead	<u>10.00</u>
Total	<u>\$62.60</u>

The Australian division is operating at 50% of capacity, and this Game Box is an important new product introduction to increase its use of capacity. Based on a target-costing approach, the Australian division management has decided that paying more than \$7.00 for the sound system would make production of the Game Box infeasible because the predicted selling price for the Game Box is only \$62.00.

Samtech Electronics evaluates divisional managers on the basis of pretax ROI and dollar profits compared to the budget. Ignore taxes and tariffs.

1. As divisional controller of the U.S. division, would you recommend supplying the sound system to the Australian division for \$7.00 each? Why or why not?
2. Would it be to the short-run economic advantage of Samtech Electronics for the U.S. division to supply the sound system to the Australian division? Explain your answer.
3. Discuss the organizational and behavioral difficulties, if any, inherent in this situation. As the U.S. division controller, what would you advise the Samtech Electronics president to do in this situation?

10-49 Transfer Prices and Idle Capacity

The Dhaka division of Bengal Garments purchases solid as well as printed cloth, which it uses to make shirts and dresses. It purchases most of the cloth from Chittagong Mill, also a division of Bengal Garments. Both the Dhaka division and Chittagong division are profit centers.

The Dhaka division proposes to produce a new line of fashionable dresses that will sell for BDT19,000. The manager is exploring the possibility of purchasing the required cloth from the Chittagong division. Production of 400 dresses is planned, using capacity in the Dhaka division that is currently idle.

The Dhaka division can purchase the cloth needed for one dress from an outside supplier for BDT14,400. Bengal Garments has a policy that internal transfers are priced at full cost.

Assume the following costs for the production of one dress and the cloth required for the same.

Variable cost	BDT9,600	Variable costs	
Allocated fixed cost	4,400	Cloth from Chittagong division	BDT14,000
Fully allocated cost	<u>BDT14,000</u>	Dhaka division variable costs	
		Manufacturing	BDT4,600
		Selling	<u>1,200</u> <u>5,800</u>
		Total variable cost	<u>BDT19,800</u>

1. Assume that the Chittagong Mill has idle capacity and, therefore, would incur no additional fixed costs to produce the required number. Would the Dhaka division manager buy the cloth for the dresses from the Chittagong Mill given the existing transfer-pricing policy? Why or why not? Would the company as a whole benefit if the manager decides to buy from the Chittagong Mill? Explain.
2. Assume that there is no idle capacity at the Chittagong Mill and the cloth required for one dress can be sold to an outside customer for BDT14,400. Would the company as a whole benefit if the Dhaka division manager buys from the Chittagong division? Explain.

10-50 Transfer-Pricing Principles

A law firm, Arno Legal Services, is decentralized with 25 offices around the state of California. The headquarters is based in San Francisco. Another operating division is located in San Jose, 50 miles away. A subsidiary printing operation, ArnoPrint, is located in the headquarters building. Top management has indicated the desirability of the San Jose office using ArnoPrint for printing reports. All charges are eventually billed to the client, but Arno Legal Services was concerned about keeping such charges competitive.

ArnoPrint charges San Jose the following:

Photographing page for offset printing (a setup cost)	\$.200
Printing cost per page	0.02

At this rate, ArnoPrint sales have a 50% contribution margin to fixed overhead.

Outside bids for 250 copies of a 180-page report needed immediately have been as follows:

Print 4U	\$942.00
Jiffy Press	918.25
Kustom Print	923.50

These three printers are located within a 5-mile radius of Arno Legal Services' San Jose office and can have the reports ready in 2 days. A messenger would have to be sent to drop off the original and pick up the copies. The messenger usually goes to headquarters, but in the past, special trips have been required to deliver the original or pick up the copies. It takes 3–4 days to get the copies from ArnoPrint (because of the extra scheduling difficulties in delivery and pickup).

Quality control at ArnoPrint is poor. Reports received in the past have contained wrinkled pages, have occasionally been mis-collated, or have had pages deleted altogether. (In one instance, an intra-company memorandum including the San Jose Office's financial performance statistics was inserted in a report prepared for an outside client. Fortunately, the San Jose office detected the error before the report was distributed to the client.) The degree of quality control in the three outside print shops is unknown.

(Although the differences in costs may seem immaterial in this case, regard the numbers as significant for purposes of focusing on the key issues.)

1. If you were the decision maker at the San Jose office of Arno Legal Services, to which print shop would you give the business? Is this an optimal economic decision from the entire organization's viewpoint?
2. What would be the ideal transfer price in this case, if based only on economic considerations?
3. Time is an important factor in maintaining client goodwill. There is potential return business from this client. Given this perspective, what might be the optimal decision for the company?
4. Comment on the wisdom of top management in indicating that ArnoPrint should be used.

10-51 Negotiated Transfer Prices

Oscar Industries requires 2,400 units of turntables. The glass and ceramic products division already produces similar turntables for the external market and sells them at an industry-wide established price of \$36. The company, so far, has maintained negotiated transfer-pricing policy across the organization. The glass and ceramic products division has enough excess capacity to produce additional 4,000 units of turntables. Its variable cost of production is \$25.

What is the natural bargaining range for a transfer price between the two divisions? Explain why no price below your range would be acceptable. Also explain why no price above your range would be acceptable.

10-52 Transfer Prices and Minority Shareholders

This chapter discussed transferring profits between divisions of a multinational company. Another situation where transfer prices have a similar effect is when a parent company transfers items to or from a subsidiary when there are minority shareholders in the subsidiary. Consider the **Michelin Group** and its Polish subsidiary, **Stomil Olsztyn**, of which Michelin owns 70%. Michelin buys tires from Stomil Olsztyn at a transfer price. Since Michelin owns a majority of Stomil Olsztyn, it controls the transfer-pricing policy. The holders of the other 30% of Stomil Olsztyn claim that Michelin sets the transfer prices too low, thereby reducing the profits of Stomil Olsztyn. They maintain that Stomil Olsztyn would be more profitable if it were allowed to sell its tires on the market rather than transfer them to Michelin. In reply, Michelin managers maintain that Stomil Olsztyn is more profitable than other members of the Michelin Group, and, therefore, the transfer prices must be fair.

Discuss the incentives for Michelin to transfer tires at a low price from Stomil Olsztyn to its Michelin parent. What transfer price do the minority shareholders in Stomil Olsztyn favor? Use an example of a tire that Stomil Olsztyn produces at a variable cost of €20 that is transferred to Michelin for €25. How should Michelin and Stomil Olsztyn establish a fair transfer price?

10-53 Multinational Transfer Prices

Orient Computers produces desktop and laptop computers for home and business use. The company has its plant at Whitsett, North Carolina in the United States. However, the company has sales divisions worldwide. One of these sales divisions is located in Dresden, Germany. Assume that the U.S. income tax rate is 25%, the German income tax rate is 40%, and a 3% import duty is imposed on computer hardware brought into Germany.

One product produced in Whitsett and shipped to Germany is gaming laptops. The variable cost of production is \$900 per unit and the fully allocated cost is \$1,400 per unit.

1. Suppose the German and U.S. governments allow either the variable cost or fully allocated cost to be used as a transfer price. Which price should Orient Computers choose to minimize the total of income taxes and import duties? Compute the amount the company saves if it uses your suggested transfer price instead of the alternative. Assume import duties are not deductible for tax purposes.
2. Suppose the German government decreased the income tax rate to 30% and increased the duty on computer hardware to 10%. Repeat number 1, using these new rates.

10-54 Review of Major Points in This Chapter

The Canadian Instruments Company uses the decentralized form of organizational structure and considers each of its divisions as an investment center. The Toronto division is currently selling 15,000 air filters annually, although it has sufficient productive capacity to produce 21,000 units per year. Variable manufacturing costs amount to \$21 per unit, while the total fixed costs amount to \$90,000. These 15,000 air filters are sold to outside customers at \$40 per unit.

The Montreal division, also a part of Canadian Instruments, has indicated that it would like to buy 1,500 air filters from the Toronto division, but at a price of \$37 per unit. This is the price the Montreal division is currently paying an outside supplier.

1. Compute the effect on the operating income of the company as a whole if the Montreal division purchases the 1,500 air filters from the Toronto division.
2. What is the minimum price that the Toronto division should be willing to accept for these 1,500 air filters?
3. What is the maximum price that the Montreal division should be willing to pay for these 1,500 air filters?
4. Suppose instead that the Toronto division is currently producing and selling 21,000 air filters annually to outside customers. What is the effect on the overall Canadian Instruments Company operating income if the Toronto division is required by top management to sell 1,500 air filters to the Montreal division at (a) \$21 per unit and (b) \$37 per unit?
5. For this question only, assume that the Toronto division is currently earning an annual operating income of \$36,000, and the division's average invested capital is \$300,000. The division manager has an opportunity to invest in a proposal that will require an additional investment of \$20,000 and will increase annual operating income by \$2,000. (a) Should the division manager accept this proposal if the Canadian Instruments Company uses ROI in evaluating the performance of its divisional managers? (b) If the company uses economic profit? (Assume a cost of capital of 7%.)

CASES

10-55 Profit Centers and Central Services

Star Manufacturing, manufacturer of Starlite brand small appliances, has a process engineering department (PED). The department's major task has been to help the production departments improve their operating methods and processes.

For several years, Star Manufacturing has charged the cost of consulting services to the production departments based on a signed agreement between the managers involved. The agreement specifies the scope of the project, the predicted savings, and the number of consulting hours required. The charge to the production departments is based on the costs to the engineering department of the services rendered. For example, senior engineer hours cost more per hour than junior engineer hours. An overhead cost is included. The agreement is really a "fixed-price" contract. That is, the production manager knows the total cost of the project in advance. A recent survey revealed that production managers have a high level of confidence in the engineers.

The PED department manager oversees the work of about 40 engineers and 10 technicians. She reports to the engineering manager, who reports to the vice president of manufacturing. The PED manager has the freedom to increase or decrease the number of engineers under her supervision. The PED manager's performance evaluation is based on many factors including the annual incremental savings to the company in excess of the costs of operating the PED department.

The production departments are profit centers. Their goods are transferred to subsequent departments, such as a sales department or sales division, at prices that approximate market prices for similar products.

Top management is seriously considering a “no-charge” plan. That is, production departments would receive engineering services at absolutely no cost. Proponents of the new plan maintain that it would motivate the production managers to take better advantage of engineering talent. In all other respects, the new system would be unchanged from the present system.

1. Compare the present and proposed plans. What are their strong and weak points? In particular, will the PED manager tend to hire the “optimal” amount of engineering talent?
2. Which plan do you favor? Why?

10-56 Management by Objectives

Roger Ravenhill is the CEO of Haida Company. Ravenhill has a financial management background and is known throughout the organization as a “no-nonsense” executive. When Ravenhill became CEO, he emphasized cost reduction and savings and introduced a comprehensive cost control and budget system. The company goals and budget plans were established by Ravenhill and given to his subordinates for implementation. Some of the company’s key executives were dismissed or demoted for failing to meet projected budget plans. Under the leadership of Roger Ravenhill, Haida has once again become financially stable and profitable after several years of poor performance.

Recently, Ravenhill has become concerned with the human side of the organization and has become interested in the management technique referred to as “management by objectives” (MBO). If there are enough positive benefits of MBO, he plans to implement the system throughout the company. However, he realizes that he does not fully understand MBO because he does not understand how it differs from the current system of establishing firm objectives and budget plans.

1. Briefly explain what MBO entails and identify its advantages and disadvantages.
2. Does Roger Ravenhill’s management style incorporate the human-value premises and goals of MBO? Explain your answer.

NIKE 10-K PROBLEM

10-57 ROI and Economic Profit

Examine Nike’s segments as defined in Note 17 to its financial statements in the 10-K report in Appendix C. We will use the segment information from the first four segments listed to calculate approximations to ROI and economic profit. For purposes of this problem, define segment income as segment EBIT and define segment assets as the sum of the assets shown in Note 17, namely receivables, inventory, and property plant and equipment. Therefore, pretax and pre-interest ROA is EBIT divided by segment assets and an approximation to economic profit is EBIT minus a charge for the cost of capital to finance segment assets.

Using these definitions, determine ROA and economic profit for each segment in 2020 and 2021 using EBIT from Note 17 in the 10-K and the information on segment assets in the following table. Assume that Nike’s cost of capital is 10%. Use your results to evaluate the performance of each segment. Which segment management seems to be doing the best job? What subjective factors would you consider, in addition to ROA and economic profit, in assessing segment performance?

Ending Accounts Receivable, Inventories, and Property, Plant, and Equipment		
Segment	2021	2020
North America	\$ 5,245	\$ 4,742
Europe, Middle East, and Africa	4,152	3,667
Greater China	1,823	1,417
Asia Pacific and Latin America	1,614	1,491
Nike Total (includes corporate assets not in segments)	<u>\$16,221</u>	<u>\$14,982</u>

EXCEL APPLICATION EXERCISE

10-58 Return on Investment and Economic Profit

Goal: Create an Excel spreadsheet to calculate performance of divisional segments using the ROI and economic profit methods. Use the results to answer questions about your findings.

Scenario: The company has asked you to calculate ROI and economic profit for three divisions. The background data for your analysis appears in Fundamental Assignment Material 10-A1. Use an interest rate of 10% when calculating the capital charge.

When you have completed your spreadsheet, answer the following questions:

1. Which division has the best performance using the ROI method? Using the economic profit method?
2. Which division has the worst performance under both methods?
3. Which method would you suggest for evaluating the manager of each division?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 10 Decision Guideline
Row 2: Divisions Hubert, Duane, and Louis
Row 3: Measures of Profitability
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–I.
4. In row 7, create the following center-justified column headings:
Column A: Division
Column B: Invested Capital
Column C: Revenue
Column D: Income
Column E: Capital Charge
Column F: Economic Profit
Column G: Return on Investment
Column H: Return on Sales
Column I: Capital Turnover
5. Change the format of Economic Profit and Return on Investment to bold-faced headings.
6. Change the format of the column headings in row 7 to permit the titles to be displayed on multiple lines within a single cell.

Alignment tab:

Wrap Text:

Checked

Note: Adjust column widths so the headings only use two lines.

Adjust row height to insure that row is the same height as adjusted headings.

7. In column A, create the following center-justified row headings:
Row 8: Hubert
Skip a row.
Row 10: Duane
Skip a row.
Row 12: Louis
8. Use the scenario data to fill in invested capital, revenue, and income amounts for each division.
9. Use the scenario data and appropriate formulas to calculate capital charge amounts for each division.
10. Use the appropriate formulas from this chapter to calculate economic profit, ROI, return on sales, and capital turnover amounts for each division.
11. Format amounts in columns B, C, D, E, and F for division A as follows:

Number tab:

Category:

Currency

Decimal places:

0

Symbol:

\$

Negative numbers:

Black with parentheses

12. Format amounts in columns B, C, D, E, and F for divisions B and C as follows:

Number tab:	Category:	Currency
	Decimal places:	0
	Symbol:	None
	Negative numbers:	Black with parentheses

13. Format amounts in columns G and H to display as percentages without decimal places.

Number tab:	Category:	Percentage
	Decimal places:	0

14. Format the capital turnover amounts to display two decimal places, followed by the word **times**.

Number tab:	Category:	Custom

From the Type list, highlight the type shown next:

Type: 0.00

Change the data in the Type field from 0.00 to the following:

Type: 0.00 “times”

Click the OK button.

15. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

10-59 ROI

Form groups of three to six students. Each student should select a company. Coordinate the selection of companies so that each group has companies from a wide variety of industries. For example, a good mix of industries for a group of five students would be a retail company, a basic manufacturing company, a computer software company, a bank, and an electric utility company.

- Each student should find the latest annual report for his or her company. (If you cannot find the company's home page, try www.sec.gov, and search the Security and Exchange Commission's Edgar files for the company's 10-K report, which will contain its financial statements.) Compute the following:
 - Return on sales
 - Capital turnover
 - ROI
- As a group, compare these performance metrics for the chosen companies. Why do they differ across companies? What characteristic of the company and its industry might explain the differences in the measures?

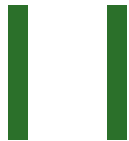
INTERNET EXERCISE

10-60 Decentralization at Marriott International

Decentralization of an organization can occur for many reasons. It may be that the organization is involved in multiple activities that are not closely related to each other, such as construction and auto sales. In other cases, the decision may be due to the structure of the firm's ownership and how it chooses to manage its image. Let's look at a firm that falls under this category—**Marriott International**.

- Go to Marriott International's Web site at www.marriott.com. Does the home page emphasize corporate information or promotional information?
- How has Marriott decentralized its businesses? Click on “Our Brands” from the menu at the left of the page to find a list of Marriott's divisions. Do you suppose the divisions are cost centers, profit centers, or investment centers?

3. Go to the most recent annual report by clicking on “Our Company,” “Investors,” “Financial Information,” and finally click on “Financial Reports & Proxy” to find the most recent annual report. Locate the information on business segments in the Notes to Financial Statements. How many segments does Marriott identify? What are these segments? What information does the firm report with respect to each of the different segments?
4. Marriott provides both income and assets for each of the segments. Calculate the return on average total assets for the past year for each of the segments.
5. What was the return on average total assets for the corporation as a whole for the past year? Given the different kinds of business segments the company has, do you think that operating return on average total assets would be a good measure for evaluating the individual segments? What factors might influence your answer?
6. Is Marriott likely to have any transfer prices? If Marriott has transfers, how do you suppose the company determines its transfer prices?



Capital Budgeting

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Describe capital-budgeting decisions and use the net-present-value (NPV) method to make such decisions.
2. Use sensitivity analysis to evaluate the effect of changes in predictions on investment decisions.
3. Calculate the NPV difference between two projects using both the total project and differential approaches.
4. Identify relevant cash flows for NPV analyses.
5. Compute the after-tax net present values of projects.
6. Explain the after-tax effect on cash received from the disposal of assets.
7. Use the payback model and the accounting rate-of-return model and compare them with the NPV model.
8. Reconcile the conflict between using an NPV model for making decisions and using accounting income for evaluating the related performance.
9. Compute the impact of inflation on a capital-budgeting project (Appendix 11).

► TOYOTA MOTOR CORPORATION

Toyota Motor Corporation was founded in 1937 by Japanese entrepreneur, Kiichiro Toyoda, to produce and sell Toyoda autos. Almost immediately the name was changed to Toyota because (according to Wikipedia) “it took eight brush strokes (a fortuitous number) to write in Japanese, was visually simpler (leaving off two ticks at the end), and sounded better with two ‘t’s.” In 1957 Toyota entered the U.S. market with a car called the Toyopet Crown. Unfortunately, U.S. consumers associated these cars with toys and pets, so Toyota quickly dropped the Toyopet name. Nevertheless, the company continued selling Toyotas in the United States. In 1963 Toyota built its first car outside of Japan (in Australia) and in 1982 began producing cars in the United States. In 2008, Toyota became the largest automobile company in the world, replacing **General Motors**. It has production or assembly plants in more than 25 countries.

Toyota was instrumental in developing lean manufacturing and just-in-time production. Its management philosophy focuses on four areas: 1) long-term thinking, 2) a process for problem-solving, 3) growth and development of employees, and 4) organizational learning. This has led to a variety of awards for quality, from the Deming Prize for Total Quality Management in 1965 to recent J.D. Power awards for automobile quality. This reputation for quality was instrumental in Toyota’s worldwide growth.

Toyota invested heavily in U.S. manufacturing facilities, especially those for full-size pickup trucks and sports-utility vehicles. With the economic downturn beginning in 2008, Toyota found itself with excess manufacturing capacity. The company moved quickly to shut down two factories for several months each

and to switch production in another from the Highlander SUV to the Prius. Every forward-looking company must make long-term investment decisions based on uncertain predictions. Despite using the best information available at the time the decision is made, some predictions subsequently turn out to be incorrect. Consequently, some investment decisions do not turn out well, as illustrated by some of Toyota's investments in production facilities. This chapter focuses on investment decisions, which are critical to the long-term success of most organizations. ■



Ekasit Wangprasert/Alamy Stock Photo

Capital Budgeting for Programs or Projects

Major corporations such as **Toyota** are not the only companies that face decisions about capital investment and expansion. Every company makes decisions about when and how to spend money on major projects. This chapter concentrates on investment decisions for programs or projects that affect financial results over a period longer than just the current year. Such decisions typically require commitment of relatively large amounts of resources—called capital outlays—in anticipation of future benefits that are often uncertain. The term **capital budgeting** describes the long-term planning for long-term investment decisions such as (1) investment in new equipment, (2) replacement of assets, (3) expansion of facilities, (4) investment in employee training programs, or (5) expenditures to improve process efficiency and reduce future costs. We discuss a number of specific investment examples in this chapter, but it is important to remember that capital-budgeting concepts apply to a wide variety of decisions.

Capital budgeting has three phases: (1) identifying potential investments, (2) choosing which investments to make (which includes gathering data to aid the decision), and (3) follow-up monitoring, or “post-audit,” of the investments. The cost-management system often provides information to help managers assess the future cash flows needed as inputs to capital-budgeting models. In addition, accountants provide post-audit information to assess the success of projects. Let's take a look at how some capital-budgeting models work.

capital budgeting

The long-term planning for investment commitments with returns spread over time, typically over multiple years.

Discounted-Cash-Flow Models

The most widely used capital-budgeting models are **discounted-cash-flow (DCF) models**. These models focus on a project's cash inflows and outflows while taking into account the time value of money. The value of a dollar today is greater than the value of a dollar to be received in the future. Therefore, investors expect to be repaid more than the original amount invested, and the excess of the amount repaid over the original amount is interest. On the investor side of the transaction, this interest is income, while on the borrower's side of the transaction, this interest is expense. More than 85% of the large industrial firms in the United States evaluate investment decisions using the DCF model, which explicitly incorporates the time value of money.

discounted-cash-flow (DCF) models

Capital-budgeting models that focus on cash inflows and outflows while taking into account the time value of money.

Major Aspects of DCF

As the name suggests, DCF models focus on cash flows rather than on net income. These models convert future cash flows into the corresponding **present values**, the value today of a future cash flow. Companies invest cash today because they expect to receive a larger amount of cash in future periods. DCF models compare today's cash outflows with the predicted future cash inflows and outflows by converting all cash flows into present values based on the theory of compound interest. If your knowledge of compound interest and time value of money is a little rusty, be sure to read Appendix B, pp. 777–782, before you continue with the rest of the discussion of DCF methods.

present value (PV)

The value today of a future cash flow.

net-present-value (NPV) method

A discounted-cash-flow approach to capital budgeting that computes the present value of all expected future cash flows using a required rate of return.

required rate of return (hurdle rate, discount rate)

The minimum acceptable rate of return, based on the firm’s cost of capital.

Objective I

Describe capital-budgeting decisions and use the net-present-value (NPV) method to make such decisions.

net present value

The sum of the present values of all expected cash flows.

Net Present Value (NPV)

We will focus on the most widely used version of DCF, the **net-present-value (NPV) method**. The NPV method computes the present value of all cash flows using an interest rate called the **required rate of return**. This rate, also called the **hurdle rate** or **discount rate**, depends on the risk of a proposed project—the higher the risk, the higher the rate. It is often based on the cost of capital—what the firm pays to acquire more capital. This rate is applied to the cash flows for a project, which can be classified into one of three categories: 1) the net initial cash flow, the cash outflow for acquisition of assets less any offsetting cash inflows from disposal of existing assets; 2) periodic cash flows during the life of the project; and 3) net cash flow at termination of the project.

Using the required rate, managers sum the present values of all expected future cash flows associated with the project and subtract the initial investment. This total is the project’s **net present value (NPV)**. A positive NPV means that the present value of the project’s future cash flows exceeds the investment, so the project should be undertaken. Conversely, a negative NPV means the investment exceeds the present value (PV) of the future cash flows, so the project should not be undertaken.

Applying the NPV Method

To illustrate how DCF models work, we will use the following example throughout the rest of this section: Managers at **Toyota’s** Tupelo, Mississippi, plant are contemplating the purchase of new, more efficient auto painting equipment that they expect will increase efficiency and produce operating savings. The cash flows associated with this investment consist of 1) an initial investment outflow of \$5,827 at time zero for the acquisition cost, followed by 2) annual cash savings (equivalent to a cash inflow) of \$2,000 at the end of each year for the 4-year life of the equipment, and 3) no net cash flow at termination of the project. The required rate of return is 10% per year.

To apply the NPV method, you can use the following three steps, which we illustrate in Exhibit 11-1.

- 1. *Identify the amount and timing of relevant expected cash inflows and outflows:* The right-hand side of Exhibit 11-1 sketches these cash flows, with outflows shown in parentheses. Sketches like this one can help you visualize costs and cost relationships over time.

	Present Value of \$1, Discounted at 10%	Total Present Value	Sketch of Cash Flows at End of Year				
			0	1	2	3	4
Approach 1: Discounting Each Year’s Cash Flows Separately*							
Cash flows							
Annual savings	0.9091	\$1,818		\$2,000			
	0.8264	1,653			\$2,000		
	0.7513	1,503				\$2,000	
	0.6830	<u>1,366</u>					\$2,000
Present value of future inflows		\$6,340					
Initial outlay	1.0000	<u>(5,827)</u>	\$(5,827)				
Net present value		<u>\$ 513</u>					
Approach 2: Using Annuity Table†							
Annual savings	3.1699	\$6,340		\$2,000	\$2,000	\$2,000	\$2,000
Initial outlay	1.0000	<u>(5,827)</u>	\$(5,827)				
Net present value		<u>\$ 513</u>					

*Present values from Table B-1, Appendix B, p. 778.
†Present value of annuity from Table B-2, Appendix B, p. 781. (Incidentally, calculators or computers may give slightly different answers than do the tables because of rounding differences.)

Exhibit 11-1

Net-Present-Value Method

Initial investment, \$5,827. Useful life, 4 years. Annual cash inflow from operations, \$2,000. Required rate of return, 10%. Cash outflows are in parentheses, while cash inflows are not. Total present values are rounded to the nearest dollar.

2. **Find the present value of each expected cash inflow or outflow:** Examine Table B-1 in Appendix B on p. 778. Find the PV factor for each year's cash flow from the correct row and column of the table. Multiply each expected cash inflow or outflow by the appropriate PV factor. For example, the present value of the \$2,000 cash savings that will occur 2 years hence is $\$2,000 \times 0.8264 = \$1,653$. As another example, the initial acquisition cost outflow of \$5,827 at time zero has a present value of \$5,827.
3. **Sum the individual present values:** The sum is the project's NPV. Accept a project whose NPV is positive, and reject a project whose NPV is negative.

The present value of the initial cash investment is \$5,827, the present value of the four annual cash inflows is \$6,340, and there are no cash flows at termination. Thus, the net present value of all the cash flows is $\$6,340 - \$5,827 = \$513$. Because the net present value is positive, Toyota's managers should accept the investment.

Choice of the Correct Table

Exhibit 11-1 also shows another way to calculate the NPV, shown as approach 2. The basic steps are the same as for approach 1. The only difference is that approach 2 uses Table B-2 in Appendix B (see p. 781) to find the present value of the four annual amounts. Table B-2 is an annuity table that provides discount factors for computing the PV of a series of equal cash flows at equal intervals. Because the four annual cash flows in our example are all equal, you can use Table B-2 to make one PV computation instead of using Table B-1 to make four individual computations. Table B-2 merely sums up the pertinent PV factors of Table B-1. Therefore, the annuity factor for 4 years at 10% is¹

$$0.9091 + 0.8264 + 0.7513 + 0.6830 = 3.1698$$

Beware of using the wrong table. Use Table B-1 for discounting individual amounts and Table B-2 for a series of equal amounts spread evenly in time. Instead of using Tables B-1 and B-2, you can use the PV function on a handheld calculator or in a spreadsheet program. When you use a calculator or spreadsheet, you still need to be sure to choose the proper function to discount a single amount or to discount a series of equal amounts. While you are initially learning the NPV method, we encourage you to use the tables and explicitly draw out all the cash flows. This will help you better understand the process of PV computation. Once you are comfortable with the method, you can take advantage of the speed and convenience of calculators and spreadsheets.

Making Managerial Decisions

For major capital investments, managers usually prepare a detailed NPV analysis. For smaller items, sometimes they make a quick calculation or use intuition. Suppose you are in charge of a company's mail room. An employee has suggested the purchase of a \$12,000 letter sorting machine. She says that it will save 1 hour per day for 250 working days a year for an employee making a total of \$12 per hour. She indicates that the \$12,000 expenditure will save \$15,000 over the machine's 5-year life. Should you approve the purchase?

Answers

The employee's calculation of the \$15,000 total savings is correct:

$$1 \text{ hour} \times 250 \text{ days} \times \$12/\text{hour} \times 5 \text{ years} = \$15,000$$

However, her calculation ignores the time value of money. The \$12,000 must be paid immediately, and the \$15,000 of savings is spread over the next 5 years at \$3,000 per year. You know that the present value of the savings is less than the \$15,000 total, but the exact amount depends on the required

rate of return. Therefore, you must know the required rate before you can answer the question.

Suppose the required rate is 10%. Using Table B-1, the NPV is negative, \$(627.90):

$$\begin{aligned} &0.9091 \times \$3,000 + 0.8264 \times \$3,000 + 0.7513 \times \$3,000 + \\ &0.6830 \times \$3,000 + 0.6209 \times \$3,000 - \$12,000 = \\ &\$2,727.30 + \$2,479.20 + \$2,253.90 + \$2,049.00 + \\ &\$1,862.70 = \$11,372.10 - \$12,000 = \$(627.90). \end{aligned}$$

Using Table B-2, the NPV is $3.7908 \times \$3,000 - \$12,000 = \$11,372.40 - \$12,000 = \$(627.60)$, which differs from the Table B-1 result by \$.30 due to rounding error. With a 10% required rate, the NPV is negative and the investment should not be accepted.

Now, suppose instead the required rate is 5%. The lower discount rate increases the present value of the annual cost savings and the NPV becomes positive. Using Table B-2, $4.3295 \times \$3,000 - \$12,000 = \$12,988.50 - \$12,000 = \$988.50$. With this change in the required rate of return, the investment should be accepted.

¹Rounding error causes a 0.0001 difference between the Table B-2 factor and the summation of Table B-1 factors. See Appendix B for further discussion of the effect of rounding error.

Effect of Required Rate

We have just seen that a decrease in the required rate of return can change the NPV from negative to positive. In general, the higher the required rate of return, the lower the PV of each future cash inflow. Why? Because the higher the rate of return, the more it costs you to wait for the cash rather than having it available today. Thus, higher required rates lead to lower NPVs.

For example, at a rate of 16%, the NPV of the project in Exhibit 11-1 would be $-\$231$. That is, $\$2,000 \times 2.7982 = \$5,596$, which is $\$231$ less than the investment of $\$5,827$, instead of the $+\$513$ computed with a 10% rate. (PV factor 2.7982 is taken from Table B-2 in Appendix B on p. 781.) When the required rate of return is 16% rather than 10%, the project should be rejected.

Assumptions of the NPV Model

We make two major assumptions when using the NPV model. First, we assume a world of certainty. That is, we act as if the predicted cash inflows and outflows are certain to occur at the times specified. Second, we assume perfect capital markets. That is, if we need to get extra cash or invest excess cash at any time, we can borrow or lend money at the same interest rate, which is our required rate of return. In a world that meets these assumptions, no model could possibly be better than the NPV model.

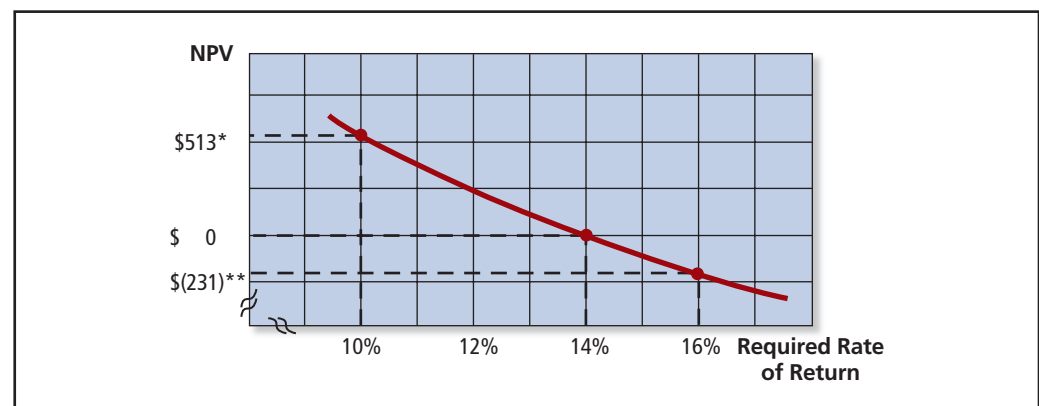
Unfortunately, the real world has neither certainty nor perfect capital markets. Nevertheless, the NPV model is usually preferred to other models because the assumptions of most other models are even less realistic. The NPV model is not perfect, but it generally meets our cost-benefit criterion. That is, the benefit of better decisions based on NPV is greater than the cost of applying it. More sophisticated models often do not improve decisions enough to be worth their cost.

Review of Decision Rules

Be sure that you understand why the NPV method works, not just how to apply it. The decision maker in our example cannot directly compare an immediate outflow of $\$5,827$ with a series of four future inflows of $\$2,000$ each because of the time value of money. The NPV model adds together the net monetary units (such as dollars, euros, or yen) after converting them to their present value at time zero. The required rate of return measures the cost of using money.

Internal Rate of Return (IRR) Model

Another popular DCF model is the **internal rate of return (IRR) model**. This model determines the interest rate at which the NPV equals zero. The rate that makes the $NPV = 0$ is called the IRR. For Toyota's painting equipment, we know that a rate of 10% yields a positive NPV (as shown in Exhibit 11-1) while a rate of 16% yields a negative NPV (as discussed in the Effect of Required Rate section). Therefore, we know that the IRR, the rate that yields a $NPV = 0$, is somewhere between 10% and 16%. The following graph plots the relationship between NPV and required rate of return for our example:



* $(\$2,000 \times 3.1699) - \$5,827 = \$513$

** $(\$2,000 \times 2.7982) - \$5,827 = \$(-231)$

The IRR for our example can be found by trying values between 10% and 16%, converging on the return that yields a present value of zero. Most spreadsheets and many financial calculators

internal rate of return (IRR) model

A capital-budgeting model that determines the interest rate, the IRR, at which the NPV equals zero.

include functions that solve for the IRR. As shown in the graph, the IRR for the painting equipment example is 14%. To confirm that this is the IRR, compute the NPV at a rate of 14%:

Outflow in today's dollars	\$(5,827)
Inflows equivalent in today's dollars at 14%	5,827*
Net present value	<u>\$ 0</u>

*\$2,000 $\times$ 2.9137 from Table B-2 = \$5,827.

The calculation confirms that at a required rate of return of 14%, the NPV is zero, and at this rate the decision maker is indifferent between having \$5,827 now or having a stream of four annual inflows of \$2,000 each.

Finance textbooks provide descriptions of the IRR method, and we will not go into details here. However, in most cases the IRR method gives equivalent decisions to the NPV method. In general, we find the following:

If $IRR > \text{required rate of return}$, then $NPV > 0$ and we should accept the project.

If $IRR < \text{required rate of return}$, then $NPV < 0$ and we should reject the project.

Because of the equivalence of NPV and IRR models for most investment proposals, we use only the NPV model for all the illustrations in this chapter.

Real Options

Whereas the IRR model is generally just an alternative formulation that yields decisions equivalent to the NPV model, the use of real options is an improvement on NPV. A **real options model** recognizes the value of contingent investments—that is, investments that a company can adjust as it learns more about their potential for success. For example, a project that a company can implement in stages, where investment in one stage occurs only if the previous stage was successful, has an advantage over an “all or nothing” project, one where the entire investment must take place up front.

The real options framework has some non-intuitive implications. For example, suppose that a project can either be implemented all at once or implemented in stages at greater cost. Despite the higher cost, staging the project might nonetheless be a preferred alternative if the company gains enough information in the early stages to make better decisions in the later stages. A real options model recognizes the value of such staging. Like the IRR model, we will leave the details of real options to the finance textbooks. However, real options models are an important innovation, and these models are becoming increasingly popular.

real options model

A capital-budgeting model that recognizes the value of contingent investments—that is, investments that a company can adjust as it learns more about its potential for success.

Sensitivity Analysis and Risk Assessment in DCF Models

The NPV model finds the present value of a set of predicted cash flows, but because the future is uncertain, actual cash inflows may differ from what was predicted. Managers often use sensitivity analysis to deal with this uncertainty. Sensitivity analysis determines what would occur if actual cash inflows and outflows differ from what was predicted. The analysis addresses what-if questions such as *What will happen to the NPV if my predictions of useful life or periodic cash flows or cash flows at termination change?*

Sensitivity analysis allows managers to find immediate answers about the effects of possible future events. It also helps managers evaluate prediction risk by showing how sensitive the decision is to changes in predictions. If only a small change in predicted cash flows would change the NPV for a project from positive NPV to negative, the project is subject to high prediction risk. The best way to understand sensitivity analysis is to see it in action, so let's apply sensitivity analysis to our example.

The **Toyota** managers know that the annual cash savings in Exhibit 11-1 could fall below the predicted level of \$2,000. Suppose the managers want to know how far the annual cash savings could drop before the NPV becomes negative? The managers find the value of annual cash inflows that result in $NPV = 0$:

$$\begin{aligned}
 NPV &= 0 \\
 (3.1699 \times \text{cash flow}) - \$5,827 &= 0 \\
 \text{cash flow} &= \$5,827 \div 3.1699 \\
 &= \$1,838
 \end{aligned}$$

Objective 2

Use sensitivity analysis to evaluate the effect of changes in predictions on investment decisions.

This sensitivity analysis shows that if the annual cash savings fall below \$1,838, the NPV falls below zero, and the managers would reject the project. Therefore, annual cash savings can drop only $\$2,000 - \$1,838 = \$162$, or 8.1% below the predicted amount, before the managers would change their decision.

Sensitivity analysis can become complicated very quickly, and manual calculations can be complex and tedious. Fortunately, there is a good deal of sensitivity analysis software available that does the calculations, thus, permitting managers and accountants to focus on interpreting the results of the analysis.

The NPV Comparison of Two Projects

So far we have seen how to use the NPV method to evaluate a single project. In practice, managers rarely look at only one project or option at a time. Instead, managers compare several options to see which is the best or most profitable. We will now see how to use NPV to compare two or more alternatives.

Total Project Versus Differential Approach

Two common methods for comparing alternatives are (1) the total project approach and (2) the differential approach.

total project approach

A method for comparing alternatives that computes the total impact on cash flows for each alternative and then converts these total cash flows to their present values.

differential approach

A method for comparing alternatives that computes the differences in cash flows between alternatives and then converts these differences in cash flows to their present values.

The **total project approach** computes the total impact on cash flows for each alternative and then converts these total cash flows to their present values. The alternative with the largest NPV of total cash flows is best. The total project approach is the most popular approach, and it can be used with any number of alternatives.

The **differential approach** computes the differences in cash flows between alternatives and then converts these differences to their present values. We cannot use this method to compare more than two alternatives.

Let's compare the differential and total project approaches. Consider a motor that drives one of the assembly lines at **Toyota's** San Antonio plant. Assume that Toyota purchased the motor 3 years ago for \$56,000. It has a remaining useful life of 5 years but will require a major overhaul at the end of two more years at a cost of \$10,000. Its disposal value now is \$20,000. Its predicted disposal value in 5 years is \$8,000, assuming that the company does the scheduled \$10,000 major overhaul. The predicted cash-operating costs of this motor are \$40,000 annually. A sales representative has offered a substitute motor for \$51,000. The new motor will reduce annual cash-operating costs by \$10,000, will not require any overhauls, will have a useful life of 5 years, and will have a disposal value of \$3,000. If the required rate of return is 14%, what should Toyota do to minimize long-run costs: keep the old machine or replace it with the new one? (Try to solve this problem yourself before examining the solution that follows.)

Regardless of the approach used, perhaps the hardest part of making capital-budgeting decisions is predicting the relevant cash flows accurately and completely. Seeing which events will cause money to flow either in or out can be complex, especially when there are many sources of cash flows. However, you cannot compare alternatives if you do not know their cash flows, so the first step for either the total project or differential approach is to estimate the relevant cash flows. Exhibit 11-2 sketches these cash flows for each approach.

Total Project Approach: For the total project approach we list the cash flows for each project, replace or keep, separately. We then determine the NPV of the cash flows for each individual project and choose the project with the largest positive NPV or smallest negative NPV. Exhibit 11-2 shows that the NPV of replacing the motor, $-132,435$, is better than the $-\$140,864$ NPV of keeping the old motor. The advantage is $\$140,864 - \$132,435 = \$8,429$. Most cash flows are negative because these are the costs of operating the motor. The alternative with the lowest cost—the smallest negative NPV—is the most desirable.

Differential Approach: For the differential approach, we first list the difference in cash flow for each year. In other words, assume implementation of one of the projects as a baseline and perform a differential analysis as discussed in Chapter 6. Suppose we use keeping the old machine as the baseline. Then we subtract the cash flows for keeping from the cash flows for replacement. This isolates the advantages (cash inflows or cost savings) and disadvantages (cash outflows) of replacement compared to the baseline, keeping the machine. (Remember that cash inflows are positive numbers, while cash outflows are negative.) Next, calculate the NPV of the differential cash flows.

Objective 3

Calculate the NPV difference between two projects using both the total project and differential approaches.

		Sketch of After-Tax Cash Flows at End of Year					
		0	1	2	3	4	5
Present Value Discount Factor, at 14%		Total Present Value					
I. Total Project Approach							
A. Replace							
Recurring cash operating costs, using an annuity table*							
Disposal value, end of year 5	3.4331	\$ (102,993)		\$ (30,000)	\$ (30,000)	\$ (30,000)	\$ (30,000)
Initial required investment	0.5194	1,558					\$ 3,000
NPV of net cash flows	1.0000	(31,000)					
		<u>\$ (132,435)</u>					
B. Keep							
Recurring cash operating costs, using an annuity table*							
Overhaul, end of year 2	3.4331	\$ (137,324)		\$ (40,000)	\$ (40,000)	\$ (40,000)	\$ (40,000)
Disposal value, end of year 5	0.7695	(7,695)					
NPV of net cash flows	0.5194	4,155					\$ 8,000
Difference in NPV between the alternatives		<u>\$ (140,864)</u>					
		<u>\$ 8,429</u>					
II. Differential Approach							
A-B. Analysis confined to differences							
Recurring cash operating savings, using an annuity table*							
Overhaul avoided, end of year 2	3.4331	\$ 34,331		\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Difference in disposal values, end of year 5	0.7695	7,695					
Incremental initial investment	0.5194	(2,597)					\$ (5,000)
Difference in NPV between alternatives	1.0000	(31,000)					
		<u>\$ 8,429</u>					

*Table B-2, Appendix B.

Exhibit 11-2
Total Project Versus Differential Approach to Net Present Value

If the NPV is positive, choose the replacement alternative; if it is negative, choose the baseline alternative to keep the motor. Whereas the total project approach computed the difference in the NPVs of the two projects, the differential method computes the NPV of the difference in cash flows of the two projects. Both give the same total difference, an \$8,429 advantage to replacement.

Exhibit 11-2 illustrates that both methods produce the same answer as long as you are considering only two alternatives. However, to compare more than two alternatives, you should use the total project approach.

Summary Problem for Your Review

PROBLEM

Review the example shown in Exhibit 11-2, p. 459. Conduct three independent sensitivity analyses:

1. Compute the difference in the NPV of the alternatives if the required rate of return were 20% instead of 14%.
2. Compute the difference in the NPV of the alternatives if predicted cash operating costs of the new motor were \$35,000 annually instead of \$30,000, using the 14% discount rate.
3. By how much may the annual cash operating savings fall short of the \$10,000 predicted amount before the difference in NPV between the alternatives reaches zero? Use the original discount rate of 14%.

SOLUTION

1. You can use either the total project approach or the differential approach. The differential approach shows the following:

	Present Value
Recurring cash operating savings, using an annuity table (Table B-2, p. 781): $2.9906 \times \$10,000 =$	\$ 29,906
Overhaul avoided: $0.6944 \times \$10,000 =$	6,944
Difference in disposal values: $0.4019 \times \$5,000 =$	(2,010)
Incremental initial investment	(31,000)
Difference in NPV between the alternatives	<u>\$ 3,840</u>

With a 20% required rate of return, replacement is still the preferred alternative. However, the difference in NPV is reduced from the \$8,429 shown in Exhibit 11-2 to \$3,840.

- 2.

Difference in NPV value in Exhibit 11-2	\$ 8,429
Present value of additional \$5,000 annual operating costs $3.4331 \times \$5,000$	(17,166)
Difference in NPV between the alternatives	<u>\$ (8,737)</u>

With \$5,000 less in annual savings, the new motor yields a negative difference in the NPV between the alternatives, and therefore is not desirable.

3. Let X = annual cash operating savings and find the value of X so that the difference in NPV between the two alternatives = 0. Then,

$$0 = 3.4331(X) + \$7,695 - \$2,597 - \$31,000$$

$$3.4331(X) = \$25,902$$

$$X = \$7,545$$

(Note that the \$7,695, \$2,597, and \$31,000 are shown at the bottom of Exhibit 11-2.)

If the annual savings fall from \$10,000 to \$7,545, a decrease of \$2,455 or almost 25%, the NPV will fall to zero.

An alternative way to obtain the same answer would be to divide the NPV of \$8,429 (see bottom of Exhibit 11-2) by 3.4331, obtaining \$2,455, the amount of the annual difference in savings that will eliminate the \$8,429 of NPV.

Relevant Cash Flows

Predicting cash flows is often the hardest part of capital budgeting. We organize the discussion of predicting cash flows into three project phases: (1) cash flows at project initiation, (2) cash flows at project termination, and (3) periodic cash flows between project initiation and termination.

Objective 4

Identify relevant cash flows for NPV analyses.

Predicting Relevant Cash Flows

INITIAL CASH INFLOWS AND OUTFLOWS These cash flows include both outflows for the purchase and installation of new equipment and other assets (such as additional investments in working capital) required by the project and cash inflows or outflows from disposal of any items that are replaced. For example, in Exhibit 11-2, we subtracted the \$20,000 cash inflow from selling the old motor that was being replaced from the \$51,000 cash outflow to purchase the new motor, resulting in the initial net cash outflow of \$31,000. As another example, if instead of selling the old motor the company had to pay to dismantle it, the net cash outflow at project initiation would be \$51,000 plus the cost of dismantling the old motor.

CASH INFLOWS AND OUTFLOWS AT TERMINATION At project termination, assets may have cash disposal values that represent a cash inflow. In other cases, there may be costs at termination to dispose of an asset that represent a cash outflow.

OPERATING CASH FLOWS DURING THE LIFE OF THE PROJECT The major purpose of most investments is to affect periodic cash inflows and outflows during the life of the project. Many of these effects are difficult to measure, and three points deserve special mention:

1. The only relevant cash flows are those that will differ among alternatives, and it is frequently difficult to identify exactly which costs will differ. Fixed overhead will often be the same under all the available alternatives. If so, you can safely ignore it.
2. We treat a reduction in a cash outflow (a cash savings) the same as a cash inflow—both signify increases in value. Similarly, we treat a reduction in a cash inflow the same as a cash outflow—both signify decreases in value.
3. Remember that you are predicting cash inflows and outflows, not revenues and expenses. When there are differences between accrual basis revenues and expenses versus the corresponding cash inflows and cash outflows, the DCF model requires you to use the cash flow. For example, we might record a \$10,000 sale on credit as accrual revenue in one period but if the related cash inflow comes in a later period, the \$10,000 cash inflow will be recognized in the DCF model in the later period. In this chapter, we generally assume that cash inflows are equivalent to accrual revenues and that cash outflows are equivalent to accrual expenses, except in two major areas—depreciation and gains or losses on disposal of assets.

There is no cash outflow corresponding to depreciation expense in NPV calculations. Why not? Because depreciation expense is not a cash flow. Depreciation is an accrual expense that allocates the cost of a long-lived asset across the periods during which the asset is used. It is easy to confuse depreciation and cash flows because they are related to a common set of facts. Suppose a company acquires a machine for \$54,000 that will be used for 5 years and then sold for \$4,000. For NPV purposes, the relevant cash flows are a \$54,000 cash outflow at acquisition and a \$4,000 cash inflow at disposal. For financial reporting purposes, depreciation expense is the \$54,000 acquisition cost less the \$4,000 disposal value, a total of \$50,000 spread across the 5-year life of the asset. For NPV purposes, it is incorrect to account for the acquisition and disposal cash flows and then also deduct depreciation over the asset's life as cash outflows—this would be like counting the net of the acquisition cost and disposal value twice.

The accrual gain or loss on disposal of an asset being replaced is another potential source of confusion. The gain or loss calculated by comparing the disposal value of the asset with its depreciated book value is not the cash flow. Rather, the cash flow is the disposal value. For example, suppose the asset in the previous example was purchased to replace an asset with a book value of \$5,000. If the actual cash disposal value of the asset being replaced is \$6,000, there is a gain on disposal of \$1,000. Is the relevant initial cash flow from disposal of the replaced asset the \$1,000 gain, the \$5,000 book value, or the \$6,000 selling price? It is the \$6,000 selling price, the cash inflow from selling the asset that is being replaced.

Discounted Cash Flow for Start-ups

Although DCF models are widely used, some have criticized them for leading to overly cautious and inaccurate investment decisions for start-ups. The critics maintain that the benefits of start-up investments are difficult to quantify and such investments lead to unforeseen opportunities. By ignoring some of the potential benefits and opportunities, companies pass up desirable start-up investments.

Many start-ups are notoriously difficult to assess in terms of their potential value, particularly those that have not yet started generating any earnings. For the investor, the value of the start-up is what the future potential is likely to be, so a DCF approach can help in some cases to forecast the kind of cash flows that could be generated in the future using an expected rate of investment return. This could reveal just how much the cash flow might be worth. Due to the high risk associated with start-ups, the tendency is to use a higher discount rate; many do fail to be able to generate any meaningful and sustained cash flow at all. The other major problem with using DCF is that the investor needs to access what the market conditions might be like in the future and base their assessments of the growth rates in the longer term upon that. These are all very difficult to get right and in many cases the best that an investor can do is to make an educated guess.

What are the alternatives? One of the easier ways to work out the value of the business is to consider how much it would cost to create a similar business from scratch. For start-ups, this is the base value of the business and simply looks at any physical assets and what they might be worth at market prices. It should be a little more complicated than this; for instance a business in the information technology market may have spent some time and funds in creating software, apps, or operating systems. There may be R&D costs, payments required to protect patents, and third-party costs for prototyping and testing. The cost-to-duplicate approach rarely considers these intangible assets and the costs incurred to create them. In addition, this approach cannot begin to understand (or factor in) the sales potential of the service being offered.

Using this approach alone tends to seriously undervalue the start-up, particularly for information technology or service-related enterprises as the value is not in the physical assets but in the intangible ones.

In 2021, across Europe, at the height of the COVID-19 pandemic, start-ups were being valued at levels never seen before. In March, **Hopin**, a virtual events business, raised \$5.65 billion, double the amount that was expected. **Klarna Bank AB** beat that with a 400% higher funding valuation of \$45.6 billion. In the United Kingdom, **Revolut**, a fin-tech start-up that had been valued at \$5.5 billion in 2020, managed to raise over \$20 billion.

What mechanism was being used to create these valuations? It is hard to tell, but many of the investors were making their own decisions during the pandemic. Not all of the start-ups necessarily benefited from the high valuations by private investors. **Darktrace**, a U.K.-based cybersecurity start-up was given a market value of nearly \$5 billion, but when trading began it was actually valued at under half that figure. A similar fate befell **Deliveroo** when they suffered a 26% drop in their market value when they were launched on the stock exchange.

High-valued technology companies are nothing new, and valuations are often based on the fact that Europe has around 166 so called unicorn tech companies (a term used to describe those with a valuation of over \$1 billion). Collectively, the 166 are worth in excess of \$800 billion.

Other possible over-valuations have been driven by acquisition fever. **Etsy** spent \$1.625 billion (mainly cash) to buy the second-hand shopping platform Depop. **Depop** was seen by Etsy as the prime marketplace used by Gen Z consumers and as such placed a very high value on it.

Sources: B. McClure, "Valuing Startup Ventures," *Investopedia*, July 30, 2021; I. Livingston and A. Eribake, "European Tech's 'Eye-Watering' Valuations Raise Bubble Fear," *Bloomberg*, July 7, 2021; R. Heilweil, "Why Etsy Dropped \$1.6 Billion on Depop," *Vox*, June 2, 2021.

Cash Flows for Investments in Technology

Many capital-budgeting decisions compare a potential investment in improved technology versus the alternative of retaining the existing technology. For example, consider investment in a highly automated production system to replace a traditional system. Cash flows predicted for the automated system should be compared with those predicted for continuation of the existing system into the future. However, it is important to note that the current cash flows for the existing system may not be the expected future cash flows from the existing system. Why? Because the competitive environment is changing. If competitors invest in automated systems, continuing with an existing system that produces lower quality or less reliable output may cause a decline in sales and cash inflows.

Suppose a company currently has a \$10,000 net cash inflow annually using a traditional system. Investing in an automated system will increase the net cash inflow to \$12,000. Failure to switch to the automated system will result in lower quality output and cause net cash inflows to fall to \$8,000. The relevant annual cash flow during the life of the investment is a net cash inflow of $\$12,000 - \$8,000 = \$4,000$, not $\$12,000 - \$10,000 = \$2,000$. Similar situations arise in many technology investments such as those described in the Business First box above.

Income Tax Effects

For companies that are subject to income taxes, another type of cash flow enters into capital-budgeting decisions: income taxes. (Tax-exempt organizations such as churches, schools, or governmental units do not pay income taxes and therefore do not have tax-related cash flows.) Income taxes paid by companies are cash outflows. Savings of income taxes that would have been paid are equivalent to cash inflows.

The basic role of tax-related cash flows in capital budgeting does not differ from that of any other cash outflow. However, income taxes modify the cash flows of projects for taxable entities by making the government a profit-sharing partner. For example, if the annual cash inflow from a project is \$1 million, a 40% tax rate shrinks the net inflow to \$600,000. Why? Because the company would have to pay $40\% \times \$1 \text{ million} = \$400,000$ of the inflow in taxes, leaving just \$600,000 net inflow for the company. The cash flow before considering the effect of income taxes is called the **pretax cash flow** (in this example, \$1 million), and the amount after the effect of taxes is the **after-tax cash flow** (\$600,000). All of our previous examples in the chapter have ignored the effect of taxes so the cash flows discussed have been pretax cash flows.

Corporations in the United States pay both federal and state taxes on their income. Federal income tax rates rise as income rises. The current federal tax rate on ordinary corporate taxable income below \$50,000 is 15%. Rates then increase until companies with taxable income over \$335,000 pay between 34% and 38% on additional income. State tax rates vary widely from state to state. Therefore, the total tax rate a company has to pay, federal rates plus state rates, also varies widely.

In capital budgeting, the relevant tax rate is the **marginal income tax rate**, the tax rate paid on incremental cash flows from a project. Suppose a corporation pays income taxes of 15% on the first \$50,000 of pretax income and 30% on pretax income over \$50,000. What is the company's marginal income tax rate when it initially has \$75,000 of pretax income? The marginal rate is 30%, because the company will pay 30% of any incremental income in taxes. In contrast, the company's average income tax rate is only 20% (that is, $15\% \times \$50,000 + 30\% \times \$25,000 = \$15,000$ of taxes on \$75,000 of pretax income). The marginal tax rate generally depends on both the initial amount of income and the amount of incremental income. Suppose the initial pretax income had been \$40,000 in our example. Then the marginal tax rate on incremental income up to \$10,000 would be 15% but incremental income beyond \$10,000 would increase the marginal rate to 30%. When we assess tax effects of capital-budgeting decisions in the examples that follow, we always assume a single marginal tax rate applies to all incremental cash flows for a project.

Effects of Depreciation Deductions

Organizations that pay income taxes generally keep two sets of books—one set that follows the rules for financial reporting and one set that follows the tax rules. This practice is not illegal or immoral—it is necessary. Tax reporting rules are designed to achieve certain social goals. These rules are in many instances different from the financial reporting rules designed to best measure an organization's financial results and position.

Managers have an obligation to stockholders to minimize taxes to the extent permitted by law. Minimization of taxes permitted by law is called tax avoidance. In contrast, reduction of taxes by illegally recording fictitious deductions or failing to report income is called tax evasion. Managers who avoid taxes get bonuses; those who evade taxes often land in jail. Because the line between tax evasion and tax avoidance is sometimes gray, it is important to act both legally and ethically when trying to minimize taxes.

One item that usually differs between tax reporting and financial reporting is depreciation. Recall that depreciation spreads the cost of an asset over its useful life. U.S. tax laws allow **accelerated depreciation**, which charges a larger proportion of an asset's cost to the earlier years and less to later years. In contrast, an asset's depreciation for financial reporting purposes is often the same each year, called straight-line depreciation. For example, a \$10,000 asset depreciated over a 5-year useful life results in straight-line depreciation of $\$10,000 \div 5 = \$2,000$ each year. In contrast, accelerated depreciation provides more than \$2,000 of depreciation per year in the early years and less than \$2,000 in the later years. In addition, U.S. tax laws generally permit companies to spread the cost of an asset over a **recovery period**—the number of years over which a company can depreciate an asset for tax purposes—that is shorter than the asset's useful life that the company uses to calculate depreciation for financial reporting purposes.

Objective 5

Compute the after-tax net present values of projects.

after-tax cash flow

The cash flow after the effect of income taxes, generally the pretax cash flow multiplied by $(1 - \text{marginal tax rate})$.

marginal income tax rate

The tax rate paid on incremental taxable income.

accelerated depreciation

A pattern of depreciation that charges a larger proportion of an asset's cost to the earlier years and less to later years.

recovery period

The number of years over which a company can depreciate an asset for tax purposes.

Annual Income Statement Effects		
(S)	Sales	\$130,000
(E)	Less: Expenses, excluding depreciation	\$ 70,000
(D)	Depreciation (straight-line)	25,000
	Total expenses	\$ 95,000
	Income before taxes	\$ 35,000
(T)	Income taxes at 40%	14,000
(I)	Net income	\$ 21,000
Total after-tax effect on cash is		
either $S - E - T = \$130,000 - \$70,000 - \$14,000 = \$46,000$		
or $I + D = \$21,000 + \$25,000 = \$46,000$		
Annual Cash Flow Effects		
Cash effects of operations:		
(S - E)	Pretax cash inflow from operations: $\$130,000 - \$70,000$	\$ 60,000
	Multiplied by $(1 - \text{tax rate})$	$\times 0.60$
	After-tax cash inflow from operations	\$ 36,000
Cash effects of depreciation tax deduction:		
(D)	Depreciation tax deduction: $\$125,000 \div 5$	\$ 25,000
	Multiplied by tax rate	$\times 0.40$
	Tax savings due to depreciation	10,000
	Total after-tax effect on cash	\$ 46,000

Exhibit 11-3**Toyota Machine**

Basic Analysis of Income Statement, Income Taxes, and Cash Flows

Exhibit 11-3 shows the interrelationship of income before taxes, income taxes, and depreciation for a hypothetical asset owned by **Toyota**. Assume that Toyota's U.S. operation purchases for \$125,000 cash a machine that produces replacement parts used in Lexus exhaust systems. The machine has a 5-year recovery period and also a 5-year useful life. Management expects the value of the machine at the end of its useful life to be zero. Toyota uses straight-line depreciation for both financial reporting and tax purposes, resulting in annual depreciation of \$25,000. Using the machine produces annual sales revenue of \$130,000 and expenses (excluding depreciation) of \$70,000. For this example, and the remaining examples in this chapter, we assume that revenues equal cash inflows and that all expenses other than depreciation equal cash outflows. We also assume a marginal tax rate of 40% applies to all incremental cash flows and that the income tax flows occur at the same time as the related pretax cash flows. Here, we assume that both the net $(\$130,000 - \$70,000) = \$60,000$ pretax cash inflow from the machine and the related tax payments occur at the end of each year during the 5-year life of the machine.

The bottom part of Exhibit 11-3 shows the three components of the after-tax cash flow: cash inflow from operations, income taxes on the inflows from operations, and income-tax savings from depreciation. Consider first the cash inflow from operations and the related tax effect. Each additional \$1 of net cash inflow from operations also results in a cash outflow for income tax payments of \$0.40, leaving a net cash inflow of \$0.60. Thus, the after-tax effect of the \$60,000 pretax net cash inflow from operations is an after-tax inflow of $(\$60,000) - (0.4 \times \$60,000) = \$60,000 \times 0.6 = \$36,000$.

The cash flow effect of the depreciation tax deduction is a decrease in the cash outflow for income taxes, equivalent to a cash inflow. We compute the tax savings due to the depreciation tax deduction by multiplying the depreciation of \$25,000 by the tax rate, or $\$25,000 \times 0.40 = \$10,000$. The depreciation deduction reduces taxes, and thereby increases cash flows, by \$10,000 annually.

Exhibit 11-4 analyzes the entire set of cash flows for Toyota's machine. The initial \$125,000 investment buys two 5-year streams of cash: (1) net after-tax cash flows from operations of \$36,000 annually plus (2) annual savings of \$10,000 of income tax outflows due to the depreciation tax deduction over the recovery period. The after-tax NPV for the investment in this asset is \$40,821, so Toyota management should accept it.

			Sketch of After-Tax Cash Flows at End of Year					
	12% Discount Factors, from Appropriate Tables	Total Present Value at 12%	0	1	2	3	4	5
Cash effects of operations, excluding depreciation, $\$60,000 \times (1 - 0.4)$	3.6048	\$ 129,773		36,000	36,000	36,000	36,000	36,000
Cash effects of straight-line depreciation: savings of income taxes, $\$25,000 \times 0.4$	3.6048	<u>36,048</u>		10,000	10,000	10,000	10,000	10,000
Total after-tax effect on cash		165,821						
Investment	1.0000	<u>(125,000)</u>	(125,000)					
Net present value of the investment		<u>\$ 40,821</u>						

Exhibit 11-4**Impact of Income Taxes on Capital-Budgeting Analysis**

Assume: original cost of equipment, \$125,000; 5-year recovery period with straight-line depreciation assumed for simplicity; 5-year useful life; zero terminal disposal value; pretax annual net cash inflow from operations, \$60,000; income tax rate, 40%; required after-tax rate of return, 12%. All items are in dollars except discount factors. The after-tax cash flows are from Exhibit 11-3.

Summary Problem for Your Review

PROBLEM

Consider **Toyota**'s purchase of the \$125,000 machine analyzed in Exhibits 11-3 and 11-4. Suppose the machine had a useful life of 6 years, but the recovery period remains 5 years. What is the net present value of the investment?

SOLUTION

The present value of the tax savings will not change because only the recovery period, not the useful life, affects the depreciation deductions. The tax law specifies recovery periods for various types of depreciable assets. The economic useful life of the asset may be different than the recovery period permitted by tax law. Thus, a longer useful life for an asset increases the present value of the operating cash flows but does not change the PV of the tax savings.

There will be one extra year of operating savings in year 6. The present value of the additional operating savings in year 6 is $\$36,000 \times 0.5066 = \$18,238$. Therefore, the net present value is \$59,059:

Original NPV (from Exhibit 11-4)	\$40,821
Added PV of savings in year 6	<u>18,238</u>
NPV	<u>\$59,059</u>

Timing of Depreciation Tax Deductions and Cash Flow Effects

The value of the depreciation tax deduction depends not only on the amount of the reduction in cash payments for income taxes but also on the timing of the reduction. A \$1 reduction now is worth more than a \$1 reduction several years from now. To illustrate the importance of timing, reconsider the facts in Exhibit 11-4. Suppose that Toyota could deduct the entire initial investment immediately rather than spreading the cost over the 5-year life of the machine.

The immediate tax deduction of \$125,000 would be the same as the total tax deduction of $5 \times \$25,000 = \$125,000$ in Exhibit 11-4, and the total reduction in tax payments would be $40\% \times \$125,000 = \$50,000$ in both cases. However, because the tax savings occur sooner, the present value of the immediate \$125,000 deduction is \$50,000 compared to only \$36,048 when the deduction is spread over 5 years. As the following calculations show, when the entire \$125,000 is deductible immediately the NPV will rise from \$40,821 to \$54,773:

	Present Values	
	As in Exhibit 11-4	Complete Write-Off Immediately
Cash effects of operations	\$ 129,773	\$ 129,773
Cash effects of depreciation	36,048	50,000
Total after-tax effect on cash	165,821	179,773
Investment	(125,000)	(125,000)
Net present value	<u>\$ 40,821</u>	<u>\$ 54,773</u>

In general, the earlier you can take a depreciation deductions, the greater the PV of the income tax savings. Therefore, a shorter recovery period and a depreciation method that takes more of the depreciation sooner during the recovery period will increase the PV of the tax deduction.

Modified Accelerated Cost Recovery System (MACRS)

modified accelerated cost recovery system (MACRS)
 The method companies use to depreciate most assets under U.S. income tax laws.

Depreciation methods that take more depreciation sooner are called accelerated depreciation methods. The example discussed in Exhibits 11-3 and 11-4 assumed that Toyota used straight-line depreciation for tax purposes. However, under U.S. income tax laws, companies depreciate most assets using the **modified accelerated cost recovery system (MACRS)**. This system specifies a recovery period and an accelerated depreciation schedule for all types of assets. The MACRS system places each asset in one of the eight classes shown in Exhibit 11-5.

Exhibit 11-5
 Examples of Assets in Modified Accelerated Cost Recovery System (MACRS) Classes

3-year	Special tools for several specific industries, tractor units for over-the-road
5-year	Automobiles, trucks, research equipment, computers, machinery and equipment in selected industries
7-year	Office furniture, railroad tracks, machinery and equipment in a majority of industries
10-year	Water transportation equipment, machinery and equipment in selected industries
15-year	Most land improvements, machinery and equipment in selected industries
20-year	Farm buildings, electricity generation and distribution equipment
27.5-year	Residential rental property
31.5-year	Nonresidential real property

Exhibit 11-6
 Selected MACRS Depreciation Schedules

Tax Year	3-Year Property	5-Year Property	7-Year Property	10-Year Property
1	33.33%	20.00%	14.29%	10.00%
2	44.45	32.00	24.49	18.00
3	14.81	19.20	17.49	14.40
4	7.41	11.52	12.49	11.52
5		11.52	8.93	9.22
6		5.76	8.92	7.37
7			8.93	6.55
8			4.46	6.55
9				6.56
10				6.55
11				3.28

Exhibit 11-6 presents MACRS depreciation schedules for recovery periods of 3, 5, 7, and 10 years. Note that each schedule extends 1 year beyond the recovery period because MACRS assumes one half-year of depreciation in the first year and one half-year in the final year. For example, a 3-year MACRS depreciation schedule has one half-year of depreciation in years 1 and 4 and a full year of depreciation in years 2 and 3. We can apply MACRS depreciation to the example in Exhibit 11-4 as follows, assuming that the machine that Toyota purchased is a 5-year MACRS asset:

Year	Tax Rate (1)	PV Factor at 12% (2)	Depreciation (3)	PV of Tax Savings (1) × (2) × (3)
1	0.40	0.8929	$125,000 \times 0.2000 = \$25,000$	\$ 8,929
2	0.40	0.7972	$125,000 \times 0.3200 = 40,000$	12,755
3	0.40	0.7118	$125,000 \times 0.1920 = 24,000$	6,833
4	0.40	0.6355	$125,000 \times 0.1152 = 14,400$	3,660
5	0.40	0.5674	$125,000 \times 0.1152 = 14,400$	3,268
6	0.40	0.5066	$125,000 \times 0.0576 = 7,200$	1,459
				<u>\$36,904</u>

How much did Toyota gain by using MACRS instead of straight-line depreciation? The \$36,904 present value of tax savings is \$856 higher with MACRS than the \$36,048 present value achieved with straight-line depreciation (see Exhibit 11-4 on p. 465).

Present Value of MACRS Depreciation Tax Deduction

The present value of the tax savings from depreciation is often referred to as the **depreciation tax shield**. As explained earlier, the value of a depreciation deduction depends on timing. Because MACRS specifies the timing of deductions for each recovery period, we can easily compute the present value of the depreciation tax shield for any recovery period.

Exhibit 11-7 provides present values for the depreciation deductions from \$1 of investment using MACRS schedules for 3-, 5-, 7-, and 10-year recovery periods for a variety of interest

depreciation tax shield

The tax savings due to depreciation deductions, generally the present value of the product of the tax rate and the depreciation deduction.

Discount Rate	3-year	5-year	7-year	10-year
3%	0.9439	0.9215	0.9002	0.8698
4%	0.9264	0.8975	0.8704	0.8324
5%	0.9095	0.8746	0.8422	0.7975
6%	0.8931	0.8526	0.8155	0.7649
7%	0.8772	0.8315	0.7902	0.7344
8%	0.8617	0.8113	0.7661	0.7059
9%	0.8468	0.7919	0.7432	0.6792
10%	0.8322	0.7733	0.7214	0.6541
12%	0.8044	0.7381	0.6810	0.6084
14%	0.7782	0.7055	0.6441	0.5678
15%	0.7657	0.6902	0.6270	0.5492
16%	0.7535	0.6753	0.6106	0.5317
18%	0.7300	0.6473	0.5798	0.4993
20%	0.7079	0.6211	0.5517	0.4702
22%	0.6868	0.5968	0.5257	0.4439
24%	0.6669	0.5740	0.5019	0.4201
25%	0.6573	0.5631	0.4906	0.4090
26%	0.6479	0.5526	0.4798	0.3985
28%	0.6299	0.5327	0.4594	0.3787
30%	0.6128	0.5139	0.4404	0.3606
40%	0.5381	0.4352	0.3632	0.2896

Exhibit 11-7

Present Value of MACRS Depreciation Deductions for \$1 Investment

rates. To see how these present values are derived, consider a company with a 5-year asset and a 12% required rate of return. The PV of \$1 of MACRS depreciation is as follows:

Year	Depreciation* (1)	PV Factor at 12% (2)	PV of Depreciation (1) × (2)
1	\$0.2000	0.8929	\$0.1786
2	0.3200	0.7972	0.2551
3	0.1920	0.7118	0.1367
4	0.1152	0.6355	0.0732
5	0.1152	0.5674	0.0654
6	0.0576	0.5066	0.0292
Total Depreciation	<u>\$1.0000</u>		
Present Value of \$1 depreciation, shown in Exhibit 11-7			<u>\$0.7381</u>

*From the 5-Year Property column of Exhibit 11-6.

You can find the PV of the depreciation tax shield from an investment in three steps:

1. Find the factor for the present value of the depreciation tax deductions from Exhibit 11-7 for the appropriate recovery period and required rate of return.
2. Multiply the factor by the amount of the investment to find the PV of the total tax deductions.
3. Multiply the PV of the total tax deductions by the marginal tax rate to find the PV of the total tax savings.

Consider Toyota's investment of \$125,000 in a machine with a 5-year MACRS recovery period. A 12% after-tax required rate of return and a 40% tax rate produce a tax savings with a present value of $0.7381 \times \$125,000 \times 0.40 = \$36,905$. (This differs by \$1 from the \$36,904 calculated earlier due only to the cumulative effect of rounding in the earlier calculation.)

Making Managerial Decisions

Why do managers prefer accelerated depreciation for tax purposes? Consider an investment of \$100,000 in an asset with a 10-year economic life and a 10-year MACRS recovery period. The asset has no salvage value at the end of 10 years. The tax rate is 40%, and the required rate of return is 10%. What is the PV of the depreciation tax savings using straight-line (SL) depreciation? What is the PV of the depreciation tax savings using MACRS depreciation? Which depreciation method would you prefer if you were managing the company?

Answers

Straight-line depreciation = \$10,000 per year, so tax savings with SL is $0.40 \times \$10,000 = \$4,000$ per year. The present value of the SL tax savings is $\$4,000 \times 6.1446 = \$24,578.40$.

The PV of MACRS depreciation tax savings using Exhibit 11-7 is $0.6541 \times \$100,000 \times 0.40 = \$26,164.00$. Although the total tax savings is \$40,000 regardless of the depreciation method, the tax savings occur earlier under the MACRS accelerated depreciation schedule, which creates a greater PV by $\$26,164.00 - \$24,578.40 = \$1,585.60$. By choosing MACRS rather than straight-line depreciation, the manager saves \$1,585.60 for the company.

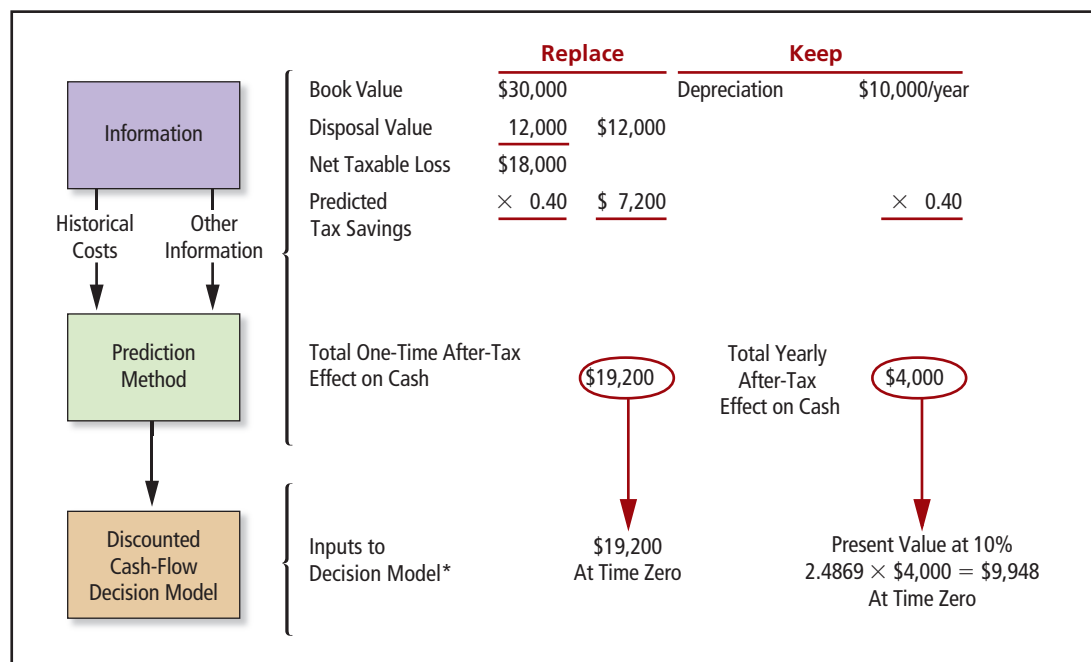
Tax Effects of Gains or Losses on Disposal at Termination

The disposal of equipment for cash can also affect income taxes. Suppose Toyota sells its \$125,000 machine at the end of year 3 after taking 3 years of straight-line depreciation. If Toyota sells it for its net book value, $\$125,000 - (3 \times \$25,000) = \$50,000$, there is no taxable gain and therefore no effect on tax payments. If Toyota receives more than \$50,000, there is a gain and an additional tax payment. If the company receives less than \$50,000, there is a loss and a tax savings. The following table shows the effects on cash flow for sales prices of \$70,000 and \$20,000:

(a)	Cash proceeds of sale	\$70,000	\$ 20,000
	Book value: [$\$125,000 - (3 \times \$25,000)$]	<u>50,000</u>	<u>50,000</u>
	Gain (loss)	<u>\$20,000</u>	<u>\$(30,000)</u>
	Effect on income taxes at 40%:		
(b)	Tax savings, an inflow effect: $0.40 \times \text{loss}$		<u>\$ 12,000</u>
(c)	Tax paid, an outflow: $0.40 \times \text{gain}$	<u>\$(8,000)</u>	
	Net cash inflow from sale:		
	(a) plus (b)		<u>\$ 32,000</u>
	(a) minus (c)	<u>\$62,000</u>	

Objective 6

Explain the after-tax effect on cash received from the disposal of assets.

Exhibit 11-8
Cash Flow Effects of
Disposal of Equipment

*There will be other related inputs to the replacement decision—for example, the cost of the new equipment, the tax effect of depreciation on the new equipment, and the differences in future annual cash flows from operations.

A second tax effect occurs when a company disposes of an asset before the end of its recovery period. In addition to taxable gains or losses, disposal eliminates future tax depreciation on the asset.

Suppose **General Electric** replaces some old copying equipment with a book value of \$30,000, an expected terminal disposal value of zero, a current disposal value of \$12,000, and 3 years remaining in its recovery period. For simplicity, assume that General Electric uses straight-line depreciation, amounting to \$10,000 of depreciation per year. The tax rate is 40% and the required rate of return is 10%.

Exhibit 11-8 shows the cash flow effects due only to disposal of the old copying equipment. (That is, Exhibit 11-8 does not show the cost, annual cash flow effects, nor the depreciation tax savings related to the new copying equipment.) The cash inflow from disposal of the old copying equipment is \$19,200, the disposal value plus the tax savings resulting from the tax loss on disposal. This immediate cash inflow is partially offset by the loss of future tax deductions of \$10,000 per year for the next 3 years, which have a present value of $2.4869 \times (\$10,000 \times 40\%) = \$9,948$. The net cash inflow due to disposal of the old equipment is $(\$19,200 - \$9,948) = \$9,252$.

Summary Problem for Your Review

PROBLEM

Consider the investment opportunity in Exhibit 11-4, p. 465: original cost of machine, \$125,000; 5-year useful life; zero terminal salvage value; pretax annual cash inflow from operations, \$60,000; income tax rate, 40%; required after-tax rate of return, 12%. Assume the equipment is a 5-year MACRS asset for tax purposes. The NPV is as follows:

	Present Values (PV)
Cash effects of operations, $\$60,000 \times (1 - 0.40) \times 3.6048$	\$129,773
Cash effects of depreciation on income tax savings using MACRS, $\$125,000 \times 0.7381^\dagger \times 0.40$	36,905
Total after-tax effect on cash	\$166,678
Investment	125,000
NPV	\$ 41,678

*See Exhibit 11-4, p. 465, for details.

[†]Factor 0.7381 is from Exhibit 11-7, p. 467.

For each requirement, compute the NPV of the investment but consider each requirement independently. Assume the original depreciation schedule is not altered for either requirement.

1. Suppose **Toyota** ends up selling the equipment for \$20,000 cash immediately after the end of year 5.
2. Ignore the assumption in number 1. Return to the original data. Suppose the economic life of the machine turns out to be 8 years, not 5 years. However, tax authorities still allow MACRS cost recovery over 5 years.

SOLUTION

1.	NPV as given		\$41,678
	Cash proceeds of sale	\$20,000	
	Book value	<u>0</u>	
	Taxable gain	\$20,000	
	Income taxes at 40%	<u>8,000</u>	
	Total after-tax effect on cash	<u>\$12,000</u>	
	PV of \$12,000 to be received in 5 years at 12%, \$12,000 × 0.5674		<u>6,809</u>
	NPV of investment		<u>\$48,487</u>
2.	NPV as given		\$41,678
	Add the PV of \$36,000 per year for 8 years		
	Discount factor of 4.9676* × \$36,000 =	\$178,834	
	Deduct the PV of \$36,000 per year for 5 years	<u>129,773</u>	
	Increase in PV		<u>49,061</u>
	NPV		<u>\$90,739</u>

*Factor 4.9676 is from Table B-2.

The investment becomes more attractive with the increased economic life because there are operating savings for an additional three years and no reduction in the tax savings from depreciation.

Objective 7

Use the payback model and the accounting rate-of-return model and compare them with the NPV model.

payback period (payback time)

The time it will take to recoup, in the form of cash inflows from operations, the initial dollars invested in a project.

Other Models for Analyzing Long-Range Decisions

Although most companies use DCF models to make major capital-budgeting decisions, some companies still use simpler models, either in place of or in addition to the NPV model. We will examine two such models, the payback and accounting rate-of-return models.

Payback Model

Payback time or **payback period** is the time it will take to recoup, in the form of undiscounted cash inflows from operations, the initial dollars invested in a project. Assume that **Toyota** spends \$12,000 for a forklift that has an estimated useful life of 4 years. Toyota expects the new forklift to reduce cash outflows by \$4,000 each year. The payback period is 3 years, calculated as follows:

$$\text{payback time} = \frac{\text{initial incremental amount invested}}{\text{equal annual incremental cash inflow from operations}}$$

$$P = \frac{I}{O} = \frac{\$12,000}{\$4,000} = 3 \text{ years}$$

We can use this formula for payback time only when there are equal annual cash inflows from operations. When annual cash inflows are not equal, we must add up each year's net cash inflows until the point in time where the cumulative cash flows add up to the amount of the initial investment.

Assume the following cash flow pattern for the forklift:

End of Year	0	1	2	3	4
Investment	(\$12,000)				
Cash inflows		\$4,000	\$6,000	\$5,000	\$5,000

The calculation of the payback period is as follows:

Year	Initial Investment	Net Cash Inflows	
		Each Year	Cumulative
0	\$12,000	—	—
1	—	\$4,000	\$ 4,000
2	—	6,000	10,000
2+	—	2,000	12,000

In this case, the payback time is slightly beyond the second year. Interpolation within the third year reveals that an additional 4/10 of a year is needed to recoup the final \$2,000, making the payback period 2.4 years:

$$2 \text{ years} + \left(\frac{\$2,000}{\$5,000} \times 1 \text{ year} \right) = 2.4 \text{ years}$$

The major weakness of the payback model is that it merely measures how many years it takes to recover the original investment. The payback model ignores elements of timing and duration of cash flows that the DCF models recognize. For example, consider two investment projects with the same 3-year payback period and the same total cash flows for their 4-year lives. However, suppose most of the Project B cash flows occur in the first year of the 3-year payback period while most of the Project A cash flows occur in the third year. The payback periods for these two projects are identical, yet project B is superior because the cash flows arrive earlier. As another example, suppose Project C has the same cash flows over the first 4 years as Project A but the Project A cash flows stop after 4 years while the Project C cash flows continue for a total of 10 years. The payback period for these two projects is identical, yet project C is superior because the cash flows continue for a much longer period of time. The payback model measures only how quickly a company will recoup its investment dollars but ignores the time value of money and ignores cash flows beyond the payback period.

Despite its conceptual weaknesses, the payback model may be useful in certain circumstances. In some situations, managers use the payback model rather than DCF because of greater uncertainty about projections of cash flows further into the future. Suppose a company faces rapid technological changes so that cash flows beyond the first few years are extremely uncertain. In such a situation, managers may decide to base their decisions on the payback period because it emphasizes how quickly projects recoup their investment and ignores the highly uncertain cash flows farther into the future. In other situations, managers use the payback model because of cash constraints. We noted earlier that the DCF model assumes that additional funds can be borrowed at the required rate of return. Some firms, such as early-stage startups, may not be able to easily borrow additional funds, so managers may use the payback model because it focuses on how quickly the firm can recover its cash investments.

Accounting Rate-of-Return Model

The **accounting rate-of-return (ARR) model** expresses a project's return as the increase in expected average annual operating income divided by the initial required investment.

$$\text{accounting rate-of-return (ARR)} = \frac{\text{increase in expected average annual operating income}}{\text{initial required investment}}$$

accounting rate-of-return (ARR) model

A non-DCF capital-budgeting model expressed as the increase in expected average annual operating income divided by the initial required investment.

If operating income is the same as cash flow except for the effect of depreciation expense, then operating income = cash flow – depreciation, and the ARR becomes

$$ARR = \frac{\text{average annual incremental net cash inflow from operations} - \text{average incremental annual depreciation}}{\text{initial required investment}}$$

ARR computations dovetail most closely with conventional accounting models of calculating income and required investment, and they show the effect of an investment on an organization’s financial statements.

To see how ARR works, assume the same facts as in Exhibit 11-1: Investment is \$5,827, useful life is 4 years, estimated disposal value is zero, and expected annual cash inflow from operations is \$2,000. Annual depreciation is $\$5,827 \div 4 = \$1,456.75$, rounded to \$1,457. Substitute these values in the accounting rate-of-return equation:

$$ARR = \frac{(\$2,000 - \$1,457)}{\$5,827} = 9.3\%$$

Some companies use the “average” investment (often assumed to be the average book value over the useful life) instead of original investment in the denominator. The investment committed to the project would decline at a rate of \$1,456.75 per year from \$5,827 to zero; hence, the average investment would be the beginning balance plus the ending balance ($\$5,827 + 0$) divided by 2, or \$2,913.50. Therefore, the ARR using the average investment is

$$ARR = \frac{(\$2,000 - \$1,457)}{\$2,913.50} = 18.6\%$$

The accounting rate-of-return model has significant limitations. Like the payback model, the ARR model ignores important aspects of the timing and duration of cash flows. For example, consider two projects that require the same initial required investment and have the same average increase in operating income over the life of the projects, where most of the savings for Project B occur in the early years while most of the savings for Project A occur in later years. The ARRs for these two projects are identical, even though project B provides returns earlier. As another example, suppose Project C has the same ARR over a 10-year life as Project A has over a 4-year life. Although these two projects have identical ARRs, the return for project C continues for a much longer period of time.

Despite some obvious limitations, some firms still use the ARR and payback models in certain situations. The Business First box on p. 473 describes the increasing use of DCF models as well as the continued use of alternative models, including the payback and accounting rate of return models.

Performance Evaluation

Potential Conflict

Objective 8

Reconcile the conflict between using an NPV model for making decisions and using accounting income for evaluating the related performance.

Many managers who are evaluated on the basis of accounting income or an ARR model are reluctant to accept DCF models as the best way to make capital-budgeting decisions. To illustrate, consider the potential conflict that might arise in the example of Exhibit 11-1. Recall that the NPV was \$513 based on a 10% required rate of return, an investment of \$5,827, cash savings of \$2,000 for each of 4 years, and no terminal disposal value. Using ARR where accounting income is computed with straight-line depreciation, the evaluation of performance for years 1–4 would be as follows:

	Year 1	Year 2	Year 3	Year 4
Cash-operating savings	\$2,000	\$2,000	\$2,000	\$2,000
Straight-line depreciation, $\$5,827 \div 4$	1,457	1,457	1,457	1,457*
Effect on operating income	543	543	543	543
Book value at beginning of year	5,827	4,370	2,913	1,456
ARR	9.3%	12.4%	18.6%	37.3%

*Total depreciation of $4 \times \$1,457 = \$5,828$ differs from \$5,827 because of rounding error. Also, the ARR is based on the book value at the beginning of the year as a proxy for the investment.

Capital Budgeting in India, South Africa, the United Kingdom, and the United States

Companies are increasingly using formal capital-budgeting models, and most use more than one model. In 2019, Siziba and Hall carried out a study analyzing the use of capital budgeting techniques between 1966 and 2016 across a variety of countries but focusing on the United States, the United Kingdom, India, and South Africa.

They discovered that the most widely used DCF versions were Internal Rate of Return (IRR) and Net Present Value (NPV); the non-DCF versions were Accounting Rate of Return (ARR) and Payback Period (PBP). They also discovered that some capital budgeting models were not used a great deal, either as a result of them being too complex or businesses simply not have the accountancy expertise to carry out the necessary calculations and interpret the figures. There were regional differences too; Return on Investment (ROI) was not highly favored by many businesses, but it was growing in popularity in the United Kingdom followed by the United States and was seeing a more modest uptake in South Africa and India. Businesses across the United Kingdom and the United States primarily used IRR backed up with PBP. In India and South Africa, the preferred method was NPV, and businesses in these countries tended to avoid ARR or PBP. The use of some of the more complex methods remained fairly low and patchy, including Economic Value Added (EVA), Modified Internal Rate of Return (MIRR), Discounted Payback Period (DPBP), and decision trees.

In recent years across the United Kingdom and the United States, the use of IRR and NPV has been particularly noticeable, and Siziba and Hall put this down to the fact that businesses were incorporating the time value of money in their decision making. In India and South Africa, there was a growth in the use of NPV compared to ARR or PBP.

There were no clear reasons for this choice, but the researchers saw this as part of the move toward using DCF.

In developing countries, the use of non-DCF method has seen a steep decline, particularly in the case of ARR and PBP, while in developed countries, it has only been ARR that has seen a significant usage drop. In contrast to developing countries, PBP has seen a steep rise in developed countries. Siziba and Hall concluded that in the case of developed countries, the increase in the use of DCF approaches and the comparable decline of non-DCF techniques suggest a significant reliance on DCF. They also suggested that companies in these countries seem to view the DCF techniques as being more accurate and reliable.

Increasingly, the DCF approach is the primary means of assessing capital investment projects. Companies may use non-DCF techniques as a back-up. Siziba and Hall observed that the non-DCF techniques are used by some companies to help them rank the project options.

The results for India and South Africa show how the approaches are very different that those in the United Kingdom and the United States. India saw a big drop in the use of PBP and ARR, with the latter diminishing even more than PBP. At the same time, NPV was growing in use, and IRR was relatively stable. These results suggest that Indian companies are opting to follow the theories that discourage the use of non-DCF methods. The South African approach shares much with India, with a downturn in the use of ARR and PBP and a corresponding increase in NPV. The researchers also found that there was a drop in the use of IRR, implying that South African companies were following the theory that prefers the use of NPV and discourages the use of IRR.

Source: S. Siziba and J.H. Hall, "The Evolution of the Application of Capital Budgeting Techniques in Enterprises," *Global Finance Journal*, 2019.

Many managers would be reluctant to replace equipment, despite the positive NPV, if superiors evaluated their performance by accounting rate of return. They might be especially reluctant if they are likely to transfer to a new position (or retire) within the first year or two. Why? This accrual accounting system understates the return in early years, especially in year 1 when the return is below the required rate, and a manager who transfers will not be around to reap the benefits of the later overstatement of returns.

As Chapter 6 indicated, managers are especially reluctant to replace assets if a heavy book loss on old equipment would appear in year 1's income statement—even though such a loss is irrelevant in a properly constructed decision model. Thus, performance evaluation based on typical accounting measures can lead to rejection of major, long-term projects where a large portion of the benefit does not appear in income immediately, such as investments in technologically advanced production systems. This pattern may help explain why many U.S. firms seem to be excessively short-term oriented.

Reconciliation of Conflict

The best way to reconcile the potential conflict between capital budgeting and performance evaluation is to use DCF for both capital-budgeting decisions and performance evaluation. Companies that use EVA for performance evaluation, as described in Chapter 10, p. 418, avoid some of the conflict. Although EVA has the weakness of relying on accrual accounting measures rather than cash flows, it is conceptually linked to the NPV method. Both EVA and NPV recognize that a firm creates value only when investment projects cover their cost of capital.

Another way to address this issue is to conduct a follow-up evaluation of capital-budgeting decisions, often called a **post-audit**. Most large companies (76% in a recent survey)

post-audit

A follow-up evaluation of capital-budgeting decisions.

post-audit at least some capital-budgeting decisions. The purposes of a post-audit include the following:

1. Seeing that investment expenditures are proceeding on time and within budget
2. Comparing actual cash flows with those originally predicted, in order to motivate and reward careful and honest predictions
3. Providing information for improving future predictions of cash flows
4. Evaluating the continuation of the project

By focusing the post-audit on actual versus predicted cash flows, we can make the evaluation consistent with the decision process. However, post-auditing of all capital-budgeting decisions is costly. Most accounting systems are best at evaluating operating performances of products, departments, divisions, territories, and so on, year by year. In contrast, capital-budgeting decisions frequently deal with individual projects, not the collection of projects that are usually being managed at the same time by division or department managers. Therefore, most companies audit only selected capital-budgeting decisions.

The conflicts between the longstanding, pervasive accrual accounting model and various formal decision models create some of the most serious unsolved problems in the design of management control systems. Top management cannot expect goal congruence if it favors the use of one type of model for decisions and the use of another type for performance evaluation.

Highlights to Remember

1. **Describe capital-budgeting decisions and use the net-present-value (NPV) method to make such decisions.** Capital budgeting is long-term planning for investments where returns are spread over multiple years. The net-present-value (NPV) model aids this planning process by computing the present value (PV) of all expected future cash flows using a required rate of return. A company should accept projects with an NPV greater than zero.
2. **Use sensitivity analysis to evaluate the effect of changes in predictions on investment decisions.** Managers use sensitivity analysis to assess the effects of changes in predicted cash flows and other variables used in investment decisions.
3. **Calculate the NPV difference between two projects using both the total project and differential approaches.** The total project approach compares the NPVs of the total cash flows from each project, while the differential approach computes the NPV of the difference in cash flows between two projects. Both produce the same results when there are two alternatives. When there are more than two alternatives, you should use the total project approach.
4. **Identify relevant cash flows for NPV analyses.** Predicting cash flows is the hardest part of capital budgeting. Managers should consider three categories of cash flows: initial cash inflows and outflows at time zero, including additional required investments in working capital, future disposal values, and operating cash flows.
5. **Compute the after-tax net present values of projects.** Income taxes can have a significant effect on the desirability of an investment. Additional taxes are cash outflows, and tax savings are cash inflows. Accelerated depreciation speeds up a company's tax savings. In most cases, companies should take depreciation deductions as early as legally permitted.
6. **Explain the after-tax effect on cash received from the disposal of assets.** When companies sell assets for more than the tax book value, the gain generates additional taxes. When they sell assets for less than the tax book value, the loss generates tax savings.
7. **Use the payback model and the accounting rate-of-return model and compare them with the NPV model.** The payback model is simple to apply, but it does not measure profitability. The accounting rate-of-return model uses accounting measures of income and investment, but it ignores the time value of money. Both models have significant limitations relative to the NPV model.
8. **Reconcile the conflict between using an NPV model for making decisions and using accounting income for evaluating the related performance.** NPV is a summary measure of all the cash flows from a project. Accounting income is a one-period measure. A positive NPV project can have low (or even negative) accounting income in the first year. Managers may be reluctant to invest in such a project, despite its positive value to the company, especially if they expect to transfer to a new position before they can benefit from the positive returns that come later.

Appendix 11: Capital Budgeting and Inflation

Capital-budgeting decision makers should also consider the effects of inflation on their cash-flow predictions. **Inflation** is the decline in the general purchasing power of the monetary unit. For example, a dollar today will buy only a fraction of what it did in the late-1980s. At a 5% annual inflation rate, average prices rise more than 60% over 10 years and 165% over 20 years. The United States had double-digit inflation rates in the late 1970s, and some countries, such as Brazil and Argentina, have had triple-digit annual inflation rates (that is, average prices more than doubling each year). In the last decade, inflation rates in the United States have been low—generally around 3%—but it is possible that rates in the future might increase. If a company expects significant inflation over the life of a project, it should specifically and consistently recognize inflation in its capital-budgeting decisions.

Watch for Consistency

The key to appropriate consideration of inflation in capital budgeting is consistent treatment of the required rate of return and the predicted cash inflows and outflows. We can achieve such consistency by either 1) including an element for inflation in both the required rate and in the cash-flow predictions, or 2) excluding the effects of inflation in both the required rate and in the cash-flow predictions. We limit our discussion to the first approach, which is both simple and widely used.

Many firms base their required rate of return on market interest rates, also called **nominal rates**, that include an inflation element. For example, consider three possible components of a 12% nominal rate:

(a)	Risk-free element—the “pure” rate of interest	3%
(b)	Business-risk element—the “risk” premium that is demanded for taking larger risks	<u>5</u>
(a) + (b)	Often called the “real rate”	8%
(c)	Inflation element—the premium demanded because of expected deterioration of the general purchasing power of the monetary unit	<u>4</u>
(a) + (b) + (c)	Often called the “nominal rate”	<u><u>12%</u></u>

In this example, 4 percentage points out of the 12 percentage-point return compensate an investor for receiving future payments in inflated dollars, that is, in dollars with less purchasing power than those invested. Therefore, basing the required rate of return on quoted market rates automatically includes an inflation element in the rate. Companies that base their required rate of return on market rates should also adjust their cash-flow predictions for anticipated inflation. For example, suppose a company expects to sell 1,000 units of a product in each of the next 2 years. Assume this year’s price is \$50, and inflation causes next year’s price to be \$52.50. This year’s predicted cash inflow is $1,000 \times \$50 = \$50,000$, and next year’s inflation-adjusted cash inflow is $1,000 \times \$52.50 = \$52,500$. Inflation-adjusted cash flows are the inflows and outflows expected after adjusting prices to reflect anticipated inflation.

Consider another illustration: purchase cost of equipment, \$200,000; useful life, 5 years; zero terminal salvage value; pretax operating cash savings per year, \$83,333 (in 20X0 dollars); income tax rate, 40%. For simplicity, we assume ordinary straight-line depreciation of $\$200,000 \div 5 = \$40,000$ per year. The after-tax required rate, based on quoted market rates, is 25%. It includes an inflation factor of 10%.

Exhibit 11-9 displays correct and incorrect ways to analyze the effects of inflation. The key words are *internal consistency*. The correct analysis (1) uses a required rate that includes an element attributable to inflation and (2) explicitly adjusts the predicted operating cash flows for the effects of inflation. Note that the correct analysis favors the purchase of the equipment, but the incorrect analysis does not.

The incorrect analysis in Exhibit 11-9 is incorrect because it is internally inconsistent. The predicted cash inflows exclude adjustments for inflation. Instead, they are stated in 20X0 dollars. However, the discount rate includes an element attributable to inflation. An analytical mistake like this might lead to an unwise refusal to purchase.

Objective 9

Compute the impact of inflation on a capital-budgeting project.

inflation

The decline in the general purchasing power of the monetary unit.

nominal rate

Interest rate that includes an inflation element.

Description	At 25%		Sketch of Relevant Cash Flows (at End of Year)					
	PV Factor	Present Value	0	1	2	3	4	5
Correct analysis (Be sure the discount rate includes an element attributable to inflation and adjust the predicted cash flows for inflationary effects.) Cash operating inflows: Pretax inflow in 20X0 dollars Income tax effect at 40% After-tax effect on cash								
		\$83,333						
		33,333						
		<u>\$50,000</u>						
	0.8000	\$ 44,000		\$55,000*				
	0.6400	38,720			\$60,500			
Subtotal Annual depreciation $\$200,000 \div 5 = \$40,000$ Cash effect of depreciation Savings in income taxes at 40% = $\$40,000 \times 0.40 =$ \$16,000 Investment in equipment Net present value	0.5120	34,074				\$66,550		
	0.4096	29,985					\$73,205	
	0.3277	26,388						\$80,526
		<u>\$ 173,167</u>						
	2.6893	43,029		\$16,000†	\$16,000	\$16,000	\$16,000	\$16,000
	1.0000	<u>(200,000)</u>						
Incorrect analysis (The error is to include an inflation element in the discount rate as shown, but not adjust the operating cash inflows.) Cash operating inflows after taxes Tax effect of depreciation Investment in equipment Net present value								
	2.6893	\$134,465		\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
	2.6893	43,029		16,000	16,000	16,000	16,000	16,000
	1.0000	<u>(200,000)</u>						
		<u>\$ (22,506)</u>						

*Each year is adjusted for anticipated inflation: $\$50,000 \times 1.10 = \$55,000$, $\$50,000 \times 1.10^2 = \$60,500$, $\$50,000 \times 1.10^3 = \$66,550$, and so on.

†Inflation will not affect the annual savings in income taxes from depreciation. Why? Because the income tax deduction must be based on original cost of the asset in 20X0 dollars.

Exhibit 11-9
Inflation and Capital Budgeting

Role of Depreciation

While internally consistent analysis using nominal interest rates must adjust cash flows for inflation, you will notice that the correct analysis in Exhibit 11-9 shows that we did not adjust the tax effects of depreciation for inflation. Why? Because the depreciation deductions under U.S. income tax laws are based on the original dollars invested, not the inflation-adjusted amount of the investment.

Critics of U.S. income tax laws emphasize that such laws discourage capital investment by not allowing companies to adjust depreciation deductions for inflationary effects. For instance, the NPV in Exhibit 11-9 would be larger if depreciation for tax purposes were based on the inflation-adjusted value of the \$200,000 investment. As shown in Exhibit 11-9, the unadjusted depreciation of \$40,000 per year generates a \$16,000 savings in 20X1 dollars, then \$16,000 in 20X2 dollars, and so forth. If tax depreciation were based on the inflation-adjusted value of the investment which grows by 10% to \$220,000 during the second year, the tax depreciation would grow to $\$220,000 \div 5 = \$44,000$ in the second year, generating a tax savings of $\$44,000 \times 40\% = \$17,600$. When the inflation-adjusted value of the investment grows by another 10% to \$242,000 during the third year, the inflation-adjusted depreciation would grow to $\$242,000 \div 5 = \$48,400$, generating a tax savings of $\$48,400 \times 40\% = \$19,360$. On the other hand, defenders of existing U.S. tax laws point out that tax laws encourage capital investment in many other ways. The most prominent example is provision for accelerated depreciation over lives that are much shorter than the economic lives of the assets.

Summary Problems for Your Review

PROBLEM

Examine the correct analysis in Exhibit 11-9. Suppose the cash-operating inflows persisted for an extra year. Compute the PV of the inflow for the sixth year. Ignore depreciation.

SOLUTION

The cash operating inflow would be $\$50,000 \times 1.10^6$, or $\$80,526 \times 1.10$, or \$88,579. Its PV would be $\$88,579 \times 0.2621$, the factor from Table B-1 of Appendix B (period 6 row, 25% column), or \$23,217.

PROBLEM

Examine the MACRS depreciation schedule in Exhibit 11-7 on p. 467. Assume an anticipated inflation rate of 7%. How would you change the PVs of depreciation to accommodate the inflation rate?

SOLUTION

The computations on p. 467 would not change. Inflation does not affect the tax effects of depreciation. Income tax laws in the United States permit a deduction based on the original dollars invested, nothing more.

Accounting Vocabulary

accelerated depreciation,
p. 463
accounting rate-of-return
(ARR) model, p. 471
after-tax cash flow, p. 463
capital budgeting, p. 453
depreciation tax shield, p. 467
differential approach, p. 458
discount rate, p. 454
discounted-cash-flow (DCF)
models, p. 453

hurdle rate, p. 454
inflation, p. 475
internal rate of return (IRR)
model, p. 456
marginal income tax rate,
p. 463
modified accelerated cost
recovery system (MACRS),
p. 466
net present value, p. 454

net-present-value (NPV)
method, p. 454
nominal rate, p. 475
payback period, p. 470
payback time, p. 470
post-audit, p. 473
present value (PV), p. 453
real options model, p. 457
recovery period, p. 463
required rate of return, p. 454
total project approach, p. 458

Fundamental Assignment Material

Special note: In all assignment materials that include taxes, assume—unless directed otherwise—that (1) all income tax cash flows occur simultaneously with the pretax cash flows, and (2) the companies in question will have enough taxable income from other sources to use all income tax benefits from the situations described.

11-A1 Exercises in Compound Interest: Answers Supplied

Use the appropriate interest table from Appendix B (see p. 778 or 781) to complete the following exercises. The answers appear at the end of the assignment material for this chapter, p. 497.

- It is your sixtieth birthday. You plan to work 5 more years before retiring, at which point you and your spouse want to take \$25,000 for a round-the-world tour. What lump sum do you have to invest now to accumulate the \$25,000? Assume that your required rate of return is
 - 5%, compounded annually.
 - 10%, compounded annually.
 - 20%, compounded annually.
- You want to spend \$2,000 on a vacation at the end of each of the next 5 years. What lump sum do you have to invest now to take the five vacations? Assume that your required rate of return is
 - 5%, compounded annually.
 - 10%, compounded annually.
 - 20%, compounded annually.
- At age 60, you find that your employer is moving to another location. You receive termination pay of \$100,000. You have some savings and wonder whether to retire now.
 - If you invest the \$100,000 now at 5%, compounded annually, how much money can you withdraw from your account each year so that at the end of 5 years there will be a zero balance?
 - Answer part a, assuming that you invest it at 10%.
- Two NBA basketball players, LeBron and Kobe, signed 5-year, \$60-million contracts. At 16%, compounded annually, which of the following contracts is more desirable in terms of present values? Show computations to support your answer.

Annual Cash Inflows (in thousands)

Year	LeBron	Kobe
1	\$20,000	\$ 4,000
2	16,000	8,000
3	12,000	12,000
4	8,000	16,000
5	4,000	20,000
	<u>\$60,000</u>	<u>\$60,000</u>

11-A2 NPV for Investment Decisions

A manager of the engineering department of Manchester University is contemplating acquiring 120 computers. The computers will cost £240,000 cash, have zero terminal salvage value, and a useful life of 3 years. Annual cash savings from operations will be £110,000. The required rate of return is 14%. There are no taxes.

- Compute the NPV.
- Should the engineering department acquire the computers? Explain.

11-A3 Taxes, Straight-Line Depreciation, and Present Values

A manager of Cascade Mutual Funds is contemplating acquiring servers to operate its website. The servers will cost \$660,000 cash and will have zero terminal salvage value. The recovery period and useful life are both 3 years. Annual pretax cash savings from operations will be \$300,000. The income tax rate is 40%, and the required after-tax rate of return is 12%.

- Compute the NPV, assuming straight-line depreciation of \$220,000 yearly for tax purposes. Should Cascade acquire the computers? Explain.
- Suppose the computers will be fully depreciated at the end of year 3 but can be sold for \$90,000 cash. Compute the NPV. Should Cascade acquire the computers? Explain.
- Ignore number 2. Suppose the required after-tax rate of return is 8% instead of 12%. Should Cascade acquire the computers? Show computations.

11-A4 MACRS and Present Values

Managers of Northwest Forge are considering whether to buy some equipment for the company's Fargo plant. The equipment will cost \$2 million cash and will have a 10-year useful life and zero terminal salvage value. Annual pretax cash savings from operations will be \$420,000. The income tax rate is 45%, and the required after-tax rate of return is 14%.

1. Compute the NPV, using a 7-year recovery period and MACRS depreciation for tax purposes. Should the company acquire the equipment?
2. Suppose the economic life of the equipment is 15 years, which means that there will be \$420,000 additional annual cash savings from operations in each of the years from 11 to 15. Assume that a 7-year recovery period and MACRS depreciation is used. Should the company acquire the equipment? Show computations.

11-A5 Gains or Losses on Disposal

On January 1, 20X1, Melbourne Company sold an asset with a book value of \$250,000 for cash.

Assume two selling prices: \$305,000 and \$230,000. For each selling price, prepare a tabulation of the gain or loss, the effect on income taxes, and the total after-tax effect on cash. The applicable income tax rate is 25%.

11-B1 Exercises in Compound Interest

Use the appropriate table to compute the following:

1. You have always dreamed of taking a safari in Africa. What lump sum do you have to invest today to have the \$22,000 needed for the trip in 5 years? Assume that you can invest the money at
 - a. 6%, compounded annually.
 - b. 10%, compounded annually.
 - c. 14%, compounded annually.
2. You are considering partial retirement. To do so you need to use part of your savings to supplement your income for the next 4 years. Suppose you need an extra \$50,000 per year. What lump sum do you have to invest now to supplement your income for 4 years? Assume that your required rate of return is
 - a. 6%, compounded annually.
 - b. 10%, compounded annually.
 - c. 14%, compounded annually.
3. You just won a lump sum of \$6,000,000 in a state lottery. You have decided to invest the winnings and withdraw an equal amount each year for 20 years. How much can you withdraw each year and have a zero balance left at the end of 20 years if you invest at
 - a. 4%, compounded annually?
 - b. 8%, compounded annually?
4. An NHL hockey player is offered the choice of two 4-year salary contracts, contract X for \$2.85 million and contract Y for \$2.72 million:

	Contract X	Contract Y
End of year 1	\$ 250,000	\$ 550,000
End of year 2	750,000	820,000
End of year 3	850,000	650,000
End of year 4	1,000,000	700,000
Total	<u>\$2,850,000</u>	<u>\$2,720,000</u>

Which contract has the higher PV at 16% compounded annually? Show computations to support your answer.

11-B2 NPV for Investment Decisions

The head of the oncology department of FH Research Center is considering the purchase of some new equipment. The cost is \$420,000, the economic life is 5 years, and there is no terminal disposal value. Annual cash inflows from operations would increase by \$140,000, and the required rate of return is 14%. There are no taxes.

1. Compute the NPV.
2. Should the research center acquire the equipment? Explain.

11-B3 Taxes, Straight-Line Depreciation, and NPV

The president of Big Fish Games, an online gaming company, is considering the purchase of some equipment used for the development of new games. The cost is \$400,000, the economic life and the recovery period are both 5 years, and there is no terminal disposal value. Annual pretax cash inflows from operations would increase by \$130,000, giving a total 5-year pretax savings of \$650,000. The income tax rate is 40%, and the required after-tax rate of return is 14%.

1. Compute the NPV, assuming straight-line depreciation of \$80,000 yearly for tax purposes. Should Big Fish Games acquire the equipment?
2. Suppose the asset will be fully depreciated at the end of year 5 but is sold for \$25,000 cash. Should Big Fish Games acquire the equipment? Show computations.
3. Ignore number 2. Suppose the required after-tax rate of return is 10% instead of 14%. Should Big Fish Games acquire the equipment? Show computations.

11-B4 MACRS and Present Values

The general manager of a New Mexico mining company has a chance to purchase a new drill at a total cost of \$300,000. The recovery period is 5 years. Additional annual pretax cash inflow from operations is \$75,000, the economic life of the drill is 5 years, there is no salvage value, the income tax rate is 45%, and the after-tax required rate of return is 10%.

1. Compute the NPV, assuming MACRS depreciation for tax purposes. Should the company acquire the drill?
2. Suppose the economic life of the drill is 6 years, which means that there will be a \$75,000 cash inflow from operations in the sixth year. The recovery period is still 5 years. Should the company acquire the drill? Show computations.

11-B5 Income Taxes and Disposal of Assets

Assume that the combined federal and state income tax rate for Kafka Company is 30%.

1. The book value of an old machine is \$40,000. Kafka sold the machine for \$35,000 cash. What is the effect of this decision on after-tax cash flows?
2. The book value of an old machine is \$40,000. Kafka sold the machine for \$85,000 cash. What is the effect of this decision on after-tax cash flows?

MyLab Accounting

Additional Assignment Material**QUESTIONS**

11-1 Capital budgeting has three phases: (a) identification of potential investments, (b) selection of investments, and (c) post-audit of investments. What is the accountant's role in each phase?

11-2 Why is discounted cash flow a superior method for capital budgeting?

11-3 "The higher the required rate of return, the higher the price that a company will be willing to pay for cost-saving equipment." Do you agree? Explain.

11-4 "The DCF model assumes certainty and perfect capital markets. Thus, it is impractical to use it in most real-world situations." Do you agree? Explain.

11-5 "Double-counting of costs occurs if depreciation is separately considered in DCF analysis." Do you agree? Explain.

11-6 Does the IRR model make significantly different decisions than does the NPV model? Why or why not?

11-7 "The real option framework has some non-intuitive implications." Explain.

11-8 "We can't use sensitivity analysis because our cash-flow predictions are too inaccurate." Comment.

11-9 Why should the differential approach to alternatives always lead to the same decision as the total project approach?

11-10 "The NPV model should not be used for investment decisions about advanced technology, such as computer-integrated manufacturing systems." Do you agree? Explain.

11-11 Distinguish between average and marginal tax rates.

11-12 "Congress should pass a law forbidding corporations to keep two sets of books." Do you agree? Explain.

11-13 Distinguish between tax avoidance and tax evasion.

11-14 How does depreciation lead to tax savings?

11-15 "Higher allocation of the cost of an asset during initial years improves the tax shield." Explain.

11-16 What is the tax effect of gains or losses on disposal at termination?

11-17 Why should companies take tax deductions sooner rather than later?

11-18 "The MACRS half-year convention causes assets to be depreciated beyond the lives

specified in the MACRS recovery schedules.” Do you agree? Explain.

11-19 What is the tax affect if any asset is sold before the end of the recovery period?

11-20 “If DCF approaches are superior to the payback and the accounting rate-of-return methods, why should we bother to learn the others? All it does is confuse things.” Answer this contention.

11-21 What is the basic flaw in the payback model?

11-22 Explain how a conflict can arise between capital-budgeting decision models and performance evaluation methods.

11-23 Study Appendix 11. What are the three components of market (nominal) interest rates?

11-24 Study Appendix 11. Describe how internal consistency is achieved when considering inflation in a capital-budgeting model.

CRITICAL THINKING EXERCISES

11-25 Investment in R&D

“It is impossible to use DCF methods for evaluating investments in R&D. There are no cost savings to measure, and we don’t even know what products might come out of our R&D activities.” This is a quote from an R&D manager who was asked to justify investment in a major research project based on its expected NPV. Do you agree with her statement? Explain.

11-26 Business Valuation and NPV

When a company elects to invest in a project with a positive NPV, what will generally happen to the value of the company? What will happen to this value when the company invests in a negative NPV project?

11-27 Replacement of Production Facilities

A manufacturing company recently considered replacing one of its forming machines with a newer, faster, more accurate model. What cash flows would this decision be likely to affect? List both cash flows that would be easy to quantify and those for which measurement would be difficult.

11-28 Capital Budgeting, Taxes, and Ethics

The U.S. tax law is complex. Sometimes the line between tax avoidance and tax evasion is not clear. Discuss the legal and ethical implications of the following two capital investment decisions:

- A company invested in an asset that it expects to grow rather than decline in value. Nevertheless, the tax law allows the company to deduct depreciation on the asset. Therefore, the company depreciated the asset for tax purposes using an accelerated MACRS schedule.
- There are often tax advantages to investments “offshore.” For example, in Bermuda there are no taxes on profits, dividends, or income, and there is no capital gains tax, no withholding tax, and no sales tax. A U.S. company decided to invest in a manufacturing plant in Bermuda and use transfer prices to move as much of the company’s profits as possible to the Bermuda plant.

EXERCISES

11-29 Exercise in Compound Interest

Emily Adams wishes to purchase a €350,000 car. She has accumulated a €30,000 down payment, but she wishes to borrow €320,000 on a 10-year mortgage. For simplicity, assume annual mortgage payments occur at the end of each year and there are no service charges.

- What are Emily’s annual payments if her interest rate is (a) 5%, (b) 9%, and (c) 13%, compounded annually?
- Repeat number 1 for a 7-year mortgage.
- Suppose Emily had to choose between a 10-year and a 7-year mortgage, either one at a 9% interest rate. Compute the total payments and total interest paid on (a) 10-year mortgage and (b) a 7-year mortgage.

11-30 Exercise in Compound Interest

Land Rover wants to extend its product line further. For this purpose, it has approached the Bank of England. They agreed on an annual rate of 5%.

- Suppose Land Rover agrees to repay £900 million at the end of 10 years. How much will the Bank of England lend Land Rover?
- Suppose Land Rover agrees to repay a total of £900 million at a rate £90 million at the end of each of the next 10 years. How much will the Bank of England lend Land Rover?

11-31 Exercise in Compound Interest

Suppose you are a loan officer for a bank. A start-up company has qualified for a loan. You are pondering various proposals for repayment:

1. Lump sum of \$250,000 five years hence. How much will you lend if your required rate of return is (a) 8%, compounded annually, and (b) 12%, compounded annually?
2. Repeat number 1, but assume that the interest rates are compounded semiannually.
3. Suppose the loan is to be paid in full by equal payments of \$50,000 at the end of each of the next 5 years. How much will you lend if your required rate of return is (a) 8%, compounded annually, and (b) 12%, compounded annually?

11-32 Basic Relationship in Interest Tables

1. Nelson borrows \$450,000 now at 12% interest, compounded annually, to pursue his higher studies. He will repay the borrowed amount plus interest in a lump sum at the end of 5 years. How much must he repay? Use Table B-1 and the basic equation $PV = \text{future amount} \times \text{conversion factor}$.
2. Suppose Nelson will repay his loan in equal installments at the end of each of the 5 years. How much must he repay each year? Use Table B-2 and the basic equation: $PV = \text{future annual payments} \times \text{conversion factor}$.

11-33 PV and Moratorium

The COVID-19 pandemic and the consequent lockdowns have badly hit the Indian economy. Revenue in many sectors has completely dried up, and firms are at the verge of shutting down. Under a relief package, the government has advocated a partial moratorium for the small, medium, and micro enterprises sector. As per said package, banks have been told to defer 50% of the annual loan repayment installments for a period of 2 years. State Bank of India (SBI), the largest public sector bank of the country, has a sizeable exposure to this sector. The chairman of the bank has estimated that the bank was supposed to receive ₹160 million in 2020–2021, ₹200 million in 2021–2022, and ₹220 million in 2022–2023 from its loan portfolio exposed to this sector. Under the revised arrangement, the bank is supposed to receive ₹80 million in 2020–2021, ₹200 million in 2021–2022, and ₹300 million in 2022–2023. The cost of capital of SBI is 10%.

Does the deferral of loan repayment cost SBI anything? If so, how much? Compute the PV of the sacrifice as of April 1, 2021. Explain.

11-34 Simple NPV

As per the contract with her modeling agency, Emma Watson is to receive \$60,000 at the end of every year that she works for the agency and \$350,000 on termination beyond the second year. If Emma wants to continue the contract up to 3 years, what will be the present value of payments at 5% interest?

11-35 NPV Relationships

Fill in the blanks.

	Number of Years			
	7	18	18	28
Amount of annual cash inflow*	\$8,000	\$	\$ 30,000	\$16,000
Required initial investment	\$	\$70,000	\$ 50,000	\$29,000
Required rate of return	10%	18%	\$	20%
NPV	\$ 980	(\$10,009)	\$231,157	\$

*To be received at the end of each year.

11-36 New Truck

Duisburg Transport Company owns and operates a fleet of trucks. The company wants to replace one of its existing trucks with a new one with better mileage and capacity. The new truck is available at a list price of €130,000. On negotiation, the seller has agreed to exchange the old truck for a €42,000 trade-in allowance against the new one. The carrying value of the old truck is €42,600 and it can be sold outright for €40,000. The new truck would yield cash operating savings of €44,000 per year for the next 8 years. The required rate of return is 14%. The old truck has a remaining useful life of 8 years. Both the old and the new truck will have zero disposal value at the end of 8 years from now.

Should the company replace the old truck with the new one? Show your computations, using the NPV method. Ignore income tax.

11-37 Present Values of Cash Inflows

City View Restaurant is about to open at a new location. Operating plans indicate the following expected cash flows:

		Outflows	Inflows
Initial investment now		\$235,000	\$ —
End of year:	1	\$150,000	200,000
	2	\$200,000	250,000
	3	\$250,000	300,000
	4	\$300,000	450,000
	5	\$350,000	500,000

1. Compute the NPV for all these cash flows. This should be a single amount. Use a discount rate of 14%.
2. Suppose the required rate was 12%. Without further calculations, determine whether the NPV is positive or negative. Explain.

11-38 Effect of Required Rate

Jerry operates a cybercafé-cum photocopy center near a college in Tucson, Arizona. Due to the high demand for photocopying, he is considering installing a second photocopier. The new machine will have higher capacity and improved speed as a result of which Jerry expects annual savings of \$4,600 over its economic life of 12 years. The machine will cost \$30,000.

1. Suppose Jerry has a required rate of return of 10%. Compute the NPV of the investment in the new photocopier and recommend whether he should buy the machine.
2. Suppose Jerry has a required rate of return of 12%. Compute the NPV of the investment in the new photocopier and recommend whether he should buy the machine.
3. How does the required rate of return affect the NPV of a potential investment?

11-39 NPV and IRR

Dordt Steel Works, Dordrecht, the Netherlands, is considering an investment in a new process technology in its production system which will cost €72,096 and would result in cash savings of €20,000 per year for the next 5 years. The company's cost of capital is 10%.

1. Compute the project's NPV at 10%, 12%, and 14%.
2. Compute the project's IRR.
3. If the company uses the NPV model, would it buy the new technology? Why or why not?
4. If the company uses the IRR model, would it buy the new technology? Why or why not?

11-40 Sensitivity Analysis

Mack and Myer, LLP, a law firm, is considering the replacement of its old accounting system with new software that should save \$10,000 per year in net cash operating costs. The old system has zero disposal value, but it could be used for the next 5 years. The estimated useful life of the new software is 5 years with zero salvage value, and it will cost \$40,000. The required rate of return is 14%.

1. What is the payback period?
2. Compute the NPV.
3. Management is unsure about the useful life. What would be the NPV if the useful life were (a) 3 years instead of 5 or (b) 10 years instead of 5?
4. Suppose the life will be 5 years, but the savings will be \$8,000 per year instead of \$10,000. What would be the NPV?
5. Suppose the annual savings will be \$9,000 for 4 years. What would be the NPV?

11-41 NPV and Sensitivity Analysis

Evercare Hospitals, Bangladesh, is currently outsourcing, for its Dhaka unit, campus-wide floor cleaning services at an annual cost of BDT3,680,000. It is considering a purchase of 20 automatic battery-operated floor cleaners for BDT4,160,000, which will be used in different departments of the hospital. The company expects savings of BDT1,200,000 per year, and the machines are expected to last 5 years. The required rate of return is 10%.

Answer each part separately.

1. Compute the NPV of the investment in cleaning facilities.
2. a. Suppose the machines last only 4 years. Compute the NPV.
b. Suppose the machines last only 7 years. Compute the NPV.

3. a. Suppose the annual savings are only BDT960,000. Compute the NPV.
b. Suppose the annual savings are only BDT1,440,000. Compute the NPV.
4. a. Compute the most optimistic estimate of NPV, combining the best outcome in numbers 2 and 3.
b. Compute the most pessimistic estimate of NPV, combining the best outcome in numbers 2 and 3.
5. Accept the expected life estimate of 5 years. What is the minimum annual savings that would justify the investment in the cleaning facilities?

11-42 Depreciation, Income Taxes, Cash Flows

Fill in the unknowns (in thousands of dollars):

(S)	Sales	750
(E)	Expenses excluding depreciation	275
(D)	Depreciation	200
	Total expenses	475
	Income before income taxes	?
(T)	Income taxes at 36%	?
(I)	Net income	?
	Cash effects of operations	
	Cash inflow from operations, before tax	?
	Cash inflow from operations, after tax	?
	Tax savings due to depreciation	?
	Total after-tax effect on cash	?

11-43 After-Tax Effect on Cash

The 20X9 income statement of United Cable Company included the following:

Sales	\$1,700,000
Less: Expenses, excluding depreciation	\$350,000
Depreciation	425,000
Total expenses	\$ 775,000
Income before taxes	\$ 925,000
Income taxes (37%)	342,250
Net income	\$ 582,750

Compute the total after-tax effect on cash. Use the format of the second part of Exhibit 11-3, p. 464, “Annual Cash Flow Effects.”

11-44 MACRS Depreciation

In 20X8, Tebow Athletic Shoe Company acquired the following assets and immediately placed them into service.

1. Special tools (a 3-year-MACRS asset) that cost \$55,000 on February 1.
2. A desktop computer that cost \$3,500 on December 15.
3. Special calibration equipment that was used in running-shoe research and cost \$16,000 on July 7.
4. A set of file cabinets that cost \$9,500, purchased on March 1.

Compute the depreciation for tax purposes, under the prescribed MACRS method, in 20X8 and 20X9. Round amounts to the nearest whole dollar.

11-45 Present Value of MACRS Depreciation

Compute the PV of the MACRS tax savings for each of the following five assets:

	Asset Cost	Recovery Period	Discount Rate	Tax Rate
(a)	\$220,000	7-year	18%	33%
(b)	\$640,000	7-year	12%	33%
(c)	\$ 40,000	10-year	8%	29%
(d)	\$950,000	10-year	5%	45%
(e)	\$420,000	3-year	14%	25%

11-46 NPV, ARR, and Payback

Snuffy's Drive-In is considering a proposal to invest in a speaker system that would allow its employees to service drive-through customers. The cost of the system (including installation of special windows and driveway modifications) is \$28,000. Brad Board, manager of Snuffy's, expects the drive-through operations to increase annual sales by \$14,000, with a 25% contribution margin ratio. Assume that the system has an economic life of 10 years, at which time it will have no disposal value. The required rate of return is 10%. Ignore taxes.

1. Compute the payback period. Is this a good measure of profitability?
2. Compute the NPV. Should Brad Board accept the proposal? Why or why not?
3. Using the ARR model, compute the rate of return on the initial investment.

11-47 Weaknesses of the Payback Model

Stallone Company is considering two possible investments, each of which requires an initial investment of \$36,000. Investment A will provide a cash flow of \$4,000 at the end of each year for 20 years. Investment B will provide a cash flow of \$4,500 at the end of each year for 8 years.

1. Determine the payback period for each investment. Which investment is most desirable using the payback method?
2. Compute the NPV of each investment using a required rate of return of 8%. Which investment is most desirable using the NPV method?
3. Explain why the payback method does not lead to an optimal decision for the Stallone Company.

11-48 Comparison of Capital-Budgeting Techniques

Kolkata Municipal Corporation (KMC) is considering the purchase of refuse collection vehicles (RCV). Each such vehicle will cost ₹700,000. It should save ₹140,000 in cash operating costs per year. Its estimated useful life is 10 years with zero disposable value. Ignore taxes.

1. What is the payback time?
2. Compute the NPV if the required rate of return is 10%. Should the department buy the vehicles?
3. Using the ARR model, compute the rate of return on the initial investment.

11-49 Inflation and Capital Budgeting

Study Appendix 11. The head of the corporate tax division of a major public relations firm has proposed investing \$290,000 in personal computers for the staff. The useful life and recovery period for the computers are both 5 years. The firm uses MACRS depreciation. There is no terminal salvage value. Labor savings of \$140,000 per year (in year-zero dollars) are expected from the purchase. The income tax rate is 35%, and the after-tax required rate of return is 25%, which includes a 5% element attributable to inflation.

1. Compute the NPV of the computers. Use the nominal required rate of return and adjust the cash flows for inflation. (For example, year 1 cash flow = $1.05 \times$ year 0 cash flow.)
2. Compute the NPV of the computers using the nominal required rate of return without adjusting the cash flows for inflation.
3. Compare your answers in numbers 1 and 2. Which is correct? Would using the incorrect analysis generally lead to overinvestment or underinvestment? Explain.

11-50 Sensitivity of Capital Budgeting to Inflation

Study Appendix 11. Enrique Mendoza, the president of a Mexican wholesale company, is considering whether to invest 420,000 pesos in new semiautomatic loading equipment that will last 5 years, have zero scrap value, and generate cash operating savings in labor usage of 150,000 pesos annually, using 20X0 prices and wage rates. It is December 31, 20X0.

The required rate of return is 18% per year.

1. Compute the NPV of the project. Use 150,000 pesos as the savings for each of the 5 years. Assume a 40% tax rate and, for simplicity, assume ordinary straight-line depreciation of 420,000 pesos $\div$ 5 = 84,000 pesos annually for tax purposes.
2. Mendoza is wondering if the model in number 1 provides a correct analysis of the effects of inflation. He maintains that the 18% rate embodies an element attributable to anticipated inflation. For purposes of this analysis, he assumes that the existing rate of inflation, 10% annually, will persist over the next 5 years. Repeat number 1, adjusting the cash operating savings upward by using the 10% inflation rate.
3. Which analysis, the one in number 1 or 2, is correct? Why?

PROBLEMS

11-51 Replacement of Office Equipment

Midwestern University is considering replacing some **Xerox** copiers with faster copiers purchased from **Brother**. The administration is very concerned about the rising costs of operations during the last decade.

To convert to Brother, two operators would have to be retrained. Required training and remodeling would cost \$3,500. Midwestern's three Xerox machines were purchased for \$8,000 each, 5 years ago. Their expected life was 15 years. Their resale value now is \$1,750 each and will be zero in 10 more years. The total cost of the new Brother equipment will be \$60,000; it will have zero disposal value in 10 years.

The three Xerox operators are paid \$12 an hour each. They usually work a 40-hour week. Machine breakdowns occur monthly on each machine, resulting in repair costs of \$75 per month and overtime of 6 hours, at time-and-one-half, per machine per month, to complete the normal monthly workload. Toner, supplies, and so on, cost \$50 a month for each Xerox copier.

The Brother system will require only two regular operators, on a regular work week of 40 hours each, to do the same work. Rates are \$14 an hour, and no overtime is expected. Toner, supplies, and so on, will cost a total of \$4,500 annually. Maintenance and repairs are fully serviced by Brother for \$600 annually. (Assume a 52-week year.)

1. Using DCF techniques, compute the PV of all relevant cash flows, under both alternatives, for the 10-year period discounted at 14%. As a nonprofit university, Midwestern does not pay income taxes.
2. Should Midwestern keep the Xerox copiers or replace them if the decision is based solely on the given data?
3. What other considerations might affect the decision?

11-52 Installation of a Computerized Distribution System

Premier Enterprises is evaluating an option to computerize their distribution system. The total investment projected for the computerization is \$100 million. The operation and maintenance costs other than depreciation are estimated at \$10 million. The system is expected to have a useful life of 5 years, after which it is expected to become obsolete and would require replacement. However, it would have negligible salvage value at that time. The depreciation rate is 10% under reducing balance method. Due to computerization, a significant amount of clerical workforce associated with the distribution system will no longer be required, and they would be terminated with immediate effect. This would lead to a saving in labor cost of about \$10 million. Additional savings of \$18 million are expected from the space released and of \$12 million on account of inventory reduction. Previous trends indicate that costs are inflating at 10% per annum. The tax rate for the firm is 30%. The cost of capital is 10% per annum.

Using NPV method, evaluate whether installing the computer system would be profitable.

11-53 Discounted Cash Flow, Uneven Revenue Stream, Relevant Costs

Narain Karthikeyan is the owner of an 11-court indoor badminton stadium in Chennai with a capacity of 4,000 spectators. He purchased the stadium early last year for ₹38,400,000. His receipts from operation during the year amounted to ₹10,800,000. Total disbursements for the year, for all purposes, were ₹6,720,000. The stadium currently hosts matches during the day only.

Karthikeyan is considering a proposal to illuminate the stadium and operate at night. This will enable him to host matches of the Indian Badminton League or similar other tournaments that are played at after dark. The required investment in lighting is estimated at ₹72,00,000. The system will require 300 special lamps of 1,000 watts capacity. Electricity costs ₹6.40 per kilowatt-hour. The expected average hours of operation per night are 5. It is estimated that there will be 130 nights of operation per year. Labor for keeping the stadium operative at night will cost ₹6,000 per night. Lightbulb costs are ₹120,000 per year. Other maintenance and repairs, per year, will amount to 5.7% of the initial cost of investment in the lighting system. It is estimated that the average revenue, per night of operation, will be ₹33,600 for the first 2 years.

Due to competition from other stadiums, Karthikeyan is not ready to make the investment unless he can earn at least 10% per annum on it. Because of anticipated competition, the estimated revenue

may drop to ₹24,000 per night for 3–5 years. The lighting equipment are expected to have a salvage value of ₹2,800,000 at the end of the 5-year period.

Using DCF techniques, determine whether Karthikeyan should install the lighting system.

11-54 Investment in Machine

Talladega Lumber Mill of Georgia Pacific is considering the replacement of one of its feller bunchers with a net disposal value of \$24,000 now and \$8,000 five years from now. A new feller buncher is offered for \$114,000 cash or \$90,000 with a trade-in. The new machine will result in an annual operating cash outflow of \$80,000 as compared with the old machine's annual outflow of \$100,000. The disposal value of the new machine 5 years hence will be \$4,000.

The required rate of return is 20%. The company uses DCF techniques to guide these decisions.

Should Talladega Lumber Mill acquire the new machine? Show your calculations. Company procedures require the computing of the PV of each alternative. The most desirable alternative is the one with the least cost. Assume that PV of \$1 at 20% for 5 years is \$.40; the PV of an annuity of \$1 at 20% for 5 years is \$3.

11-55 Replacement Decision

The authority of the National Museums of Kenya maintains a cafeteria for the visitors. Yearly operations of the cafeteria have shown a consistent loss, which is expected to worsen further in future, as follows (in thousand Kenyan Shilling, KES):

Revenue (in cash)		KES100,000
Expenses for food, supplies, etc. (in cash)	KES50,000	
Salaries	<u>55,000</u>	<u>105,000</u>
Net loss		<u>(5,000)</u>

The Ready-Vend Company, which supplies automatic vending machines, has offered to sell vending machines to the National Museums for KES11,000,000, less a KES1,500,000 trade-in allowance on old equipment (whose present book value is KES1,500,000 and which can be sold outright for KES1,500,000 cash) now used in the cafeteria. The economic life of the vending machine is estimated at 10 years, with zero scrap value. The vending machine is expected to serve 50% more food than the cafeteria, at 50% less price. Therefore, the new revenue will be KES75,000,000. The variety and mix of the food sold will however remain the same. A catering company will service and supply food and beverages for the machines, paying 10% of revenue to the museum authority and bearing all costs of food, repairs, and so on. All cafeteria employees will be discharged immediately. Their termination pay will total KES17,500,000. However, the Museum will have to employ an attendant having some general knowledge of the vending machines for one shift per day. This will cost an additional KES6500,000 to the museum authority.

For political and other reasons, the authority cannot abandon its food service. The old equipment will have zero scrap value at the end of 10 years.

Using the above data, compute the following. Label computations. Ignore income taxes.

1. Use the NPV method to analyze the incremental investment. Assume a required rate of return of 10%. For this problem, assume that PV of KES1 at 10% to be received at the end of 10 years is KES.400 and that the PV of an annuity at 10% for 10 years is KES6.000.
2. What would be the minimum amount of annual revenue that National Museum would have to receive from the catering company to justify making the investment? Show computations.

11-56 Minimization of Transportation Costs Without Income Taxes

Compu-Tech Company produces LCD monitors for desktop computers at its manufacturing facility at Petechannappa, Bangalore, India. The company currently ships its products to a warehouse 1,900 kilometers from the manufacturing facility through common carriers at a rate of ₹43.20 per kilogram.

Allu Sirish, a manager at Compu-Tech, is considering whether to purchase a truck for transporting products to the warehouse. The following data on the truck are available:

Purchase price	₹4,000,000
Economic life	4 years
Salvage value after 4 years	0
Capacity of the truck	3500 kg
Cash operating cost	₹76 per km

Sirish feels that the investment in this truck is particularly attractive because of successful negotiation with Smart-Print Inc., which has agreed to pay ₹184,000 per load of Smart-Print's products on the return journey from the warehouse location up to and including 100 loads per year.

Compu-Tech's marketing division has estimated that the company will require to ship 192,500 LCDs to the warehouse each year for the next 4 years. The truck will be fully loaded on each round trip. The weight of each LCD is approximately 1 kilogram.

Ignore income taxes.

1. Assume that Compu-Tech requires a rate of return of 18%. Should it purchase the truck? Show computations to support your answer.
2. What is the minimum number of trips that Smart-Print must guarantee to make the deal acceptable to Compu-Tech, based on the preceding numbers alone?
3. What qualitative factors might influence your decision? Be specific.

11-57 Straight-Line Depreciation, MACRS Depreciation, and Immediate Write-Off

Silver Bricks Inc. bought a new £25,000 skid steer loader for its construction business on January 3, 2020. The loader has a 5-year economic life and recovery period. The cost of capital of the company is 12% and its tax rate is 40%.

1. Suppose Silver Bricks uses straight-line depreciation for tax purposes. Compute the PV of the tax savings from depreciation. Assume that Silver Bricks takes a full year depreciation at the end of 2020.
2. Suppose Silver Bricks uses MACRS depreciation for tax purposes. Compute the PV of the tax savings from depreciation.
3. Suppose Silver Bricks was allowed to immediately deduct the entire cost of the loader for tax purposes. Compute the PV of the tax savings from depreciation.
4. Which of the methods of deducting the cost of the loader would Silver Bricks prefer if all the three were allowable for tax purposes? Why?

11-58 MACRS, Residual Value

Gangwon Steel Company, South Korea, estimates that it can save ₩36,000,000 per year in annual operating costs for 3 years if it buys a Continuous Casting Machine (CCM) at a cost of ₩80,000,000. Residual value is expected to be ₩12,000, although no residual value is being provided for in using MACRS depreciation (3-year recovery period) for tax purposes. The company will sell the equipment at the end of the third year. The required rate of return is 16%. Assume the income tax rate is 30%.

Using the NPV method, show whether the investment is desirable.

11-59 Purchase of Equipment, MACRS

The Scranton Clinic, a for-profit medical facility, is planning to spend \$35,000 for modernized MRI equipment. It will replace equipment that has zero book value and no salvage value, although the old equipment would have lasted another 10 years.

The new equipment will save \$6,000 in cash operating costs for each of the next 10 years, at which time the clinic will sell it for \$8,500. A major overhaul costing \$9,000 will occur at the end of the seventh year; the old equipment would require no such overhaul. The entire cost of the overhaul is deductible for tax purposes in the seventh year. The equipment has a 3-year recovery period. The clinic uses MACRS depreciation for tax purposes.

The required rate of return is 8%. The applicable income tax rate is 44%.

Compute the after-tax NPV. Is the new equipment a desirable investment?

11-60 MACRS and Non-residential Real Estate

ELF Real Estate Company is a real estate developer who specializes in non residential properties. It is currently considering buying an office complex at a cost of \$665,000. The management predicts that after remodeling, 12 small office spaces (of 450 square foot) and 8 large office spaces (of 1,800 square foot) will be available, which the company can rent for \$760 and \$880, respectively. The company budgets 15% of the rental fees for repairs and maintenance. The complex won't require any further

remodeling in next 34 years. Expected remodeling cost is \$30,000 on an average per office unit. Both purchase price and remodeling costs qualify as 31.5-year MACRS property.

Assume that the MACRS schedule uses the straight-line method. In other words, it divides the total cost recovery amount by 31.5 and assigns a full year of depreciation to year 1 and a half year to year 32.

The CEO of ELF does not believe that the company will keep the office complex for its entire 34-year life. Most likely the company will sell it just after the end of 10 years. His predicted sale price is \$1,960,000.

The required rate of return of the company is 10% and applicable tax rate is 38%.

Should the company buy the office complex? What is the after-tax NPV? Ignore any capital gains.

11-61 PV of After-Tax Cash Flows, Payback, and ARR

Suppose that **Mitsubishi Chemical Corporation** is planning to buy new equipment to expand its production of a popular solvent. Estimated data are as follows (monetary amounts are in thousands of Japanese yen):

Cash cost of new equipment now	¥400,000
Estimated life in years	10
Terminal salvage value	¥ 50,000
Incremental revenues per year	¥330,000
Incremental expenses per year other than depreciation	¥165,000

Assume a 60% flat rate for income taxes. The company receives all revenues and pays all expenses other than depreciation in cash. Use a 14% discount rate. Assume that the company uses ordinary straight-line depreciation based on a 10-year recovery period for tax purposes. Also assume that the company depreciates the original cost less the terminal salvage value.

Compute the following:

1. Depreciation expense per year
2. Anticipated net income per year
3. Annual net cash flow
4. Payback period
5. ARR on initial investment
6. NPV

11-62 Investment Justification Analysis and Graphs

Consider a new video game developed by Dynamic Gaming, Inc. (DGI). DGI's development team was formed at the end of 2009 and has been working on the development of the game for several years. After spending \$175,000 on the development, the team has reached the point in 2013 where it must make a decision on whether to proceed with production of the game. Production of the game will require an initial investment in facilities of \$199,500 at the end of 2013. The project has an expected life cycle of 7 years (end of 2013 through 2020). Predicted cash flows for the game are as follows (assuming that all cash flows occur at the end of the year):

End of Year	Cash Inflow	Cash Outflow
2013	\$ 0	\$199,500
2014	100,000	100,000
2015	220,000	180,000
2016	340,000	260,000
2017	460,000	320,000
2018	470,000	280,000
2019	410,000	200,000
2020	150,000	120,000

DGI's applicable tax rate is 40%, and DGI uses straight-line depreciation over the asset's expected life for tax purposes. The salvage value of the facilities will be zero in 7 years. DGI uses two criteria to evaluate potential investments: payback time and NPV. It wants a payback period of 3 years or less and an NPV greater than zero. DGI has a cost of capital of 18%.

1. Prepare a table that shows the after-tax annual net cash flows, cumulative net cash flow, and cumulative discounted net cash flow each year.
2. Would DGI invest in production of the game if it uses the payback period?
3. Would DGI invest in production of the game if it uses the NPV model?
4. Would you recommend that DGI invest in this project? Explain.

11-63 Fixed and Current Assets; Evaluation of Performance

The 2020 annual financial results of Apollo Diagnostics have revealed a decline in operating income. To overcome such a decline, an organization-wide cost control drive has been initiated by the company. The company has various revenue-producing centers, including X-ray and MRI units, pathological tests, and electrocardiogram and related tests. The administrator has been considering improving the X-ray and MRI units with more advanced and cost-effective machines. The infrastructural upgradation will cost \$125,500. Its unique characteristics would generate additional cash operating income of \$25,000 per year for the diagnostic center as a whole.

The machines are expected to have a useful life of 8 years and may be sold at a terminal salvage value of \$17,500. The machines require a constant inventory of some supplies and spare parts so that instant replacement of supplies and parts is possible. This will cost the center an additional investment of \$3,500 at all times. However, the investment can be recovered fully at the end of the useful life of the machines.

1. Compute NPV if the required rate of return is 10%.
2. Compute the ARR on (a) the initial investment and (b) the “average” investment. Assume straight-line depreciation.
3. Why might the administrator be reluctant to base his decision on the DCF model?

11-64 Investment Before and After Taxes

Deer Valley Lodge, a ski area near Salt Lake City, has plans to eventually add five new chairlifts. Suppose that one of the lifts costs \$2.2 million, and preparing the slope and installing the lift costs another \$1.48 million. The lift will allow 300 additional skiers on the slopes, but there are only 40 days a year when the lodge needs the extra capacity. (Assume that Deer Valley will sell all 300 lift tickets on those 40 days.) Running the new lift will cost \$500 a day for the entire 200 days the lodge is open. Assume that lift tickets at Deer Valley cost \$65 a day and added cash expenses for each skier-day are \$9. The new lift has an economic life of 20 years.

1. Assume that the before-tax required rate of return for Deer Valley is 14%. Compute the before-tax NPV of the new lift and advise the managers of Deer Valley about whether adding the lift will be a profitable investment.
2. Assume that the after-tax required rate of return for Deer Valley is 8%, the income tax rate is 40%, and the MACRS recovery period is 10 years. Compute the after-tax NPV of the new lift and advise the managers of Deer Valley about whether adding the lift will be a profitable investment.
3. What subjective factors would affect the investment decision?

11-65 After-Tax NPV

Delicious Chocolate Company, Switzerland, is considering the purchase of a new fully automatic cocoa processing and chocolate manufacturing system. The following information is available:

New System	
Purchase cost	CHF84,000
Annual increase in cash revenues	65,000
Annual increase in cash operating costs	47,000
Salvage value—10 years from now	4,000

If Delicious purchases the new system, it will use it for 10 years and then trade in on another system. The company computes depreciation on a straight-line basis, for both taxes and financial reporting purposes. Assume Delicious currently has an old semi-automatic processing system with a book value of CHF31,000 that it can currently dispose of for CHF9,000 if it buys the new system. Assume that cost of capital of the company is 14% and its tax rate is 30%.

Should the new system be purchased based on the NPV method.

11-66 Minimization of Transportation Costs After Taxes, Inflation

Study Appendix 11. (This problem is similar to Problem 11-56, but the numbers are different and it includes taxes and inflation elements.) The Green Lighting Company produces industrial and residential lighting fixtures at its manufacturing facility in Scottsdale. The company currently ships products to an eastern warehouse via common carriers at a rate of \$.26 per pound of fixtures (expressed in

year-zero dollars). The warehouse is located in Cleveland, 2,500 miles from Scottsdale. The rate will increase with inflation.

Alexis Azra, the treasurer of Green Lighting, is currently considering whether to purchase a truck for transporting products to the eastern warehouse. The following data on the truck are available:

Purchase price	\$50,000
Useful life	5 years
Salvage value after 5 years	0
Capacity of truck	10,000 lb
Cash costs of operating truck	\$.90 per mile

Azra feels that an investment in this truck is particularly attractive because of her successful negotiation with Jetson to back-haul Jetson's products from Cleveland to Scottsdale on every return trip from the warehouse. Jetson has agreed to pay Green Lighting \$2,400 per load of Jetson's products hauled from Cleveland to Scottsdale for as many loads as Green Lighting can accommodate, up to and including 100 loads per year over the next 5 years.

Green Lighting's marketing manager has estimated that the company will ship 500,000 pounds of fixtures to the eastern warehouse each year for the next 5 years. The truck will be fully loaded on each round trip.

Make the following assumptions:

- Green Lighting requires a 20% after-tax rate of return, which includes a 10% element attributable to inflation.
 - A 40% tax rate.
 - MACRS depreciation based on 5-year cost recovery period.
 - An inflation rate of 10%.
- Should Green Lighting purchase the truck? Show computations to support your answer.
 - What qualitative factors might influence your decision? Be specific.

11-67 Inflation and Nonprofit Institution

St George College, United Kingdom, is considering the installation of automatic coffee vending machines in its campus. The college may buy 10 coffee vending machines at a total cost of \$3,500 on December 31, 20X0. The machines will have a useful life of 5 years and no residual value. The cash operating savings are expected to be \$1,000 annually, measured in 20X0 dollars.

The required rate is 14%, which includes an element attributable to anticipated inflation of 6%. (Remember that the college does not pay any income tax.)

Use 14% required rate of return for numbers 1 and 2.

- Compute the NPV of the project without adjusting the cash operating savings for inflation.
- Repeat number 1, adjusting the cash operating savings upward in accordance with the 6% inflation rate.
- Compare your results in numbers 1 and 2. What generalization seems applicable about the analysis of inflation in capital budgeting?

CASES

11-68 Investment in CAD/CAM

Aswega AS is an Estonian manufacturer of electromagnetic flowmeters, heatmeters, and calibration equipment located in Tallinn. Suppose that it is considering the installation of a computer-aided design/computer-aided manufacturing (CAD/CAM) system. The current proposal calls for implementation of only the CAD portion of the system. The manager in charge of production design and planning has estimated that the CAD portion of CAD/CAM could do the work of five designers, who are each paid EEK 520,000 per year (52 weeks $\times$ 40 hours $\times$ EEK 250 per hour), where EEK is the symbol for the Estonian kroon.

Aswega can purchase the CAD/CAM system for EEK 2.8 million. (It cannot purchase the CAD portion separately.) The annual out-of-pocket costs of running the CAD portion of the system are EEK 1.8 million. The company expects to use the system for 8 years. The company's required rate of return is 12%. Ignore income taxes.

- Compute the NPV of the investment in the CAD/CAM system. Should Aswega purchase the system? Explain.

2. Suppose the manager was not certain about her predictions of savings and economic life. Possibly the company will replace only four designers, but if everything works out well, it may replace as many as six. If better systems become available, the company may use the CAD/CAM system for only 5 years, but it might last as long as 10 years. Prepare pessimistic, most likely, and optimistic predictions of NPV. Would this analysis make you more confident or less confident in your decision in number 1? Explain.
3. What subjective factors might influence your decision?

11-69 Investment in Technology

Nashville Tool Company is considering installation of a CIM system as part of its implementation of a JIT philosophy. Gretchen Torres, company president, is convinced that the new system is necessary, but she needs the numbers to convince the board of directors. This is a major move for the company, and approval at board level is required.

Maria, Gretchen's daughter, has been assigned the task of justifying the investment. She is a business school graduate and understands the use of NPV for capital-budgeting decisions. To identify relevant costs, she developed the following information.

Nashville Tool Company produces a variety of small automobile components and sells them to auto manufacturers. It has a 40% market share, with the following condensed results expected for 2011:

Sales		\$12,000,000
Cost of goods sold		
Variable	\$4,000,000	
Fixed	<u>4,300,000</u>	8,300,000
Selling and administrative expenses		
Variable	\$2,000,000	
Fixed	<u>400,000</u>	<u>2,400,000</u>
Operating income		<u>\$ 1,300,000</u>

Installation of the CIM system will cost \$6 million, and the company expects the system to have a useful life of 6 years with no salvage value. Installation will occur at the beginning of 2012. In 2012, the training costs for personnel will exceed any cost savings by \$400,000. In years 2013–2017, variable cost of goods sold will decrease by 35%, an annual savings of \$1.4 million. There will be no savings in fixed cost of goods sold—it will increase by the amount of the straight-line depreciation on the new system. Selling and administrative expenses will not be affected. The required rate of return is 12%. Assume that all cash flows occur at the end of the year the revenue or expense is recognized, except the initial investment, which occurs at the beginning of 2012. Ignore income taxes.

1. Suppose that Maria assumes that production and sales would continue for the next 6 years as they are expected in 2011 in the absence of investment in the CIM. Compute the NPV of investing in the CIM.
2. Now suppose Maria predicts that it will be difficult to compete without installing the CIM. She has undertaken market research that estimates a drop in market share of three percentage points a year starting in 2012 in the absence of investment in the CIM (i.e., market share will be 37% in 2012, 34% in 2013, 31% in 2014, etc.). Her study also showed that the total market sales level will stay the same, and she does not expect market prices to change. Compute the NPV of investing in the CIM.
3. Prepare a memo from Maria to the board of directors of Nashville Tool Company. In the memo, explain why the analysis in number 2 is appropriate and why analyses such as that in number 1 cause companies to underinvest in high-technology projects. Include an explanation of qualitative factors that are not included in the NPV calculation.

11-70 Investment in Quality

The Sydney Manufacturing Company produces a single model of a high-quality DVD player that it sells to Australian manufacturers of sound systems. It sells each DVD player for \$210, resulting in a contribution margin of \$70 before considering any costs of inspection, correction of product defects, or refunds to customers.

On January 1, 2014, top management at Sydney is contemplating a change in its quality control system. Currently, the company spends \$30,000 annually on quality control inspections for the 50,000 DVD players it produces and ships each year. In producing those DVD players, the company produces an average of 2,000 defective units. The inspection process identifies 1,500 of these, and the company spends an average of \$85 on each to correct the defects. The company ships the other 500 defective

players to customers. When a customer discovers a defective DVD player, Sydney Manufacturing refunds the \$210 purchase price.

Many of Sydney's customers build the DVD players into home-entertainment units. As more of these customers change to JIT inventory systems and automated production processes, the receipt of defective goods poses greater and greater problems for them. Sometimes a defective DVD player causes them to delay their whole production line while they replace the DVD player. Companies competing with Sydney recognize this situation, and most have already begun extensive quality control programs. If Sydney does not improve quality, sales volume is expected to fall by 5,000 DVD players a year, beginning after 2014:

	Predicted Sales Volume in Units Without Quality Control Program	Predicted Sales Volume in Units with Quality Control Program
2014	50,000	50,000
2015	45,000	50,000
2016	40,000	50,000
2017	35,000	50,000

The proposed quality control program has two elements. First, Sydney would spend \$950,000 immediately to train workers to recognize and correct defects at the time they occur. This is expected to cut the number of defective DVD players produced from 2,000 to 500 without incurring additional manufacturing costs. Second, an earlier inspection point would replace the current inspection. This would require purchase of an X-ray machine at a cost of \$250,000 plus additional annual operating costs of \$60,000 more than the current inspection costs. Early detection of defects would reduce the average amount spent to correct defects from \$85 to \$50, and only 50 defective DVD players would be shipped to customers. To compete, Sydney would refund one-and-one-half times the purchase price (\$315) for defective DVD players delivered to customers.

Top management at Sydney has decided that a 4-year planning period is sufficient for analyzing this decision. The required rate of return is 20%. For simplicity, assume that under the current quality control system, if the volume of production decreases, the number of defective DVD players produced remains at 2,000. Also assume that all annual cash flows occur at the end of the relevant year. Should Sydney undertake the new quality control program? Explain using the NPV model. Ignore income taxes.

11-71 Make or Buy and Replacement of Equipment

International Hoists is one of the largest producers of hoists of all types. An especially complex part of a particular auto hoist needs special tools that are not useful for other products. The company purchased these tools on July 1, 20X0, for \$2,000,000.

It is now July 1, 20X4. The manager of the auto hoists division, David Lee, is contemplating three alternatives. First, he could continue to produce the ship using the current tools; they will last another 5 years, at which time they would have zero terminal value. Second, he could sell the tools for \$400,000 and purchase the parts from an outside supplier for \$110 each. Third, he could replace the tools with new, more efficient tools costing \$1,800,000.

Lee expects to produce 8,000 units of this particular hoist each of the next 5 years. Manufacturing costs for the hoist have been as follows, and no change in costs is expected:

Direct materials	\$ 38
Direct labor	37
Variable overhead	17
Fixed overhead*	45
Total unit cost	<u>\$137</u>

*Depreciation accounts for two-thirds of the fixed overhead.
The balance is for other fixed overhead costs of the factory that require cash outlays, 60% of which would be saved if production of the parts were eliminated.

The outside supplier offered the \$110 price on a 5-year contract as a once-only offer. It is unlikely it would make such a low price available later. International Hoists would also have to guarantee to purchase at least 7,000 parts for each of the next 5 years.

The new tools that are available would last for 5 years with a disposal value of \$500,000 at the end of 5 years. The old tools are a 5-year MACRS property, the new tools are a 3-year MACRS property, and both use the current MACRS schedules. International Hoists uses straight-line depreciation for book purposes and MACRS for tax purposes. The sales representative selling the new tools stated, "The new tools will allow direct labor and variable overhead to be reduced by \$21 per unit." Lee thinks

this estimate is accurate. However, he also knows that a higher quality of materials would be necessary with the new tools. He predicts the following costs with the new tools:

Direct materials	\$ 40
Direct labor	25
Variable overhead	8
Fixed overhead	<u>60*</u>
Total unit cost	<u>\$133</u>

*The increase in fixed overhead is caused by depreciation on the new tools.

The company has a 40% marginal tax rate and requires a 12% after-tax rate of return.

1. Calculate the NPV of each of the three alternatives. Recognize the tax implications. Which alternative should Lee select?
2. What are some factors besides the NPV that should influence Lee's selection?

NIKE 10-K PROBLEM

11-72 Nike Capital Budgeting with NPV

Examine **Nike's** financial statements and notes 1 and 3 to those statements in Appendix C.

1. What method of depreciation does Nike use in reporting to shareholders? Do you think it uses the same method for tax purposes? If not, what method do you suppose they use for tax reporting? Why?
2. What is the original cost of the machinery and equipment currently used by Nike? If Nike generally invests about \$800 million per year in machinery and equipment, what is the average useful life of its machinery and equipment?
3. Nike's Statement of Cash Flows shows that the company invested \$695 million in property, plant, and equipment during fiscal 2021. Assume that these assets have a useful life of 5 years and that Nike requires a 14% pretax rate of return. Compute the minimum average annual pretax net cash inflow that would justify this investment.
4. Using the \$695 million of investment and the net cash flow you computed in requirement 3 (and assuming zero residual value), determine the investment's a) payback period and b) accounting rate of return on average investment.

EXCEL APPLICATION EXERCISE

11-73 Net Present Value and Payback Period for a Purchase Decision

Goal: Create a spreadsheet to compute the NPV and payback period to assist with a purchase decision. Use the results to answer questions about your findings.

Scenario: **Amazon.com** is planning to purchase a new bar-coding machine for one of its warehouses. You have been asked to prepare a simple analysis to determine whether Amazon should purchase the machine. The bar-coding machine costs \$60,000. It has a 5-year economic life and an estimated residual value of \$10,000. The estimated annual net cash flow from the machine is \$16,000. Amazon.com's required rate of return is 16%.

When you have completed your spreadsheet, answer the following questions:

1. What is the machine's NPV?
2. What is the machine's payback period?
3. Should Amazon.com purchase the machine? Why or why not?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create bold-faced headings that contain the following:
Row 1: Chapter 11 Decision Guideline
Row 2: Amazon.com
Row 3: Analysis for Purchase of Bar-Coding Machine
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–H.

4. In row 7, create the following bold-faced headings:

Column A: Cash Outflow

Column B: Calculations

Column D: Annualized Cash Flows

5. Center the heading in column A, row 7 and then shade the heading as follows:

Patterns tab: Color: Lightest gray (above white)

Note: Adjust column width as necessary.

6. Merge and center the heading in column B, row 7 across columns B–C.

7. Merge and center the heading in column D, row 7 across columns D–H and shade the heading as follows:

Patterns tab: Color: Lightest gray (above white)

8. In row 8, create the following bold-faced, center-justified column headings:

Column A: Investment

Column B: Net Present Value

Column C: Payback Period

Column D: Year 1

Column E: Year 2

Column F: Year 3

Column G: Year 4

Column H: Year 5

Note: Adjust the width of columns B and C as necessary.

9. Use the scenario data to fill in the investment and annualized cash flows for each of the 5 years.

Note: The amount in the Investment column should be entered as a negative amount because it represents cash outflow. Be sure to include the machine's residual value in the appropriate column when entering the Annualized Cash Flows data.

10. Use the NPV function to calculate the NPV of the machine in column B, row 9.

Click Insert on the tool bar and select Function. Then do the following:

Function category: Financial

Function name: NPV

Complete the fill-in form that appears with the appropriate data from the scenario.

Hint: Go to "Help" and search the topic "NPV." Review the help text that appears. Carefully read the examples given and their associated formulas. Use the formula that matches the scenario data for the problem.

11. Enter a formula to calculate the payback period in column C, row 9. Ensure a positive result by using the absolute value function in your payback formula. (The formula can be found in the chapter.)
12. Modify the format of the payback period result by clicking in the cell containing the results. At the end of the formula that appears in the formula bar, type the following: & "years". Right justify the result.
13. Format row 9, columns A–B and columns D–H as follows:

Number tab:	Category:	Currency
	Decimal places:	2
	Symbol:	\$
	Negative numbers:	Red with parentheses

14. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

11-74 Capital Budgeting, Sensitivity Analysis, and Ethics

Abrielle Rossi had recently been appointed controller of the soup division of a major food company. The division manager, Asim Sharma, was known as a hard-driving, intelligent, uncompromising manager. He had been very successful and was rumored to be on the fast track to corporate top management, maybe even in line for the company presidency. One of Abrielle's first assignments was to prepare the financial analysis for a new soup, Delhi Chicken. This product was especially important to Sharma because he was convinced that it would be a success and thereby a springboard for his ascent to top management.

Rossi discussed the product with the food lab that had designed it, with the market research department that had tested it, and with the finance people who would have to fund its introduction. After putting together all the information, she developed the following optimistic and pessimistic sales projections:

	Optimistic	Pessimistic
Year 1	\$ 1,600,000	\$ 800,000
Year 2	3,600,000	1,200,000
Year 3	5,000,000	1,000,000
Year 4	8,000,000	800,000
Year 5	10,000,000	400,000

The optimistic predictions assume a successful introduction of a popular product. The pessimistic predictions assume that the product is introduced but does not gain wide acceptance and is terminated after 5 years. Rossi thinks the most likely results are halfway between the optimistic and pessimistic predictions.

Rossi learned from finance that this type of product introduction requires a predicted pretax rate of return of 16% before top management will authorize funds for its introduction. She also determined that the contribution margin should be about 50% on the product but could be as low as 42% or as high as 58%. Initial investment would include \$3.5 million for production facilities and \$2.5 million for advertising and other product introduction expenses. The production facilities would have a value of \$1.2 million after 5 years.

Based on her preliminary analysis, Rossi recommended to Sharma that the product not be launched. Sharma was not pleased with the recommendation. He claimed that Rossi was much too pessimistic and asked her to redo her numbers so that he could justify the product to top management.

Rossi carried out further analysis, but her predictions came out no different. She became even more convinced that her projections were accurate. Yet, she was certain that if she returned to Sharma with numbers that did not support introduction of the product, she would incur his wrath. And he could be right—that is, there is so much uncertainty in the forecasts that she could easily come up with believable numbers that would support going forward with the product. She would not believe them, but she believed she could convince top management that they were accurate.

The entire class could role-play this scenario or it could be done in teams of three to six persons. Here, it is acted out by a team.

Choose one member of the team to be Abrielle Rossi and one to be Asim Sharma.

1. With the help of the entire team except the person chosen to be Sharma, Rossi should prepare the capital-budgeting analysis used for her first meeting with Sharma.
2. Next, Rossi should meet again with Sharma. They should try to agree on the analysis to take forward to top management. As they discuss the issues and try to come to an agreement, the remaining team members should record all the ethical judgments each discussant makes.
3. After Rossi and Sharma have completed their role-playing assignment, the entire team should assess the ethical judgments made by each and recommend an appropriate position for Rossi to take in this situation.

INTERNET EXERCISE

11-75 Capital Budgeting at Carnival Corporation

Many companies strive to continue to grow and develop. Some companies grow through the expansion of existing operations and increased utilization of existing assets. Others grow through the acquisition of firms within their industry or by purchasing a firm that opens up new direction for them. No matter which method a company selects, capital budgeting is an important part of a systematic expansion plan. Consider the expansion activities of **Carnival Corporation**, the cruise ship company.

1. Go to Carnival Corporation's home page at www.carnivalcorp.com. What cruise lines does Carnival own or have an interest in? Now go to the page "Corporate Information." How many ships does Carnival currently operate? What type of plans does the firm list for future expansion? What does this information indicate about the intent of the firm?
2. As we can see, the firm has looked ahead to buying new ships. To get additional information, click on the link to "Investor Relations" and then "Financial Information." Select the most recent annual report and open it. Go to the section on Highlights near the beginning of the report. Looking at passengers carried and passenger capacity, examine how capacity available and capacity used have changed over the past 5 years.
3. Now examine the CEO's letter. What does the letter tell the investor about new investment during the current year and investment plans for the future?
4. Let's look at the Statement of Cash Flows to see if we can determine where the firm got the cash to pay for the new ships. Based on your review of the cash flow statement, how much money did

the firm invest in new property and equipment? Did Carnival generate the cash to pay for this investment from operations or from financing activities?

Solutions to Exercises in Compound Interest, Problem 11-A1

The general approach to these exercises centers on one fundamental question: Which of the two basic tables am I dealing with? No calculations should be made until after this question is answered with assurance. If you made any errors, it is possible that you used the wrong table.

1. From Table B-1, Appendix B, p. 778:

- a. \$19,587.50
- b. \$15,522.50
- c. \$10,047.50

The \$25,000 is an amount of future worth. You want the PV of that amount:

$$PV = \$25,000 \times \frac{1}{[(1 + i)^n]}$$

The conversion factor, $1/(1 + i)^n$, is on line 5 of Table B-1. Substituting,

$$PV = \$25,000 (0.7835) = \$19,587.50$$

$$PV = \$25,000 (0.6209) = \$15,522.50$$

$$PV = \$25,000 (0.4019) = \$10,047.50$$

Note that the higher the interest rate, the lower the PV.

2. From Table B-2, Appendix B, p. 781:

- a. \$8,659.00
- b. \$7,581.60
- c. \$5,981.20

The \$2,000 withdrawal is a uniform annual amount, an annuity. You need to find the PV of an annuity for 5 years:

$$PV_A = \text{annual withdrawal} \times F, \text{ where } F \text{ is the conversion factor.}$$

Substituting:

$$PV_A = \$2,000 (4.3295) = \$8,659.00$$

$$PV_A = \$2,000 (3.7908) = \$7,581.60$$

$$PV_A = \$2,000 (2.9906) = \$5,981.20$$

3. From Table B-2:

- a. \$23,097.36
- b. \$26,379.66

You have \$100,000, the PV of your contemplated annuity. You must find the annuity that will just exhaust the invested principal in 5 years:

$$PV_A = \text{annual withdrawal} \times F$$

$$\$100,000 = \text{annual withdrawal} \times 4.3295$$

$$\text{annual withdrawal} = \$100,000 \div 4.3295$$

$$= \$23,097.36$$

$$\$100,000 = \text{annual withdrawal} \times 3.7908$$

$$\text{annual withdrawal} = \$100,000 \div 3.7908$$

$$= \$26,379.66$$

4. Amounts are in thousands. From Table B-1: LeBron's contract is preferable; its PV exceeds that of Kobe's contract by \$43,143 – \$35,441 = \$7,702. Note that the nearer dollars are more valuable than the distant dollars.

Year	Present Value at 16% from Table B-1	Present Value of LeBron's Contract	Present Value of Kobe's Contract
1	0.8621	\$17,242	\$ 3,448
2	0.7432	11,891	5,946
3	0.6407	7,688	7,688
4	0.5523	4,418	8,837
5	0.4761	1,904	9,522
		<u>\$43,143</u>	<u>\$35,441</u>

Cost Allocation

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Describe the general framework for cost allocation.
2. Allocate the variable and fixed costs of service departments to other organizational units.
3. Use the direct and step-down methods to allocate service department costs to user departments.
4. Allocate costs from producing departments to products or services using the traditional and ABC approaches.
5. Allocate costs associated with customer actions to customers.
6. Allocate the central corporate costs of an organization.
7. Allocate joint costs to products using the physical-units and relative-sales-value methods.

► H.L. DISPLAY

H.L. Display, active across 70 countries, is now a global leader in store fittings. The business was established in 1954 by Swedish travelling salesman Harry Lundvall. At the time, stores were just making the switch to self-service; at most grocers, products were badly displayed and it was difficult to find the price labels. By the 1990s, Lundvall's business had been taken over by his granddaughter and the global expansion began. Today, H.L. Display's merchandising installations can be found in nearly 300,000 stores worldwide. The company serves **Asda**, **Marks and Spencer**, and **Budgens** in the United Kingdom, **SPAR** and **Co-op** in Switzerland, **Innocent** in Holland, **DEKO Zakupy** in Poland, **Ben & Jerry's** and **Sensodyne & GSK** in Sweden, **K-Supermarkets** in Finland, and **Auchan** in France. In 2020, H.L. Display had sales revenues of around \$170 million with 10.7% earnings before interest, taxes, and amortization (EBITA). One of the advantages H.L. Display offers companies is large and flexible production capacity. While this gives the company a competitive advantage, accounting for capacity costs, most of which are fixed manufacturing overhead, is a real challenge.

Should H.L. Display allocate these fixed overhead costs to individual products or services when assessing their profitability? When estimating a customer's profitability? When evaluating a manager's performance? These are important questions for managers as well as for accountants.

Many managerial decisions require information about product or customer profitability. For example, a sales manager at H.L. Display knows that large customers such as Asda require different kinds and amounts of H.L. Display's resources than small specialty stores. The mix of products that Asda orders from H.L. Display is vastly different from products ordered by specialty stores, as are the costs of ordering, shipping, and customer service. Improvements in computer technology and cost-allocation techniques enable better measurements of both product and customer profitability.

Cost allocations also can affect the evaluation of managers. Some companies evaluate managers based partly on the income of the organizational segment they manage. Therefore, both accountants and managers are concerned with how the allocations affect segment income.

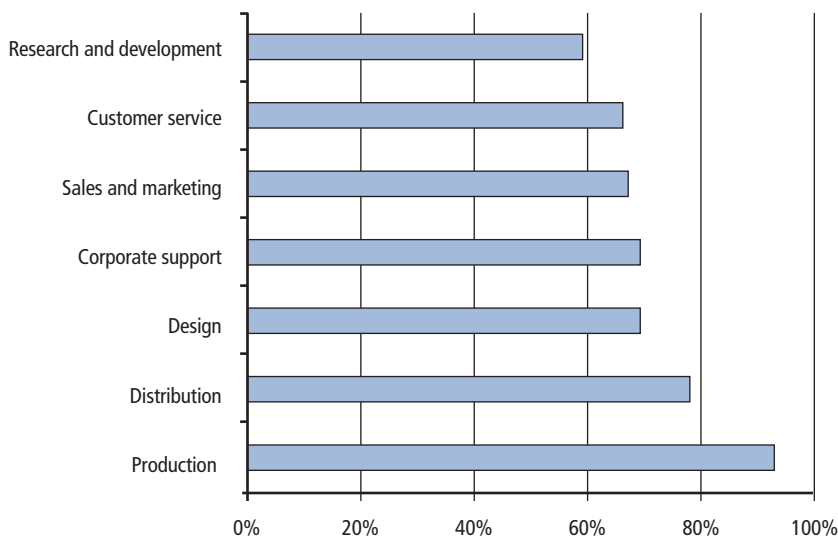
Cost allocation is of strategic importance to most businesses. For example, many faculty use a university's computer systems for both teaching and performing government-funded research. How much

of the computer systems' costs should the university assign to the research projects? Or consider the cost to a law firm of preparing a particular case. What is the total cost of the effort, including various support costs including the cost of renting the law firm's offices and the cost of its law library? Finally, suppose a company uses a machine to make two different product lines. How much of the cost of the machine should the company assign to each product line? These are all problems of cost allocation, the subject of this chapter. ■

A General Framework for Cost Allocation

As described in Chapter 4, cost-allocation methods are an important part of a company's cost accounting system—the techniques it uses to determine the cost of a product, service, customer, or other cost object. Why? Because less than half of most companies' operating costs can be traced directly to products and services. The rest of a company's costs must either be allocated using a cost-allocation base or left unallocated.

Because the profitability of their products, services, or customers is important to most organizations, we focus on how companies assign direct costs and indirect (allocated) costs to these cost objects. For external financial reporting purposes, companies must assign all production costs (and no other costs) to products. However, for internal management purposes, they can assign to products whatever costs are useful for management's decisions. For management purposes, companies trace or allocate many of the costs in their value-chain functions to products or customers. The following graph shows the percent of costs of several value-chain functions that companies trace or allocate to products or customers:



After developing a general framework for allocation, we will take a careful look at the development and use of allocation systems. We will use the framework in Exhibit 12-1 to show how cost allocation fits into the overall cost accounting system. Each of the arrows in Exhibit 12-1 represents an assignment of some costs to a cost objective. We show four types of cost objectives—service departments, producing departments, products/services, and customers. The cost accounting system first accumulates costs and assigns them to organizational units. We will call each unit a department. There are two types of departments: (1) **producing departments**, where employees work on the organization's products or services, and (2) **service departments**, which exist only to support other departments or customers. Examples of service departments are personnel departments, laundry departments in hospitals, technical support centers, and facility management departments. We can trace the *direct* costs to each department, shown by the arrows labeled 1. In contrast, we have to *allocate* the *indirect* costs, such as rent for facilities used by more than one department. We label these allocations as 2 in Exhibit 12-1.



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H.L. Display does store fittings for many well known stores such as Asda, Marks and Spencer, Ben & Jerry's, and others. Everyone is sure to have seen their work.

Objective 1

Describe the general framework for cost allocation.

producing departments

Departments where employees work on the organization's products or services.

service departments

Units that exist only to support other departments or customers.

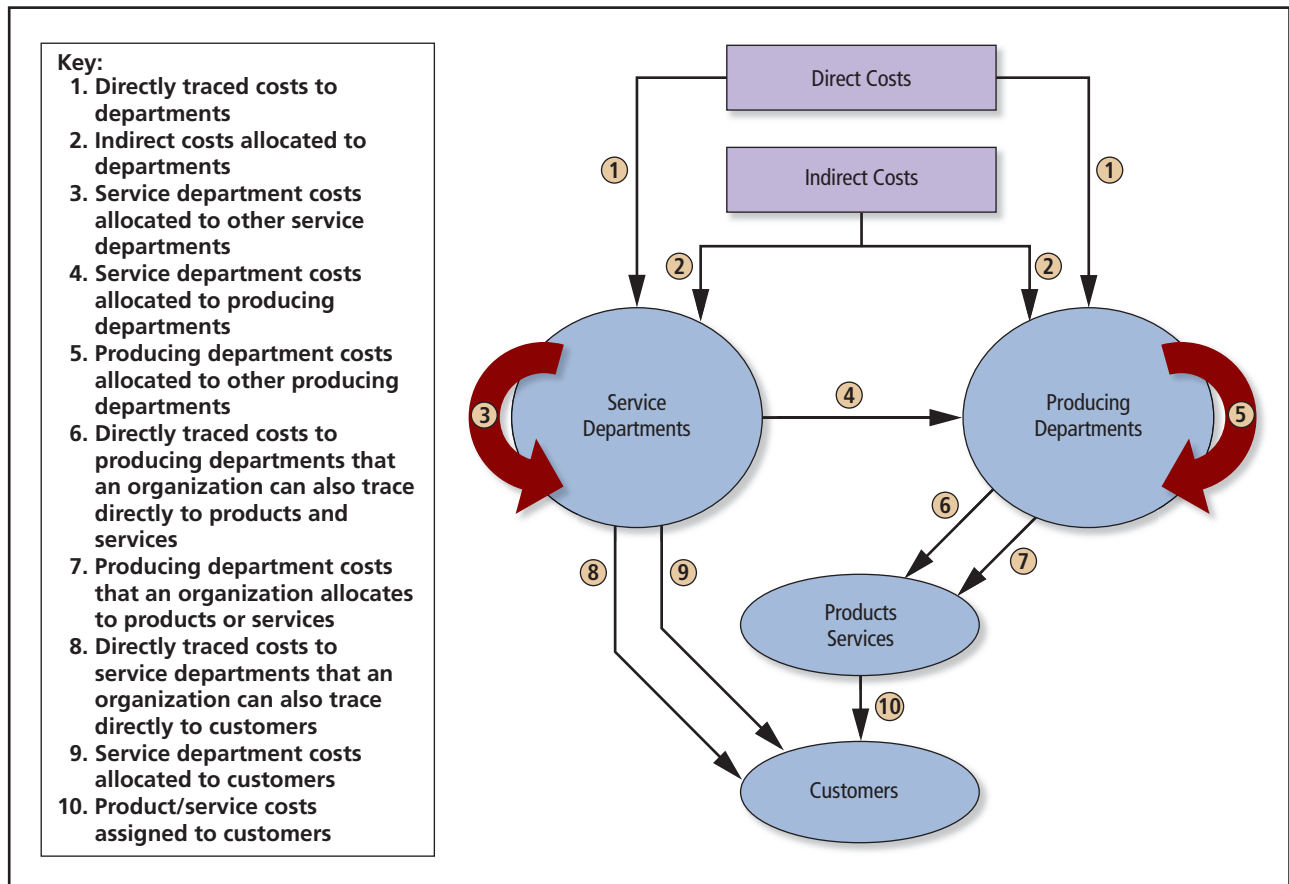


Exhibit 12-1

Framework for Cost Accounting Systems

After assigning resource costs 1 and 2 to producing and service departments, we examine service departments that provide services to other service departments. An example is personnel services provided to employees in the facilities maintenance department. Arrow 3 represents the allocation of these costs. After making assignments 1, 2, and 3, managers can evaluate the performance of each service department.

Many companies next develop allocation methods to assign service department costs to the producing departments. Why? Because managers want to know total costs of production, both costs within the producing-department and the cost of using resources from service departments. We show these assignments as 4 in Exhibit 12-1. Notice that direct service department costs—labeled as 1—become indirect costs to the producing department when they are part of allocation 4. For example, the salaries of human resources personnel are a direct departmental cost for the human resources department. However, when we allocate these costs, along with all other human resource department costs, to producing departments, they become indirect to the producing department.

Sometimes, producing departments transfer items to other producing departments as well as producing products or services. For example, a producing department may process a chemical resulting in several finished products and several products that need further processing in another department. We transfer the costs of products that need further processing to other producing departments—labeled as 5 in Exhibit 12-1.

At this point, we have accumulated all service department and producing department costs into the producing departments. The next step is to assign costs to products or services. There are significant producing department costs that are directly traceable to products and services. We indicate these costs as 6; examples are direct materials and direct labor. The other producing department costs are allocated to products and services, labeled as 7 in Exhibit 12-1. Again, because we have changed the cost objectives, some costs that were directly traceable to the

producing departments will be indirect when the cost objective is the various products or services; examples include salaries of production supervisors, supplies, and most equipment costs.

Some service department activities support customers rather than the production process; examples include order processing and customer service activities. Therefore, many companies assign the costs of such services to customers rather than to the producing departments. We can trace some of these costs directly to customers—labeled 8 in Exhibit 12-1. Examples are sales commissions and dedicated customer support, such as presales negotiations. We then allocate the other customer-related services, such as order processing—arrow 9 in Exhibit 12-1. The last step shown in Exhibit 12-1 is to assign the cost of products or services to customers who purchase them. After this last assignment, a company can determine customer profitability by subtracting costs 8, 9, and 10 from customer revenue.

Why is it important to directly trace and allocate customer-related service department costs to customers (8 and 9 in Exhibit 12-1) rather than assigning them first to producing departments and then to customers? If we assigned these costs to producing departments and then to products, the allocation to products would be based on production-related output measures that may have little relationship to the cause of customer-service costs. This would cause cost distortions to both the product and customer cost objectives. We discuss this in detail later in the chapter.

Most of the direct and indirect costs for each department will be traced or allocated to the department's outputs, although some costs may remain unallocated if there is no logical basis for allocating them. Allocating indirect costs requires accountants to identify and measure a department's output (to which it will allocate costs) and determine an appropriate cost-allocation base. For example, the pediatrics department of a medical clinic might allocate its indirect costs to patients based on physician time per patient. Or a manufacturing firm might allocate its indirect assembly costs to units assembled based on machine hours used. Or the tax department of a CPA firm might allocate indirect costs to clients based on professional hours spent.

As indicated in Chapter 4, when selecting a cost-allocation base, we try to use cost drivers that have a logical cause-and-effect relationship to costs being allocated. For example, a logical cost-allocation base for allocating building rent costs to departments is the square feet that each department occupies. Other logical cost-allocation bases include cubic feet for allocating depreciation of heating and air conditioning equipment and total direct cost for allocating general administrative expense. Some individual indirect costs are important enough that we allocate them individually. For example, we would allocate the cost of professional labor for a law firm to departments, jobs, and projects using labor hours used. Other costs are not important enough to justify being allocated individually. We group these costs together into a cost pool, and allocate the pool of costs to cost objectives using a single cost-allocation base. For example, building rent, utilities cost, and janitorial services may be in the same cost pool because a company allocates all of them on the basis of square footage of space occupied. Similarly, a university could pool all the operating costs of its registrar's office and allocate them to individual colleges on the basis of the number of students in each college.

The next section looks in detail at allocation of service department costs, and the following sections focus on allocation to products or services and to customers.

Allocation of Service Department Costs

In our general framework shown in Exhibit 12-1, we label service department allocations as 3, 4, and 9. Before discussing methods of allocation, we give some general guidelines that managers should consider when designing allocation systems.

General Guidelines

Following are three general guidelines for allocating service department costs:

1. Allocate variable- and fixed-cost pools separately. Each service department can contain multiple cost pools if more than one cost driver causes the department's costs. At a minimum, there should be a variable-cost pool and a fixed-cost pool. The variable- and fixed cost pools should be based on the fixed and variable cost specifications in a department's flexible budget.

Objective 2

Allocate the variable and fixed costs of service departments to other organizational units.

2. Establish the cost-allocation procedure in advance of rendering the service rather than after the fact. This approach establishes the “rules of the game” so that all departments can plan appropriately.
3. Evaluate performance using flexible budgets for each service (staff) department, just as for each production or operating (line) department. Managers should evaluate the performance of a service department by comparing actual costs with a budget, regardless of how the company allocates costs.

Consider an example of a service department—the computer department of a university—that serves two major users, the School of Business and the School of Engineering. Suppose there are two major reasons for allocating computer costs to the two schools: (1) predicting economic effects of the use of the computer, and (2) motivating the individuals in the two schools to use computer services most effectively. How should the university allocate the costs of the computer department (salaries, depreciation, energy, materials, and so on) to the two schools?

We begin by analyzing the costs of the computer department in detail. The primary activity performed is computer processing. The university acquired the computer mainframe on a 5-year noncancelable lease. Resources consumed include processing time, operator time, energy, materials, and building space. Suppose the computer department’s flexible budget for the forthcoming year is €100,000 monthly fixed cost plus €200 variable cost per hour of computer time used.

Variable-Cost and Fixed-Cost Pools

Guideline 1 requires the separation of fixed and variable costs. Costs in the variable-cost pool include energy, operator labor costs, and materials. The cost-allocation base for variable-cost pools should be a measure of activity within the departments that causes the variable costs—that is, the cost driver of the variable costs. In our university example, there is only one such cost driver, actual hours of computer time used, so we put all variable costs into one cost pool. The cause-and-effect relationship is clear—the larger the number of hours of computer time used, the higher the total variable costs. Therefore, the university should allocate variable costs as follows:

$$\text{Cost-allocation rate per hour} \times \text{actual hours of computer time used}$$

Costs in the fixed-cost pool include the lease payment on the computers, salaries of managers and supervisors, and building occupancy costs (depreciation, insurance, and so on). These fixed costs do not change with short-term fluctuations in the actual hours of computer time used. Rather, they all depend on the initial decision about the capacity of computer services the university required. Therefore, the best cost-allocation base is the predicted level of usage of computer hours, a prediction made when the university decided how large a computer operation it needed. This results in the following lump-sum allocation each month:

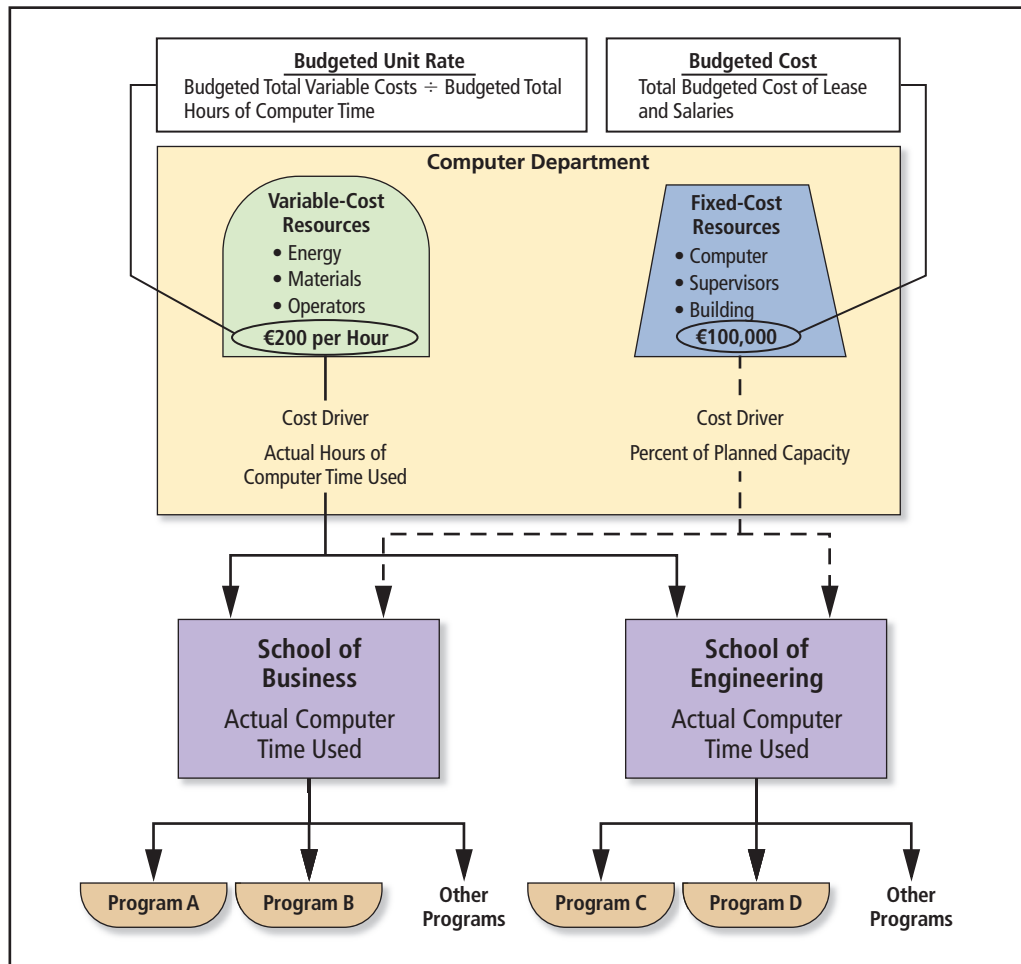
$$\text{Percentage of predicted usage} \times \text{monthly fixed cost}$$

Budgeted Cost-Allocation Rates

To satisfy guideline 2, companies should determine in advance the cost-allocation rate per hour for variable costs and the monthly lump-sum fixed cost, based on the flexible budget. In this example, the budgeted variable cost-allocation rate is €200 per hour, the flexible budget for variable costs, which we can determine by dividing the total budgeted costs of energy, operators, and materials by the total budgeted hours of computer time. The budgeted monthly fixed cost is the lump-sum flexible-budget amount, €100,000. Neither the budgeted cost-allocation rate per hour nor the budgeted fixed cost is affected by actual results. Exhibit 12-2 shows the cost-allocation system for the computer department.

The use of budgeted cost rates rather than actual cost rates for allocating costs of service departments protects the user departments from inefficiencies in the service departments. If an organization were to allocate *actual* total service department cost, it would hold user department managers responsible for costs beyond their control and provide less incentive for service departments to be efficient. Both effects are undesirable.

Consider the allocation of variable costs to the Engineering School when it uses 500 hours of computer time. Suppose inefficiencies in the computer department caused the variable costs of providing those 500 hours of service to be €120,000 instead of the $500 \text{ hours} \times €200 = €100,000$ budgeted. A good cost-allocation scheme would allocate only the €100,000 to the Engineering School and would let the €20,000 remain as an unallocated unfavorable budget variance of the

**Exhibit 12-2**

Allocation of Variable- and Fixed-Cost Pools

computer department. This allocation method holds computer department managers responsible for the €20,000 variance, as specified in guideline 3. It also may reduce the resentment of user managers. User department managers sometimes complain more vigorously about uncertainty over allocations and the poor cost control in a service department than about the choice of a cost-allocation base (such as direct-labor dollars or number of employees). Such complaints are less likely if the service department managers have budget responsibility and the user departments are protected from short-run price fluctuations and inefficiencies.

Allocating the budgeted fixed costs is similar. Costs that differ from the flexible-budget fixed cost of €100,000 per month are the responsibility of the computer department managers and should not be allocated to the user departments.

Allocating Fixed Costs Based on Capacity Available

Let's consider further the allocation of fixed costs based on predicted usage. This means that the allocation will be based on the long-run capacity available to the user, regardless of actual usage from month to month. The reasoning is that long-range planning regarding the expected required overall level of service, not short-run fluctuations in actual usage, affects the level of fixed costs.

Suppose the deans had originally predicted the long-run average monthly usage by the School of Business at 210 hours, and by the School of Engineering at 490 hours, a total of 700 hours. These estimates resulted in a set of committed fixed costs that remain largely uncontrollable over many years. We should allocate the fixed-cost pool as follows:

	Business	Engineering
Fixed costs per month		
210/700, or 30% of €100,000	€30,000	
490/700, or 70% of €100,000		€70,000

A major strength of using capacity available rather than capacity used when allocating budgeted fixed costs is that actual usage by user departments does not affect the short-run allocations to other user departments. Such a budgeted lump-sum approach is more likely to have the desired motivational effects with respect to the ordering of services in both the short run and the long run.

In practice, companies often inappropriately allocate fixed-cost pools on the basis of capacity used, not capacity available. Suppose for two successive months the computer department's actual fixed costs were exactly the €100,000 budgeted. The university allocated these costs based on actual hours used by the consuming departments. Compare the costs borne by the two schools in the first month when business uses 210 hours and engineering 490 hours, as originally predicted.

Total fixed costs incurred, €100,000	
Business: $210/700 \times €100,000 =$	€ 30,000
Engineering: $490/700 \times €100,000 =$	<u>70,000</u>
Total cost allocated	<u>€100,000</u>

What happens if business uses only 110 hours during the following month, and engineering still uses 490 hours?

Total fixed costs incurred, €100,000	
Business: $110/600 \times €100,000 =$	€ 18,333
Engineering: $490/600 \times €100,000 =$	<u>81,667</u>
Total cost allocated	<u>€100,000</u>

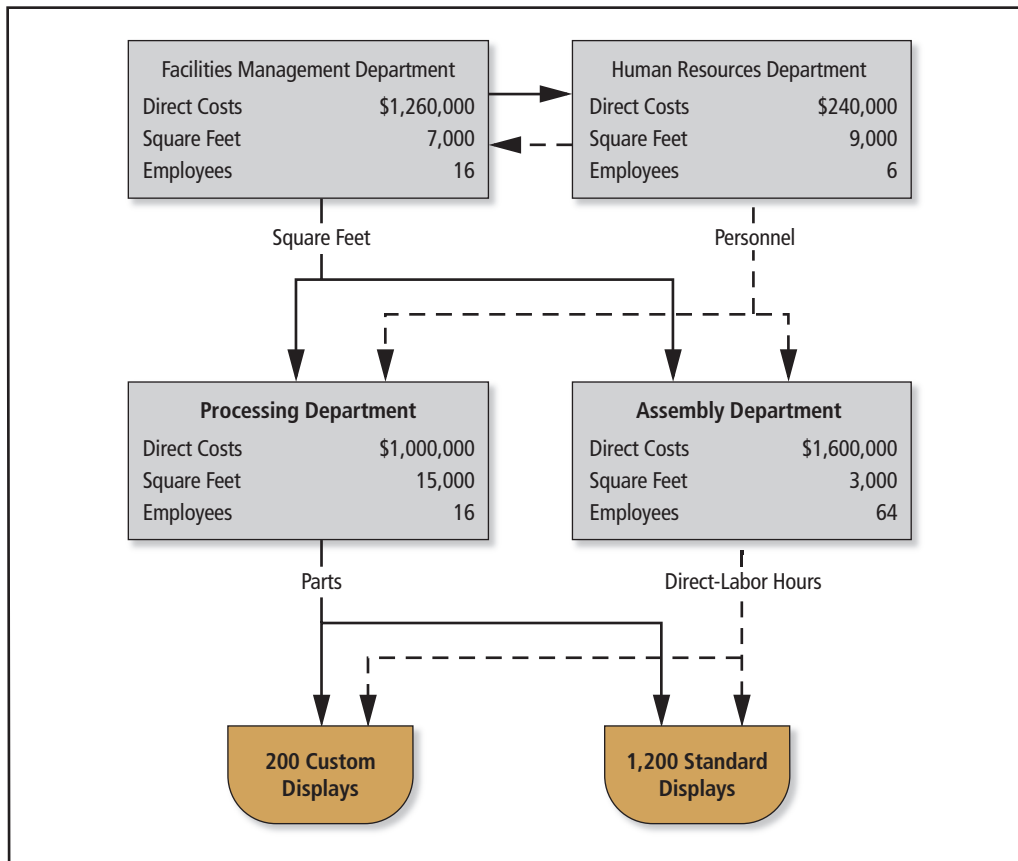
Engineering's usage was unchanged, but it must bear an additional cost of $(€81,667 - €70,000) = €11,667$, an increase of 17%. Its short-run costs depend on what other consumers have used, not solely on its own actions. This phenomenon is caused by a faulty allocation method for the fixed portion of total costs, a method in which one department's usage affects the allocation to other departments. We can avoid this weakness by using a predetermined lump-sum allocation of fixed costs based on budgeted usage, but this approach is not without problems itself. If a company allocates fixed costs on the basis of long-range plans, there is a natural tendency on the part of managers to underestimate their planned usage and thus obtain a smaller fraction of the cost allocation. Top management can counteract these tendencies by monitoring predictions and by following up and using feedback to keep future predictions more honest.

In some organizations, there are even definite rewards for managers who make accurate predictions. Moreover, some cost-allocation methods provide for penalties for underpredictions. For example, suppose a manager predicts usage of 210 hours and then demands 300 hours. The manager either doesn't get the hours or pays a higher rate for every hour beyond 210 in such systems.

Allocating Service Department Costs to Producing Departments

Recall from Exhibit 12-1 on p. 500 that assignment type 4 is allocating service department costs to producing departments. We now explore methods commonly used for this type of allocation. Suppose one of **H.L. Display**'s manufacturing facilities assembles parts into custom and standard displays that the business sells to **Marks and Spencer**, **Asda**, and **Budgens**. The facility has two producing departments, processing and assembly. There are also two service departments, facilities management (rent, power, insurance, janitorial services, and some corporate resources such as administration and engineering) and human resources. In this section of the chapter, we treat the processing and assembly departments as cost objectives to which we allocate service department costs. Normally there would be at least two cost pools in each service department, one for variable costs and one for fixed costs. However, for simplicity we will assume that all costs are variable. We would allocate fixed costs in a similar manner but with different cost-allocation bases.

Let's assume that a single plausible and reliable cost driver serves as a cost-allocation base for the costs of each service department and that all resource costs vary in proportion to this cost driver. Managers have determined that the cost driver for facilities management costs is the square footage occupied and the cost driver for human resources costs is the number of employees.

**Exhibit 12-3**

H.L. Display's Processing Facility: Service Department Allocation

Exhibit 12-3 shows the costs for a recent month when the company produced 200 custom and 1,200 standard displays. It also shows the square footage occupied and number of employees for each department. Note that facilities management provides services for the human resources department in addition to providing services for the producing departments and that human resources aids employees in facilities management as well as those in production departments.

There are two popular methods for allocating service department costs to producing departments in such cases: the direct method and the step-down method.

DIRECT METHOD The **direct method** ignores other service departments when allocating any given service department's costs to the producing departments. For example, the direct method ignores the services that facilities management provides for human resources and the services that human resources provides to facilities management.

Consider facilities management costs. The direct method allocates these costs to the processing and assembly departments based on the relative square footage occupied by each of the two departments.

- Total square footage in producing departments = $15,000 + 3,000 = 18,000$
- Facilities management cost allocated to processing department = $(15,000 \div 18,000) \times \$1,260,000 = \$1,050,000$
- Facilities management cost allocated to assembly department = $(3,000 \div 18,000) \times \$1,260,000 = \$210,000$

Likewise, the direct method allocates human resources department costs to the producing departments on the basis of the relative number of employees in the producing departments.

- Total employees in producing departments = $16 + 64 = 80$
- Human resources costs allocated to processing department = $(16 \div 80) \times \$240,000 = \$48,000$
- Human resources costs allocated to assembly department = $(64 \div 80) \times \$240,000 = \$192,000$

Objective 3

Use the direct and step-down methods to allocate service department costs to user departments.

direct method

A method for allocating service department costs that ignores other service departments when allocating any given service department's costs to the operating departments.

step-down method

A method for allocating service department costs that recognizes that some service departments support the activities in other service departments as well as those in operating departments.

STEP-DOWN METHOD The **step-down method** recognizes that some service departments support the activities in other service departments as well as those in producing departments. This method allocates the costs of one service department at a time, assigning the costs to the producing departments and to the remaining service departments. Once we have allocated a department's costs, we never allocate costs back to the department in a later step.¹

To apply the step-down method, we need to choose the sequence in which to allocate service department costs. Although other sequences are possible, we recommend starting with the service department that renders the greatest service (as measured by costs) to the other service departments. The last service department in the sequence is the one that renders the least service to the other service departments.

Exhibit 12-4 illustrates the step-down method for our example. We allocate facilities management department costs first. Why? Because facilities management renders more support to human resources than human resources provides to facilities management. How should we determine which of the two service departments provides more service to the other? We can carry out step 1 of the step-down method with facilities management costs allocated first, and then repeat it assuming we allocate personnel costs first. With facilities management costs allocated first, we allocate \$420,000 to human resources, as shown in Exhibit 12-4. If we had allocated human resources first, we would have allocated $(16 \div 96) \times \$240,000 = \$40,000$ to facilities management. Because \$40,000 is smaller than \$420,000, we allocate facilities management first. After allocating facilities management costs, we do not allocate any costs back to facilities management, even though human resources provides services to facilities management.

The next step is to allocate human resources cost. The \$660,000 of human resources costs allocated to the producing departments includes the \$420,000 allocated to human resources from facilities management in addition to the \$240,000 of direct human resources department costs. Notice that we ignored services provided by a service department to itself. Even though there are six employees in human resources and facilities maintenance occupies 7,000 square feet of space, these numbers do not affect the service department cost allocations.

Now examine the last column of Exhibit 12-4. Before allocation, the four departments incurred costs of \$4,100,000. In step 1, we deducted \$1,260,000 from facilities management and added it to the other three departments. There was no net effect on the total cost. In step 2, we deducted \$660,000 from human resources and added it to the remaining two departments. Again, total cost was unaffected. After allocation, all \$4,100,000 remains, but it is all in the processing and assembly departments. Nothing is left in facilities management or human resources.

	Facilities Management	Human Resources	Processing	Assembly	Total
Direct department costs before allocation	\$ 1,260,000	\$ 240,000	\$1,000,000	\$1,600,000	\$4,100,000
Step 1					
Facilities Management	\$(1,260,000)	$(9 \div 27) \times$ \$1,260,000 = \$ 420,000	$(15 \div 27) \times$ \$1,260,000 = \$ 700,000	$(3 \div 27) \times$ \$1,260,000 = \$ 140,000	
Step 2					
Human Resources		\$ (660,000)	$(16 \div 80) \times$ \$ 660,000 = \$ 132,000	$(64 \div 80) \times$ \$ 660,000 = \$ 528,000	
Total cost after allocation	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$1,832,000</u>	<u>\$2,268,000</u>	<u>\$4,100,000</u>

Exhibit 12-4
Step-Down Allocation

¹There is another method of allocation that allocates costs both forward and backward, called reciprocal allocation, which requires the solution of simultaneous linear equations. This method is discussed in advanced managerial accounting texts but is beyond the scope of this book.

COMPARISON OF THE METHODS Compare the costs of the producing departments under direct and step-down methods, as shown in Exhibit 12-5. Note that the method of allocation can significantly affect the costs. Processing appears to be a more expensive operation to a manager using the direct method than it does to one using the step-down method. Conversely, assembly seems more expensive to a manager using the step-down method.

Which method is better? Generally, the step-down method. Why? Because it recognizes the effects of the most significant support provided by service departments to other service departments. The greatest virtue of the direct method is its simplicity. If the two methods do not produce significantly different results, many companies elect to use the direct method because it is easier for managers to apply and understand.

COSTS NOT RELATED TO COST DRIVERS Our example illustrating direct and step-down allocation methods assigned all costs using a single cost driver as a cost-allocation base. For example, we assumed that we could use square footage occupied to allocate all facilities-management costs. But what if some of the costs in facilities management do not vary proportionately to the cost-driver square footage? Some may vary with another cost driver. For example, heating costs may vary with cubic footage rather than square footage, and power costs may vary with megawatt hours used. Other costs—supervisors' salaries, for example—may be fixed over large ranges of cost-driver activity and therefore require predicted capacity as a cost-allocation base. For still other costs it may be nearly impossible to identify an appropriate cost-allocation base.

We suggest two alternatives for situations where costs are not related to a single cost driver:

1. Identify multiple cost pools, each with its own cost-allocation base. Divide facilities-management costs into two or more cost pools and use a different cost-allocation base to allocate the costs in each pool via the direct or step-down method. For cost pools with costs that vary with the cost-allocation base, the allocation is straightforward—the use of more units of the cost-allocation base result in the allocation of more cost. Fixed cost pools are more complex. A company may allocate fixed costs on the basis of a long-term cause-effect relationship. While supervisors' salaries may not change immediately if the department changes the amount of square footage it uses, growth in the size of the department may eventually lead to the need for more supervisors. Remember to use the budgeted amount of the cost-allocation base, not the actual amount used, to allocate these fixed costs. That is, we might use budgeted square footage for allocating supervisors' salaries. A fixed-cost pool that does not have a plausible or reliable long-term cost driver might remain unallocated.
2. Allocate all costs by the direct or step-down method using the same cost-allocation base. In our example, we might choose square footage as the cost-allocation base. In this simplified alternative, we implicitly assume that, in the long run, square footage causes all facilities management costs—even if we cannot easily identify a short-term causal relationship. In other words, the need for more square footage may not cause an immediate increase in all facilities management costs, but management may believe that all costs are related to square footage because both costs and the amount of space used change as the size of the department changes.

	Processing		Assembly	
	Direct	Step-Down*	Direct	Step-Down*
Direct costs	\$1,000,000	\$1,000,000	\$1,600,000	\$1,600,000
Allocated from				
facilities management	1,050,000	700,000	210,000	140,000
Allocated from personnel	48,000	132,000	192,000	528,000
Total costs	<u>\$2,098,000</u>	<u>\$1,832,000</u>	<u>\$2,002,000</u>	<u>\$2,268,000</u>

*From Exhibit 12-4

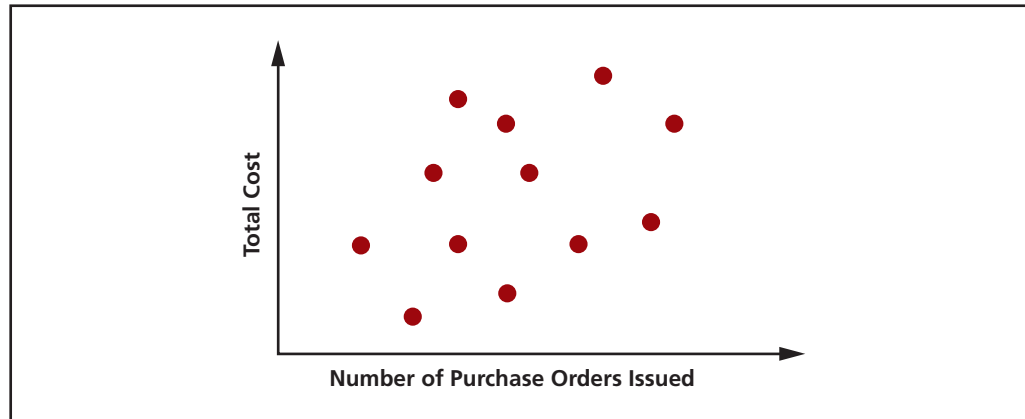
Exhibit 12-5

Direct Versus Step-Down Method

Making Managerial Decisions

Suppose you are on a cross-functional team that is discussing how to allocate the costs of a purchasing department. One team member suggested that “number of purchase orders issued” is

the best cost driver to use as a cost-allocation base. However, a scatter graph of total costs versus number of purchase orders issued shows the following:



Because the data clearly indicate that the single cost driver “number of purchase orders issued” is not a reliable measure of the work done in the department, the team investigated further. It discovered that a significant amount of work of the purchasing department was certifying new vendors in addition to issuing purchase orders. What alternative method of allocation would you recommend?

Answer

Because a large percentage of the work of the purchasing department is not related to the single cost driver “number of purchase orders,” the team should use a second cost pool with another cost-allocation base, such as “number of new vendors.”

Allocation of Costs to Product or Service Cost Objects

cost application

The allocation of total departmental costs to the revenue-producing products or services.

After the allocation of service department costs, we have all costs except unallocated costs residing in the producing departments. All that remains is to allocate the costs in the producing departments to the product or service cost objects. Examples of such cost objects are products such as automobiles, furniture, and newspapers, and services such as bank accounts, patient visits, and student credit hours. Some accountants use the term **cost application** for the allocation of departmental costs to the revenue-producing products or services.

A Traditional Approach

The traditional approach to cost allocation has the following four steps:

1. Divide the costs in each producing department, including both the direct department costs and all the costs allocated to it, into two categories: (1) the direct costs that you can physically trace to the product or service cost objectives and (2) the remainder, the indirect costs, which must be allocated.
2. Trace the direct costs to the appropriate products or services. Note that some costs that are direct to the department will be indirect to the product or service cost objectives—for example, depreciation on the department’s equipment.
3. Select cost pools and related cost-allocation bases in each production department, and assign all the indirect departmental costs to the appropriate cost pool. For example, you might assign a portion of the indirect departmental costs on the basis of direct-labor hours, another portion on the basis of machine hours, and the remainder on the basis of number of parts. Be sure to use separate cost pools for fixed and variable costs.

Objective 4

Allocate costs from producing departments to products or services using the traditional and ABC approaches.

4. Allocate (apply) the costs in each cost pool to the products or services in proportion to their usage of the related cost-allocation base. Apply variable costs on the basis of the actual amount of the cost-allocation base. Apply fixed costs on the basis of the budgeted amount of the cost-allocation base.

Consider our example of the **H.L. Display**'s manufacturing facility. Exhibit 12-6 shows the process map for the facility assuming that the facility uses the step-down method for allocating service department costs. We now shift our focus from the two operating departments as cost objectives to the two types of displays—the products manufactured by the H.L. Display manufacturing facility.

The first step is to determine the operating department costs that we can directly trace to displays. Of the \$1,832,000 total costs in the processing department, we can trace the \$800,000 cost of parts to custom and standard displays, as shown in Exhibit 12-6. Similarly, of the \$2,268,000 total costs in the assembly department, we can directly trace the wages for direct labor, \$50,000 to custom and \$150,000 to standard displays. The remaining costs in the producing departments are indirect costs with respect to the displays, and we will assume they represent fixed-cost resources. You may wonder why there are no direct-labor costs in the processing department. It is because this is a machine intensive department with only indirect labor maintaining the machines.

In step 2, we trace the direct costs to the two display types as shown in Exhibit 12-6. Compare the processing department costs in Exhibits 12-3 and 12-6. How did \$1,000,000 in direct processing department costs in Exhibit 12-3 decrease to only \$800,000 direct costs in Exhibit 12-6?

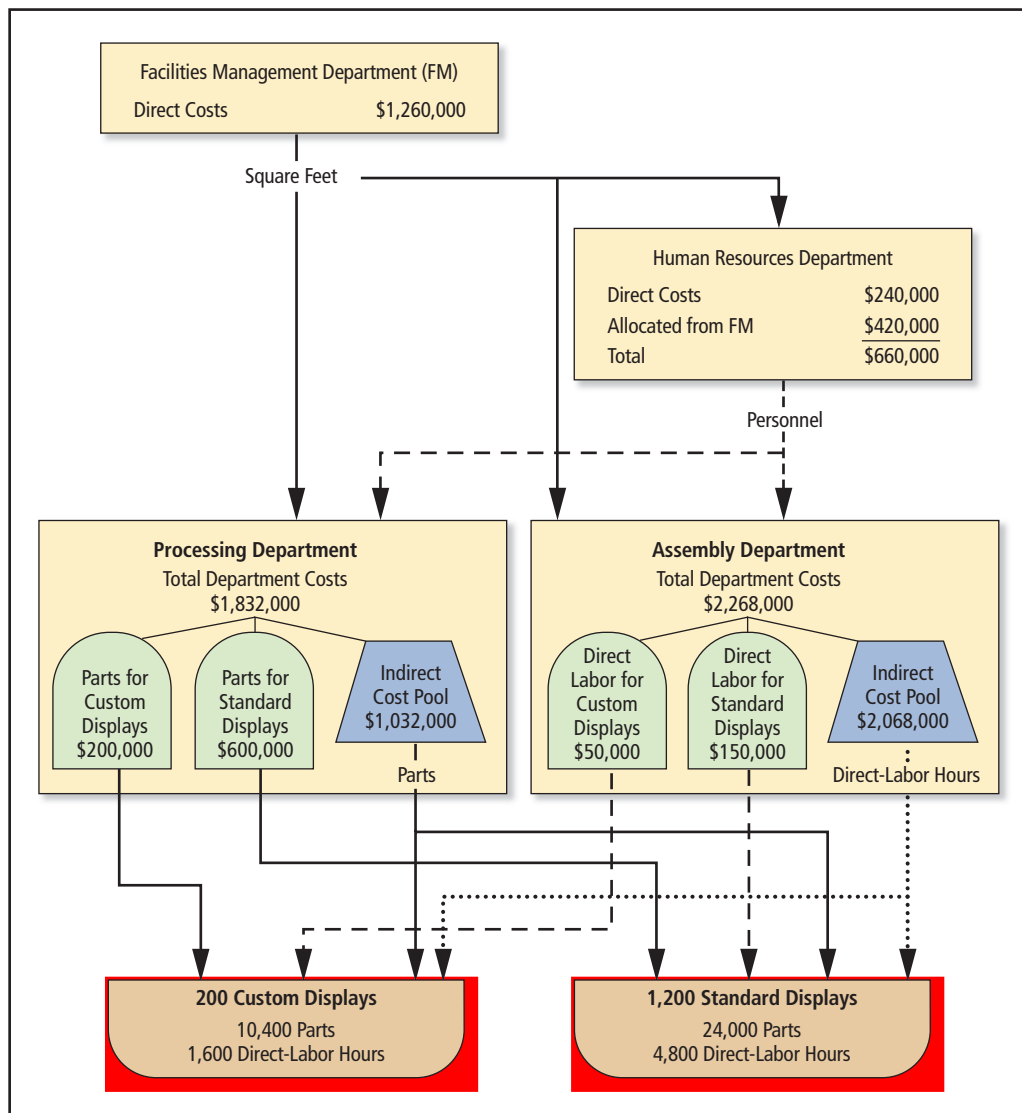


Exhibit 12-6

H.L. Display's Manufacturing Facility: Allocation to Cost Objects Using Traditional Approach and Step-Down Allocation Method

The answer lies in our change in cost objectives. We are assuming that \$200,000 represents costs such as depreciation on department equipment and costs of supervisors that are wholly in support of the department—a single cost object—and do not need to be allocated. When we changed the cost objective to the two displays, these resources became shared. Since we could find no economically feasible way to trace their use directly, we need to allocate their costs or leave them unallocated. In this case, we will allocate all of the indirect costs.

Next, in step 3, we select cost pools and related cost-allocation bases for the indirect costs of each department. We assign the remaining \$1,032,000 of indirect costs in the processing department to one fixed-cost pool with budgeted number of parts as the cost-allocation base. Similarly, we assign all the remaining \$2,068,000 indirect costs in the assembly department to one fixed-cost pool with budgeted direct-labor hours as the cost-allocation base.

Therefore, we allocate indirect departmental costs to the displays as follows:

$$\begin{aligned}\text{Processing: } \$1,032,000 \div (10,400 + 24,000) \text{ parts} &= \$30.00 \text{ per part} \\ \text{Assembly: } \$2,068,000 \div (1,600 + 4,800) \text{ direct-labor hours} \\ &= \$323.125 \text{ per direct-labor hour}\end{aligned}$$

The total and unit costs of making 200 custom and 1,200 standard displays are shown in Exhibit 12-7.

Exhibit 12-7

Total and Unit Costs for Custom and Standard Displays

	200 Custom Displays		1,200 Standard Displays	
	Total	Unit	Total	Unit
Parts	\$ 200,000	\$1,000.00	\$ 600,000	\$ 500.00
Direct labor	50,000	250.00	150,000	125.00
Indirect costs—processing department	312,000*	1,560.00	720,000†	600.00
Indirect costs—assembly department	517,000‡	2,585.00	1,551,000§	1,292.50
	<u>\$1,079,000</u>	<u>\$5,395.00</u>	<u>\$3,021,000</u>	<u>\$2,517.50</u>

*\$30.00 × 10,400 parts

†\$30.00 × 24,000 parts

‡\$323.125 × 1,600 direct-labor hours

§\$323.125 × 4,800 direct-labor hours

Summary Problem for Your Review

PROBLEM

Nonmanufacturing organizations often find it useful to allocate costs to products or services. Consider a hospital. The output of a hospital is not as easy to define as the output of a factory. Assume the following measures of output in three revenue-producing departments:

Department*	Measures of Output†
Radiology	X-ray films processed
Laboratory	Tests administered
Daily patient services	Patient-days of care (e.g., 1 patient for 2 days and 1 patient for 3 days is 5 patient-days)

*There would be many of these departments, such as obstetrics, pediatrics, and orthopedics. Moreover, there may be both inpatient and outpatient care; for simplicity, we do not distinguish between them.

†These become the "product" cost objectives, the various revenue-producing activities of a hospital.

Budgeted output for 20X1 is 60,000 X-ray films processed in radiology, 50,000 tests administered in the laboratory, and 30,000 patient-days in daily patient services.

In addition to the revenue-producing departments, the hospital has three service departments: administrative and fiscal services, plant operations and maintenance, and laundry. (Real hospitals have more than three revenue-producing departments and more than three service departments. This problem is simplified to keep the data manageable.)

The hospital management has decided that the cost-allocation base for administrative and fiscal services costs is the direct department costs of the other departments. The cost-allocation base for plant operations and maintenance is square feet occupied, and for laundry is pounds of laundry. The pertinent budget data for 20X1 are as follows:

	Direct Department Costs	Square Feet Occupied	Pounds of Laundry
Administrative and fiscal services	\$1,000,000	1,000	—
Plant operations and maintenance	800,000	2,000	—
Laundry	200,000	5,000	—
Radiology	1,000,000	12,000	80,000
Laboratory	400,000	3,000	20,000
Daily patient services	<u>1,600,000</u>	<u>80,000</u>	<u>300,000</u>
Total	<u>\$5,000,000</u>	<u>103,000</u>	<u>400,000</u>

1. Allocate service department costs using the direct method.
2. Allocate service department costs using the step-down method. Allocate administrative and fiscal services first, plant operations and maintenance second, and laundry third.
3. Compute the cost per unit of output in each of the revenue-producing departments using (a) the costs determined using the direct method for allocating service department costs and (b) the costs determined using the step-down method for allocating service department costs.

SOLUTION

1. Exhibit 12-8 shows the solutions to all three problems. We present the direct method first. Note that we did not allocate service department costs to another service department. Therefore, we base allocations on the relative amounts of the cost-allocation base in the revenue-producing department only. For example, in allocating plant operations and maintenance, we ignore square footage occupied by the service departments. The cost-allocation base is the 95,000 square feet occupied by the revenue-producing departments.

Note that the total cost of the revenue-producing departments after allocation, $\$1,474,386 + \$568,596 + \$2,957,018 = \$5,000,000$, is equal to the total of the direct department costs in all six departments before allocation.

2. The lower half of Exhibit 12-8 shows the step-down method. First, we allocate the costs of administrative and fiscal services to all five other departments. Because we do not allocate a department's own costs to itself, the cost-allocation base consists of the \$4,000,000 direct department costs in the five departments excluding administrative and fiscal services. Second, we allocate plant operations and maintenance on the basis of square feet occupied. We allocate no cost to the department itself or back to administrative and fiscal services. Therefore, the square footage used for allocation is the 100,000 square feet occupied by the other four departments.

Third, we allocate laundry. We would not allocate cost back to the first two departments, even if they had used laundry services.

As in the direct method, note that the total costs of the revenue-producing departments after allocation, $\$1,430,000 + \$545,000 + \$3,025,000 = \$5,000,000$, equals the total of the direct department costs before allocation.

Allocation Base	Administrative and Fiscal Services	Plant Operations and Maintenance	Laundry	Radiology	Laboratory	Daily Patient Services
	Accumulated Costs	Sq. Footage	Pounds			
1. Direct method:						
Direct departmental costs before allocation	\$ 1,000,000	\$ 800,000	\$ 200,000	\$1,000,000	\$400,000	\$1,600,000
Administrative and fiscal services	(1,000,000)	—	—	333,333*	133,333	533,334
Plant operations and maintenance		(800,000)	—	101,053†	25,263	673,684
Laundry			(200,000)	40,000‡	10,000	150,000
Total costs after allocation				<u>\$1,474,386</u>	<u>\$568,596</u>	<u>\$2,957,018</u>
Product output in films, tests, and patient-days, respectively				60,000	50,000	30,000
3a. Cost per unit of output				<u>\$24,573</u>	<u>\$ 11,372</u>	<u>\$ 98,567</u>
2. Step-down method:						
Direct departmental costs before allocation	\$ 1,000,000	\$ 800,000	\$ 200,000	\$1,000,000	\$400,000	\$1,600,000
Administrative and fiscal services	(1,000,000)	200,000§	50,000	250,000	100,000	400,000
Plant operations and maintenance		(1,000,000)	50,000¶	120,000	30,000	800,000
Laundry			(300,000)	60,000#	15,000	225,000
Total costs after allocation				<u>\$1,430,000</u>	<u>\$545,000</u>	<u>\$3,025,000</u>
Product output in films, tests, and patient-days, respectively				60,000	50,000	30,000
3b. Cost per unit of output				<u>\$23,833</u>	<u>\$ 10,900</u>	<u>\$ 100,833</u>

*\$1,000,000 ÷ (1,000,000 + 400,000 + 1,600,000) = \$0.33; 1/3 × 1,000,000 = \$333,333; and so on.

†\$800,000 ÷ (12,000 + 3,000 + 80,000) = \$8,421,052; \$8,421,052 × 12,000 sq. ft. = \$101,053; and so on.

‡\$200,000 × (80,000 + 20,000 + 300,000) = \$0.50; \$0.50 × 80,000 = \$40,000; and so on.

§\$1,000,000 ÷ (800,000 + 200,000 + 1,000,000 + 400,000 + 1,600,000) = \$0.25; 0.25 × 800,000 = \$200,000; and so on.

¶\$1,000,000 × (5,000 + 12,000 + 3,000 + 80,000) = \$10,000; \$10,000 × 5,000 sq. ft. = \$50,000; and so on.

#\$300,000 ÷ (80,000 + 20,000 + 300,000) = \$0.75; \$0.75 × 80,000 = \$60,000; and so on.

Exhibit 12-8

Allocation of Hospital Service Department Costs: Direct and Step-Down Methods

3. The per-unit costs are shown in lines 3a and 3b in Exhibit 12-8. Compare the unit costs derived from the direct method with those of the step-down method. In many instances, the product costs may not differ enough to warrant investing in a cost-allocation method that is any fancier than the direct method. But sometimes even small differences may be significant to a government agency or anybody paying for a large volume of services based on costs. For example, in Exhibit 12-8 the “cost” of an “average” laboratory test is either \$11.37 or \$10.90. This may be significant for the fiscal committee of the hospital’s board of trustees, who must decide on hospital prices. Thus, cost allocation often helps answer the vital question, “Who should pay for what, and how much?”

An ABC Approach

The traditional approach to cost allocation focuses on accumulating and reporting costs by department. Many companies have started using an alternative approach, activity-based costing, as described in Chapter 4. It focuses on activities rather than departments. Let’s examine how the same facility of **H.L. Display** might apply ABC to determine the costs of custom and standard displays.

Assume that management decides to apply ABC only to the production activities; the company will continue to allocate the service department costs using traditional costing using the step-down method. First, we replace the production departments with the production activities—in this case three activities: design activity, processing activity, and assembly activity. Then we allocate facilities management department costs to the human resources department and to each production activity. Then, we allocate the human resources department costs, both the direct department costs and the costs allocated from facilities management, to the activities. Finally, we allocate the costs of each activity to the custom and standard displays using a two-stage ABC system. This ABC approach uses the three-step procedure that follows and is illustrated in Exhibit 12-9, a process map for the ABC costing system.

STEP 1: DETERMINE THE KEY COMPONENTS OF THE SYSTEM AND THE RELATIONSHIP AMONG THEM. The costing objective is to determine the costs of custom and standard displays—the final cost objects for H.L. Display shown at the bottom of Exhibit 12-9. We focus on the production-related activities. If the company allocates costs from other value-chain activities, the process would be similar.

Production-related costs flow into the final cost objects in two ways: 1) direct costs (parts and direct labor) are traced to the cost objectives, and 2) indirect costs are allocated via the three production activities (design, processing, and assembly). Accounting for the direct costs does not differ from a traditional system. Both systems physically trace such costs to the cost objectives.

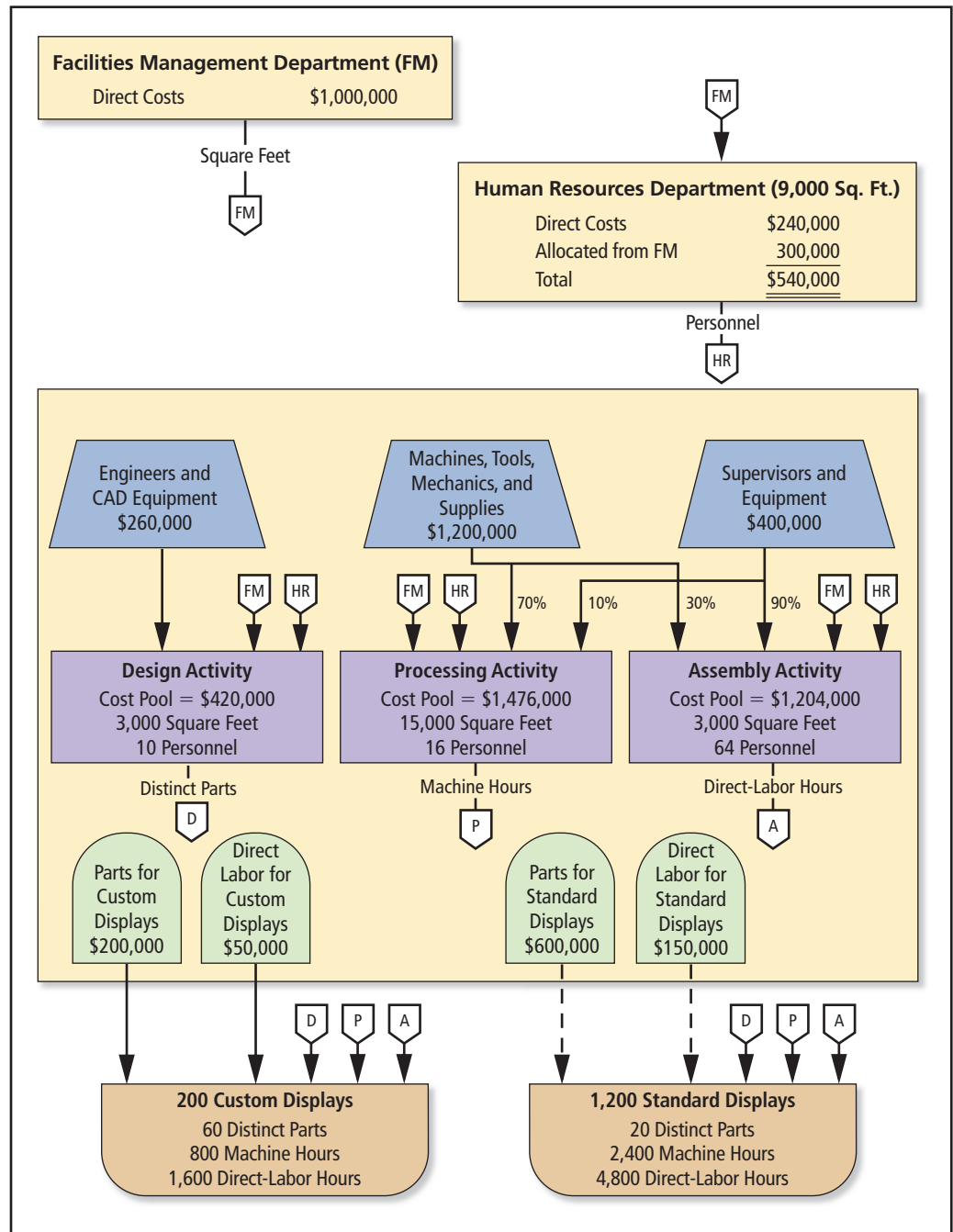
Now let’s consider the indirect costs. The key is to identify the production activities and an appropriate cost-allocation base for each. Often production departments will have multiple activities. However, in this case, management decided that the processing and assembly department each have a single activity. Therefore, the first two activities are processing and assembly, and the cost-allocation bases are machine hours and direct-labor hours. In addition, management decided that part of the facilities management department, the design of products and processes, is a third production activity with number of distinct parts as an appropriate cost-allocation base. Exhibit 12-9 shows these activities in the rectangles in the middle of the page.

Once we have identified the activities, we next determine the resources used by the activities. In this case there are three resources: 1) engineers and CAD equipment used only in the design activity; 2) machines, tools, machinists, and supplies used in both processing and assembly activities; and 3) supervision and equipment, also used in both processing and assembly activities.

In addition to resources, the activities require support from the service departments. The structure of the service department component of the cost-allocation system is unchanged—we still have two service departments that use the step-down method. However, the cost of engineers and CAD equipment has been removed from the facilities management department, so the costs to be allocated from that service department are smaller.

Exhibit 12-9

H.L. Display's Manufacturing Facility: Allocation to Final Cost Objectives Using the ABC Approach



STEP 2: COLLECT RELEVANT DATA CONCERNING COSTS AND THE PHYSICAL FLOW OF COST-ALLOCATION BASE UNITS AMONG RESOURCES AND ACTIVITIES. Using the process map as a guide, accountants collected the required cost and operational data from the accounting system and by interviews with relevant personnel. The data collected, shown in Exhibit 12-9, include the following: 1) costs for each service department, resource, and direct cost, 2) cost-allocation base amounts for each cost pool, 3) allocation percentages for shared resources and service departments. Note that the total costs of the facilities management department is only \$1,000,000 instead of the \$1,260,000 used under the traditional approach. The difference is the cost of engineers and CAD equipment that management now treats as a production activity. From the data collected, we can compute the total indirect cost of each activity as shown in Exhibit 12-10.

Activity	Design	Processing	Assembly
Service department allocations:			
Facilities maintenance ¹	\$100,000	\$ 500,000	\$ 100,000
Human resources ²	60,000	96,000	384,000
Resource allocations:			
Engineers and CAD ³	260,000	—	—
Machines, tools, mechanics, and supplies ⁴	—	840,000	360,000
Supervision and equipment ⁵	—	40,000	360,000
Total indirect activity costs	<u>\$420,000</u>	<u>\$1,476,000</u>	<u>\$1,204,000</u>

¹ $\$1,000,000 \times [3,000 \div (9,000 + 3,000 + 15,000 + 3,000)] = \$100,000$, etc.

² $(\$240,000 + \$300,000) \times [10 \div (10 + 16 + 64)] = \$60,000$, etc.

³ Total cost of engineers and CAD is assigned to design.

⁴ $\$1,200,000 \times 70\% = \$840,000$, etc.

⁵ $\$400,000 \times 10\% = \$40,000$, etc.

Exhibit 12-10

H.L. Display's Manufacturing Facility: Computation of Indirect Activity Costs

STEP 3: CALCULATE AND INTERPRET THE NEW ABC INFORMATION. Exhibit 12-11 shows the last step of allocating the costs of activities to the custom and standard displays. For each activity, the exhibit shows the cost pool of indirect costs from Exhibit 12-9, allocates these costs to the displays via the appropriate cost-allocation bases, and then adds the direct costs.

Now that we have completed the three steps, let's compare the cost per unit figures using the traditional and ABC approaches:

	Allocated Cost	
	Custom Displays	Standard Displays
Traditional approach	\$5,395.00	\$2,517.50
ABC approach	\$6,175.00	\$2,387.50

The ABC cost of standard displays is $(\$6,175 - \$5,395) \div \$5,395 = 14.5\%$ higher than the costs measured by the traditional system, and the ABC cost of custom displays is $(\$2,517.50 - \$2,387.50) \div \$2,517.50 = 5.2\%$ lower. If managers believe that the ABC system is more accurate, the traditional system leads them to overestimate the profitability of the custom displays and to underestimate the profitability of the standard displays.

A company that switched from traditional to ABC costing is **Dow Chemical**. The Business First box on p. 516 explains how Dow used ABC to help implement a new business strategy.

Activity/Resource (Cost Driver)	Cost Pool	Physical Flow of Cost Driver	Cost per Driver Unit	Custom Displays		Standard Displays	
				Flow	Cost	Flow	Cost
Design (distinct parts)	\$ 420,000	80	\$5,250.000	60	\$ 315,000	20	\$ 105,000
Processing (machine hours)	1,476,000	3,200	461.250	800	369,000	2,400	1,107,000
Assembly (direct-labor hours)	1,204,000	6,400	188.125	1,600	301,000	4,800	903,000
Parts					200,000		600,000
Direct labor					50,000		150,000
Total direct and allocated cost					<u>\$1,235,000</u>		<u>\$2,865,000</u>
Units					<u>$\div 200$</u>		<u>$\div 1,200$</u>
Display cost per unit					<u>\$ 6,175.00</u>		<u>\$ 2,387.50</u>

Exhibit 12-11

H.L. Display Manufacturing Facility: Allocation to Final Cost Objects Using the ABC Approach

Business First

Companies Use ABC to Improve the Allocation of Service Costs and Lower the Costs to Serve Customers

Dow Chemical believes that its ABC allocation system is the foundation of its cost-management system. Dow, with annual revenues of more than \$60 billion, is the largest chemical company in the United States and number two worldwide. The company has three major business segments: plastics, chemicals, and agricultural products. Dow switched from a traditional allocation system to ABC as part of a major shift in its total strategy. It sold its pharmaceutical, energy, and consumer products businesses and set a goal to be the number one company in chemicals, plastics, and agrosience. Dow believed that, to accomplish its goal, it needed to improve the quality and accuracy of its costing system, including the costs of internal services such as those provided by the human resources and maintenance departments.

Service providers, such as human resources and maintenance, identified the major activities performed, determined the appropriate cost-allocation base for each activity, and computed costs for each activity and service provided to using departments. The focus on activities has led to a better understanding of costs by everyone and better cost control. Another advantage of the ABC system is improved resource planning and utilization. By focusing on activities and their related cost-allocation bases, Dow's maintenance department manag-

ers can more effectively plan maintenance resource needs and availability. Overall, since the company integrated ABC into its cost management system, it has realized significant benefits.

According to Carola Raab and Dina Marie Zemke, restaurants often operate on comparatively low margins and restaurant managers rarely understand the costs that are involved in operating a profitable restaurant. Often, a restaurant will offer an unprofitable menu due to either inaccurate costings or under-priced items. Raab and Zemke contend that activity-based accounting is beginning to take hold in the broader food-service industry. They believe that the approach can help the restaurants to reduce waste and drive up profitability. They cite a 2015 review of the top 100 revenue-producing restaurant chains in the United States (including **MacDonald's** and **Pizza Hut**) and note that most of them use ABC in order to capture true costs and improve the value chain of their operations.

Sources: J. Damitio, G. Hayes, and P. Kintzele, "Integrating ABC and ABM at Dow Chemical," *Management Accounting Quarterly*, Winter 2000, pp. 22–26; R. Kaplan and S. Anderson, "Time-Driven Activity-Based Costing," *Harvard Business Review*, November 2004, pp. 131–138; and *Dow Chemical Company, 2011 Annual Report*.

C. Raab and D.M. Zemke, "Activity-Based Costing in the Restaurant Industry: What's Past Is Prologue," *Journal of Hospitality Financial Management*, 2016, 24: 2, Article 5.

Objective 5

Allocate costs associated with customer actions to customers.

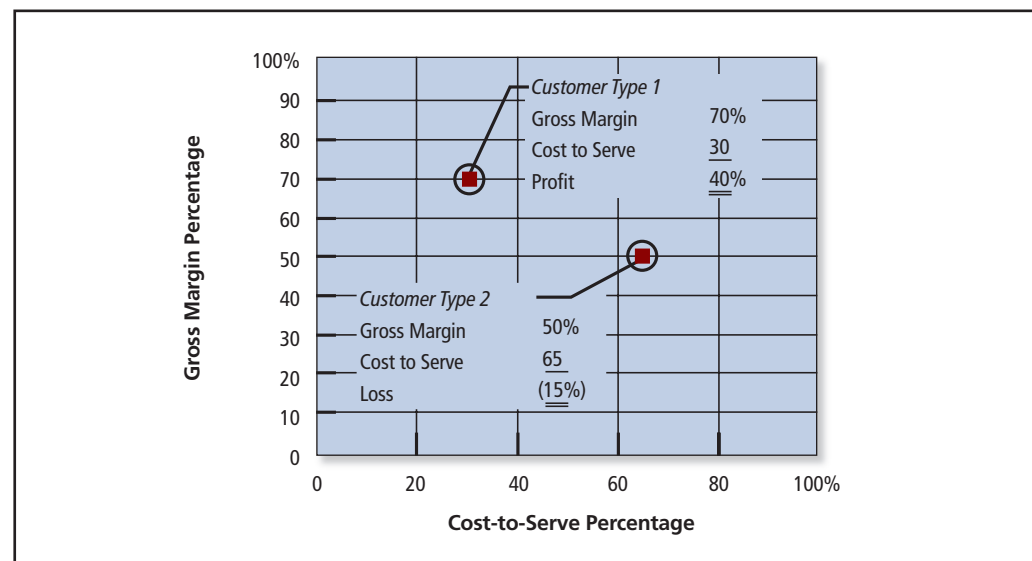
Allocation of Costs to Customer Cost Objects to Determine Customer Profitability

So far, we have seen how to accumulate costs and trace or allocate them to products or services—numbers 1–7 in Exhibit 12-1. This enables the calculation of gross profit for products or services. Many managers recognize that to achieve overall profitability goals, it is necessary to have both profitable products or services and profitable customers. We now consider how organizations measure and manage customer profitability.

As shown in Exhibit 12-1 on p. 500, customer profitability depends on more than the gross margin of the products or services purchased. Customer profitability also depends on the costs incurred to fulfill customer orders and to provide other customer services such as order changes, returns, and expedited scheduling or delivery. Exhibit 12-12 shows how these two factors determine profitability.

Exhibit 12-12

Customer Profitability as a Function of Customer Gross Margin and Cost to Serve



Consider customer type 1. This customer buys a mix of products that have high gross margins yielding a high gross margin percentage, about 70%. Customer type 1 has a low cost-to-serve percentage (cost to serve $\div$ sales revenue), about 30%. As a result, customer type 1 will have a high level of profitability, $70\% - 30\% = 40\%$. On the other hand, customer type 2 buys products with a lower gross margin and is very costly to serve resulting in a loss to the company of $50\% - 65\% = -15\%$. Most of this difference reflects the 35% higher cost to serve. The following list is a profile of low and high cost-to-serve customers.

Low Cost to Serve	High Cost to Serve
Large order quantity	Small order quantity
Few order changes	Many order changes
Little pre- and post-sales support	Large amounts of pre- and post-sales support
Regular scheduling	Expedited scheduling
Standard delivery	Special delivery requirements
Few returns	Frequent returns

Measuring and Managing Customer Profitability

In the general framework for cost allocation, we stated that it is often important to directly trace or allocate costs associated with customer actions to customers rather than assigning them first to producing departments and then to customers. This is because if we assigned these costs to producing departments and then to products, the allocation to customers would be based on production-related cost-allocation bases that may have little relationship to the cause of customer-service costs. Such allocations can lead to cost distortions and resulting erroneous customer-profitability measures. Let's consider an example that illustrates this important concept.

Cedar City Distributors (CCD) is a distributor of athletic apparel and sports gear. CCD distributes many products to retail outlets but classifies products into just two product groups—apparel and sports gear.

- Apparel items arrive at CCD in prepackaged cases and CCD ships them to customers in these cases. Examples include shirts, shorts, socks, and hats.
- CCD receives sports gear in bulk shipments and then unpacks the products and repacks them to meet small order quantities for specific gear. Examples include tennis rackets and balls, baseball bats and gloves, and golf clubs and bags.

CCD has two types of customers:

1. Small stores: stores that order low volumes (an average of 10 cases per order), the majority being apparel
2. Large stores: stores that order large volumes of both apparel and sports gear

CCD's management has set a strategic goal to improve both product and customer profitability. A related and necessary subgoal that supports this strategy is to identify profitable products and customers using an accurate cost-accounting system.

SIMPLE COST ACCOUNTING SYSTEM CCD currently uses a simple cost accounting system to calculate both product and customer profitability. The only direct costs are the purchase costs of apparel and sports gear products. CCD allocates indirect costs to the product groups using a single indirect cost pool for all indirect costs with "actual pounds of product" as the cost-allocation base. Although it is preferable to allocate variable and fixed costs separately, each with its own cost-allocation base, it is not unusual for companies to use a simpler system that combines all indirect costs in a department into one cost pool. If most indirect costs are variable and vary with changes in the cost-allocation base, this is a reasonable simplification. We will see later if it is reasonable for CCD.

Product Data		
	Apparel	Sports Gear
Annual demand in cases	1,400	1,000
Average purchase cost per case	\$80	\$140
Average weight per purchased case	15 pounds	25 pounds
Average sales price per case	\$570	\$830
Customer Data		
	Small Stores	Large Stores
Apparel demand in cases	600	800
Sports gear demand in cases	200	800
Total annual demand in cases	800	1,600
Orders	80	35
Indirect Cost Data		
A single indirect cost pool consists of resources needed to perform receiving, storing, picking, packing, shipping, order processing, and customer service activities. The annual cost of these resources is \$690,000. The cost-allocation base used to allocate this pool to the two product groups is pounds of product sold.		

Exhibit 12-13

Operating Data for Cedar City Distributors

Cost and operating data accumulated for the most recent year are shown in Exhibit 12-13. To determine the profitability of a customer under this simple system, we first calculate the profit margin per case for each product. Then, we use the product mix ordered by each customer to calculate profitability. Exhibit 12-14 shows how to calculate the profit margin per case and the profit margin percentage of both products. Based on the profit-margin percentage, apparel products are more profitable than sports gear. Since small stores' product mix is 75% apparel compared to only 50% for large stores, we expect small store customers to have

	Output Measure or Cost-Allocation Base	Revenue or Cost per Unit	Apparel		Sports Gear	
			Amount of Output or Cost-Allocation Base	Total Revenue or Cost	Amount of Output or Cost-Allocation Base	Total Revenue or Cost
Apparel revenue	Cases	\$570.00	1,400	<u>\$798,000</u>		
Sports gear revenue	Cases	\$830.00			1,000	<u>\$830,000</u>
Apparel purchase cost	Cases	\$ 80.00	1,400	112,000		
Sports gear purchase cost	Cases	\$140.00			1,000	140,000
Indirect cost pool, \$690,000	Pounds	\$ 15.00*	21,000**	<u>315,000</u>	25,000	<u>375,000</u>
Total cost				<u>427,000</u>		<u>515,000</u>
Profit margin				<u>\$371,000</u>		<u>\$315,000</u>
Profit margin per case				<u>\$ 265.00</u>		<u>\$ 315.00</u>
Profit margin percentage				<u>46.5%†</u>		<u>38.0%‡</u>

*\$690,000 ÷ (15 lb per case × 1,400 cases) + (25 lb per case × 1,000 cases)

**15 lb per case × 1,400 cases

†\$371,000 ÷ \$798,000

‡\$315,000 ÷ \$830,000

Exhibit 12-14

Profit Margin Per Case of Apparel and Sports Gear

	Small Stores			Large Stores		
	Cases	Profit Margin Per Case	Total Profit Margin	Cases	Profit Margin Per Case	Total Profit Margin
Apparel	600	\$265.00	\$159,000	800	\$265.00	\$212,000
Sports Gear	200	315.00	63,000	800	315.00	252,000
			<u>\$222,000</u>			<u>\$464,000</u>
Total Profit Margin Percentage			<u>43.7%*</u>			<u>41.4%†</u>

* $\$222,000 \div (600 \text{ cases} \times \$570 \text{ per case} + 200 \text{ cases} \times \$830 \text{ per case}) = \$222,000 \div (\$342,000 + \$166,000) = \$222,000 \div \$508,000 = 0.437$

† $\$464,000 \div (800 \text{ cases} \times \$570 \text{ per case} + 800 \text{ cases} \times \$830 \text{ per case}) = \$464,000 \div (\$456,000 + \$664,000) = \$464,000 \div \$1,120,000 = 0.414$

Exhibit 12-15

Customer Profitability at Cedar City Distributors

a larger profit margin percentage. We verify this in Exhibit 12-15, which shows customer profitability. Note that customer profitability is based solely on the product mix ordered by a particular customer.

Our analysis indicates that a strategy to increase CCD's overall profitability would involve an emphasis on apparel products and small stores. However, in setting this strategy, CCD's management relied on the accuracy of the costs. CCD's simple cost-accounting system may accurately allocate indirect costs if the single cost-allocation base, pounds of product sold, is a plausible and reliable cost driver for all resources in the indirect cost pool. Let's see if that is the case.

REFINED COST ACCOUNTING SYSTEM We look again at Exhibit 12-13 and ask, "Is it plausible that all the activities and associated indirect resources included in the indirect cost pool are related solely to the weight of purchased product?" Might "number of customer orders" be a more plausible cost-allocation base for some items, like the order processing and customer service activities and related resources?

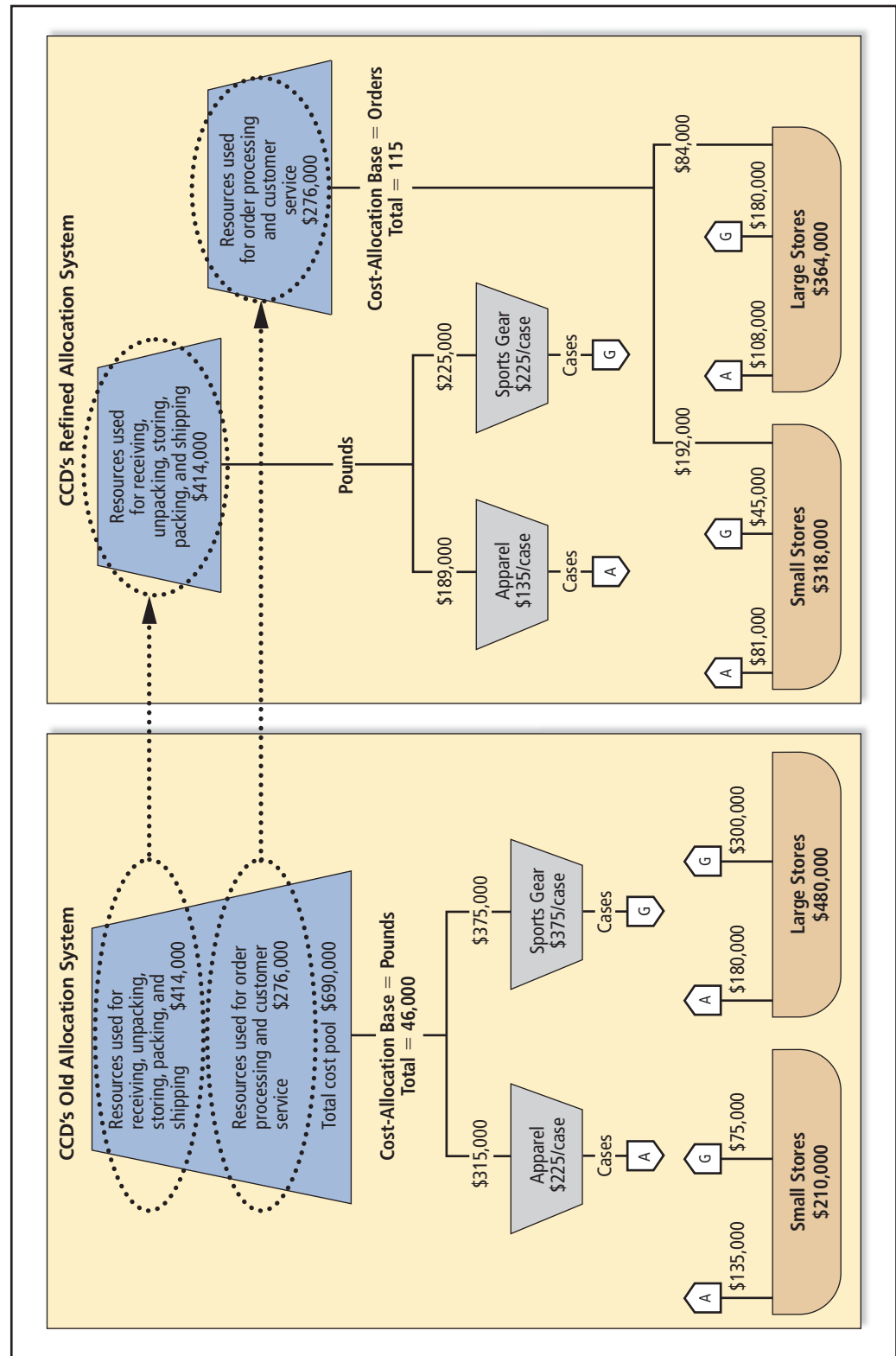
Let's assume that "number of orders" was indeed a better cost-allocation base for the order processing and customer service activities. The cost of the resources used by these two activities is \$276,000 out of the total indirect cost pool of \$690,000. CCD should exclude these costs from the computation of product profit margin. Instead, it should set up an additional cost pool and allocate these costs to customer types. (Note, this is shown as allocation type "9" in Exhibit 12-1 on p. 500.)

The partial process map in Exhibit 12-16 shows how we can refine CCD's simple allocation system. The exhibit does not contain revenue and direct product costs because they will not change. It shows only the \$690,000 of indirect costs, separated into two cost pools. One cost pool is the \$276,000 cost of resources used for processing customer orders and providing customer services. We will examine how to allocate this cost shortly. The other cost pool is the $\$690,000 - \$276,000 = \$414,000$ associated with resources used for receiving, unpacking, storing, packing, and shipping that remains in the original indirect cost pool. The allocation of this \$414,000 does not change and is still based on pounds of product.

In our refined system, we allocate the \$276,000 to the customer cost objectives on the basis of number of orders, an allocation base that represents the cause of the costs much better than does pounds of product. An analysis of the allocation percentages in Exhibit 12-16 reveals how customer profitability will change under the refined allocation system. Consider the allocations of the \$276,000 to large stores under both systems. In the old system, large stores receive $(32,000 \text{ lb} \div 46,000 \text{ lb}) \times \$276,000 = \$192,000$ because shipments to large stores weigh 32,000 pounds out of total shipments of 46,000 pounds. In the refined allocation system, the allocation of the \$276,000 is based on the proportion of orders by large stores. Large stores make only 35 out of 115 orders, so the allocation is $(35 \div 115) \times \$276,000 = \$84,000$. The refined cost-accounting system allocates $\$192,000 - \$84,000 = \$108,000$ less indirect, customer-related costs to large stores and, correspondingly, \$108,000 more cost to small stores.

Exhibit 12-16

Cedar City Distributors'
Refined Cost-Allocation
System



The refined cost-allocation system significantly changes the profitability measures of small and large stores. Exhibit 12-17 shows the calculation of product gross margin, customer gross margin, customer cost to serve, and customer profitability.

Contrary to the results based on the simple, existing cost-accounting system (Exhibit 12-14), the refined system shows that large stores are the most profitable customers. Exhibit 12-18 is based on Exhibit 12-17 and depicts both the customer product gross margin and cost to serve. It is easy to see why large stores are the major source of profit for CCD. The cost to serve is low and the product mix yields a substantial gross margin. This example demonstrates

why it is important for accountants to carefully choose and measure cost-allocation bases. The refined system gives managers at CCD more insight into operations, and they have a tool to measure and manage customer profitability.

Product Profitability Measures

	Output Measure or Cost-Allocation Base	Revenue or Cost per Unit of Cost-Allocation Base	Apparel		Sports Gear	
			Amount of Output or Cost-Allocation Base	Total Revenue or Cost	Amount of Output or Cost-Allocation Base	Total Revenue or Cost
Apparel revenue	Cases	\$570.00	1,400	<u>\$798,000</u>		
Sports gear revenue	Cases	830.00			1,000	<u>\$830,000</u>
Apparel purchase cost	Cases	80.00	1,400	112,000		
Sports gear purchase cost	Cases	140.00			1,000	140,000
Indirect cost pool, \$414,000	Pounds	9.00*	21,000	<u>189,000</u>	25,000	<u>225,000</u>
Total cost				<u>301,000</u>		<u>365,000</u>
Product gross margin				<u>\$497,000</u>		<u>\$465,000</u>
Product gross margin per case				<u>\$ 355.00</u>		<u>\$ 465.00</u>
Product gross margin percentage				<u>62.3%</u>		<u>56.0%</u>

Customer Profitability Measures

	Small Stores			Large Stores		
	Amount of Output or Cost-Allocation Base	Margin or Cost Per Unit of Cost-Allocation Base	Total Margin or Cost	Amount of Output or Cost-Allocation Base	Margin or Cost Per Unit	Total Margin or Cost
Apparel product gross margin	600 Cases	\$355.00	\$213,000	800 Cases	\$355.00	284,000
Sports gear product gross margin	200 Cases	465.00	<u>93,000</u>	800 Cases	465.00	<u>372,000</u>
Gross margin for product mix			306,000			656,000
Cost to serve, \$2,400 per order [§]	80 Orders	2,400	<u>192,000</u>	35 Orders	2,400	<u>84,000</u>
Customer profit margin			<u>\$114,000</u>			<u>\$572,000</u>
Customer gross margin percentage			60.2% [†]			58.6% [‡]
Cost to service percentage			37.8%			7.5%
Customer profit margin percentage			<u>22.4%[¶]</u>			<u>51.1%[#]</u>

*\$414,000 ÷ (15 lb per case × 1,400 cases + 25 lb per case × 1,000 cases)

†\$306,000 ÷ (600 cases × \$570 per case + 200 cases × \$830 per case)

‡\$656,000 ÷ (800 cases × \$570 per case + 800 cases × \$830 per case)

§\$276,000 ÷ (80 orders + 35 orders)

¶60.2% – 37.8% or \$114,000 ÷ (600 cases × \$570 per case + 200 cases × \$830 per case)

#58.6% – 7.5% or \$572,000 ÷ (800 cases × \$570 per case + 800 cases × \$830 per case)

Exhibit 12-17

Product and Customer Profitability Measures Based on CCD's Refined Cost-Allocation System

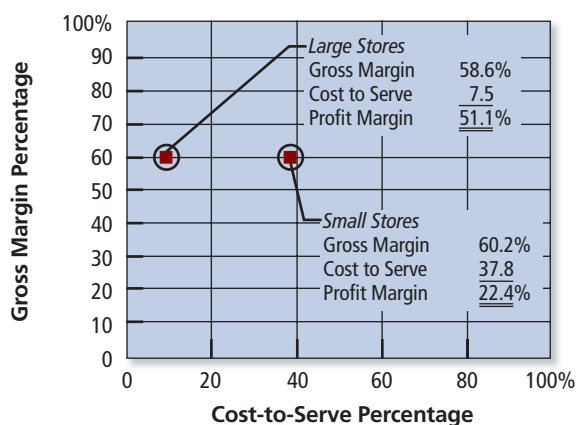


Exhibit 12-18

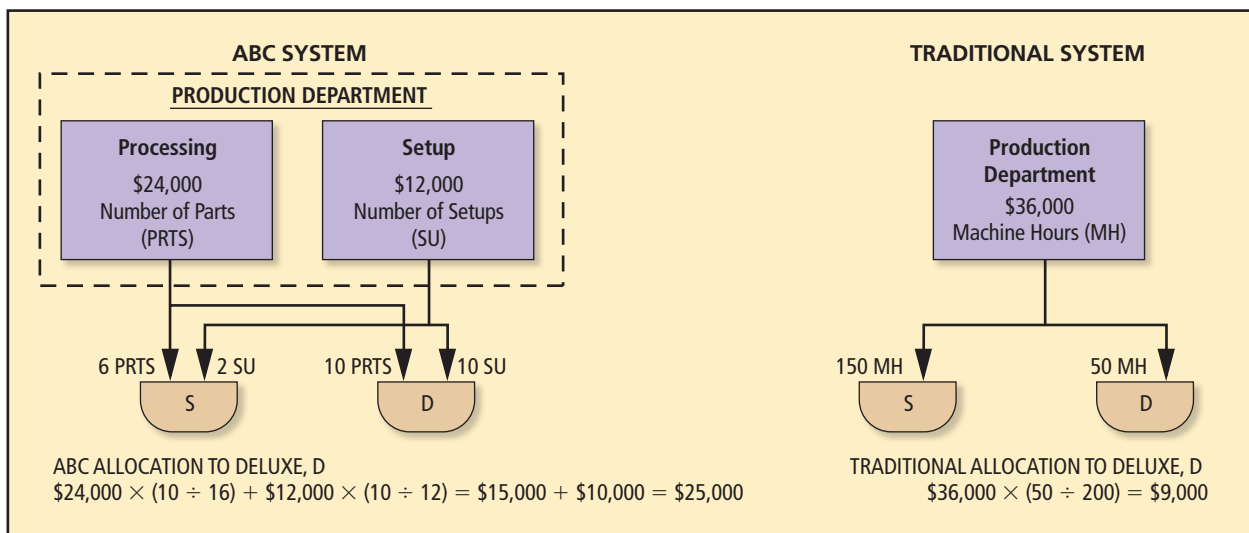
Customer Profitability at Cedar City Distributors

Making Managerial Decisions

Louder Is Better Company makes two speaker models—standard (S) and deluxe (D). The following diagrams show how ABC and traditional allocation systems allocate overhead costs to the deluxe model. The production department has overhead costs of \$36,000. Why does the cost allocated to the deluxe type speakers by the ABC system differ from that in the traditional system?

Answer

In the traditional system, the deluxe product receives only 25% of the overhead costs because it uses only 25% of the machine hours. But in the ABC system, it receives 72% of the overhead because it uses 63% of the parts and 83% of the setups.



Summary Problem for Your Review

PROBLEM

Consider our example of **H.L. Display**'s manufacturing display facility. Exhibits 12-9, 12-10, and 12-11 on pp. 514 and 515 show how the company used the ABC approach to determine the cost of goods sold for custom and standard displays. Suppose that management wants to know the profitability of its major customers. Assume that two major customers are **Marks and Spencer (M&S)** and **Asda**. M&S orders a mix of custom and standard displays. It also has unique service requirements, orders relatively small order sizes, and requires substantial pre- and post-sales support from customer service and corporate staff. In contrast, Asda orders only a few custom displays, has larger order quantities, and does not require much customer service or corporate staff support.

Accountants have performed an analysis of customer-related activities and concluded that two activities provide services to customers: 1) sales order activity and 2) customer service and corporate support. Both customers use each of these services to some extent, and it is not economically feasible to directly trace the costs of these services to individual customers. Therefore, H.L. Display allocates these costs. The cost-allocation bases chosen are number of orders for the sales order activity cost pool and service staff labor hours for the customer and corporate support cost pool.

To determine the profitability of the two customers, the company has collected the following data:

• Average price of a custom display	\$12,000
• Average price of a standard display	\$ 8,500
• Number of custom displays ordered by M&S	180
• Number of custom displays ordered by Asda	20
• Number of standard displays ordered by M&S	220
• Number of standard displays ordered by Asda	980
• Cost to serve activity analysis data:	
• Total sales order activity cost pool	\$3,000,000
• Total customer and corporate support cost pool	\$1,150,000
• Amount of each cost-allocation base used by each customer:	

Cost-Allocation Base	M&S	Asda
Orders	40	20
Hours	6,400	3,600

1. Calculate the gross margin percentage and cost-to-serve percentage for M&S and Asda.
2. Construct a graph similar to Exhibit 12-18 that depicts customer profitability for M&S and Asda.
3. Suggest a strategy for profit improvement for both customers.

SOLUTION

1. Exhibit 12-19 shows the calculation of customer gross margin and customer cost to serve.
2. Exhibit 12-20 depicts the profitability of M&S and Asda.
3. You can use Exhibit 12-20 as a guide for setting strategy for profit improvement. Asda is generating much more profit for the company than is M&S. H.L. Display managers should protect customers such as Asda from possible competitor actions, perhaps offering discounts to ensure continued business. In addition, the sales department manager should profile this type of customer to make it easier for salespersons to identify profitable new business. M&S is very expensive to serve because of its small order quantities and extensive pre- and post-sales support. Possible actions that would improve its profitability include charging for corporate support, reviewing internal processes within H.L. Display's customer service and corporate support function to improve efficiencies, and increasing prices for custom displays.

	Cost-Allocation Base	Revenue or Cost per Unit of Cost-Allocation Base	M&S		Asda	
			Amount of Cost-Allocation Base	Revenue/Cost	Amount of Cost-Allocation Base	Revenue/Cost
Revenue—Custom	Displays	\$12,000.00	180	\$2,160,000	20	\$ 240,000
Revenue—Standard	Displays	8,500.00	220	1,870,000	980	8,330,000
Total Revenue				4,030,000		8,570,000
Cost of goods sold—Custom	Displays	6,175.00*	180	1,111,500	20	123,500
Cost of goods sold—Standard	Displays	2,387.50*	220	525,250	980	2,339,750
Total cost of goods sold				1,636,750		2,463,250
Gross margin				2,393,250		6,106,750
Cost to serve:						
Sales order activity	Orders	50,000.00†	40	2,000,000	20	1,000,000
Customer service and corporate support	Hours	115.00‡	6,400	736,000	3,600	414,000
Total cost to serve				2,736,000		1,414,000
Contribution to unallocated corporate overhead				\$ (342,750)		\$4,692,750
Gross margin percentage				59.4%		71.3%
Cost-to-serve percentage				67.9%		16.5%
Customer profit margin percentage				(8.5)%		54.8%

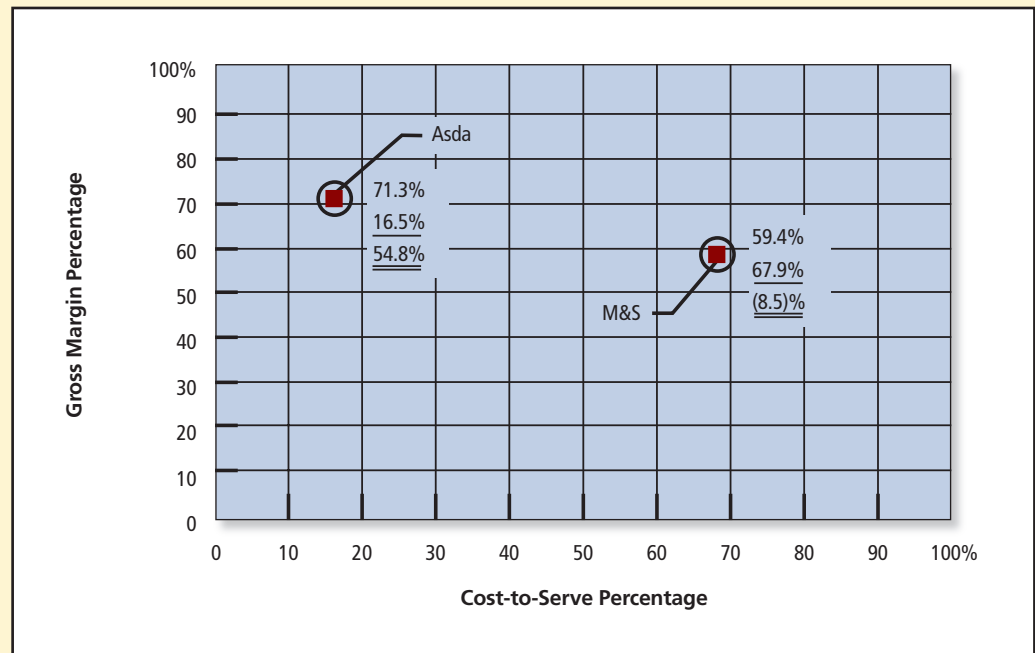
*From Exhibit 12-11

†\$3,000,000 ÷ (40 orders + 20 orders)

‡\$1,150,000 ÷ (6,400 hours + 3,600 hours)

Exhibit 12-19

Contribution to Unallocated Corporate Overhead at H.L. Display Manufacturing

**Exhibit 12-20**

H.L. Display Manufacturing Facility: Customer Profitability Using the ABC Approach

This concludes our discussion of service department allocation. We will next consider two specific types of cost allocations: (1) allocation of central corporate costs such as public relations and legal costs, and (2) allocation of joint and by-product costs.

Allocation of Central Corporate Support Costs

Objective 6

Allocate the central corporate costs of an organization.

Many managers believe it is desirable to fully allocate all of an organization's costs, including central corporate support costs, to the revenue-producing (operating) parts of the organization. Such allocations are not necessary from a financial accounting viewpoint and usually not useful as management information. For this reason, we do not consider central costs to be part of the value chain in this text, and we generally recommend that companies not allocate these costs. However, if a company chooses to allocate central support costs, it is important to allocate them in a way that managers accept as "fair." It is often difficult to find a good measure of the usage of central services, but some companies find measures that managers believe are fair, such as usage, either actual or estimated. Consider the experience of **J. C. Penney Company** as reported in *BusinessWeek*:

*The controller's office wanted subsidiaries such as **Thrift Drug Co.** and the insurance operations to base their share of corporate personnel, legal, and auditing costs on their revenues. The subsidiaries contended that they maintained their own personnel and legal departments, and should be assessed far less.... The subcommittee addressed the issue by asking the corporate departments to approximate the time (a measure of usage) and costs involved in servicing the subsidiaries. The final allocation plan, based on these studies, cost the divisions less than they were initially assessed but more than they had wanted to pay. Nonetheless, the plan was implemented easily.*

It is often difficult to find a cause and effect relationship between a cost-allocation base and costs such as the president's salary and related expenses, public relations, legal services, income tax planning, company-wide advertising, and basic research. As a result, some companies use cost-allocation bases such as the revenue of each division, the cost of goods sold by each division, the total assets of each division, or the total costs of each division (before allocation of the central costs) to allocate central costs, even though these bases are not necessarily the cost drivers.

Although the foregoing cost-allocation bases may not reflect a cause-and-effect relationship, they may represent an “ability to bear” philosophy of cost allocation. For example, a company might allocate the costs of company-wide advertising, such as the sponsorship of a charity event, to all products and divisions on the basis of the revenues in each. But such discretionary costs are determined by management policies, not by sales results. Although 60% of the companies in a large survey use sales revenue as a cost-allocation base for some cost-allocation purposes, sales revenue is seldom truly a cost driver in the sense of being an activity that causes the costs.

Use of Budgeted Sales for Allocation

If management feels it must allocate the costs of central services based on sales, even though the costs do not vary in proportion to sales, it should use budgeted sales rather than actual sales as an allocation base. This method has the advantage that the fortunes of other departments will not affect the costs allocated to a given department. However, it also has the disadvantage of providing an incentive for the department to under-predict their own sales. For example, suppose **H.L. Display** budgets central advertising as 10% of forecasted sales in two countries—Finland and Sweden. The forecasted sales are \$500,000 in both Finland and Sweden so the total advertising budget, a fixed cost, is \$100,000. Actual sales in Finland and Sweden are \$300,000 and \$600,000, respectively. How does the company allocate the \$100,000 advertising budget if it uses forecasted sales compared to actual sales?

Allocation of \$100,000 Central Advertising Budget

	Finland	Sweden
Forecast sales	\$500,000	\$500,000
Allocation based on forecast sales	50,000	50,000
Actual sales	300,000	600,000
Allocation based on actual sales	33,333	67,667

The preferred allocation is based on forecast sales. Why? Because it indicates a low ratio of sales to advertising in Finland—it directs attention to a potential problem. In contrast, allocation based on actual sales soaks the Swedish operations with more advertising cost because of the achieved results and relieves Finnish operations despite its lower success. This is another example of the confusion that can arise when cost allocations to one company unit depend on the activity of other units.

Allocation of Joint Costs and By-Product Costs

Joint costs and by-product costs create especially difficult cost-allocation problems. By definition, such costs relate to more than one product, and we cannot separately identify them with an individual product. Let’s examine these special cases, starting with joint costs.

Joint Costs

So far, we have assumed that we could identify cost-allocation bases with an individual product. For example, if we are allocating activity costs to products or services on the basis of machine hours, we have assumed that we can measure the amount of machine time consumed in making each product. However, sometimes we add inputs to the production process before we can separately identify individual products (i.e., before the split-off point). Recall from Chapter 6 (p. 256) that we call such costs joint costs. Joint costs include all inputs of material, labor, and overhead costs that are incurred before the split-off point.

Suppose a department has more than one product and some costs are joint costs. How should we allocate such joint costs to the products? Companies routinely allocate joint product costs to products for purposes of inventory valuation and income determination, so we illustrate two methods of allocation. *However, it is important to remember that allocation of joint costs should not affect decisions about the individual products, such as selling a joint product or processing it further.*

Consider the example of joint product costs that we used in Chapter 6. A department in **Dow Chemical Company** produces two chemicals, X and Y. The joint cost is \$100,000, and production is 1,000,000 liters of X and 500,000 liters of Y. X sells for \$.09 per liter and Y for \$.06 per liter. We want to find a method to allocate some part of the \$100,000 joint cost to the inventory of X

Objective 7

Allocate joint costs to products using the physical-units and relative-sales-value methods.

and the rest to the inventory of Y. There are two conventional ways of allocating joint costs to products: physical units and relative sales values.

If a company uses the *physical units method*, it would allocate the joint costs as follows, using liters as the physical units:

	Liters	Weighting	Allocation of Joint Costs	Sales Value at Split-Off Point
X	1,000,000	$(10 \div 15) \times \$100,000$	\$ 66,667	\$ 90,000
Y	<u>500,000</u>	$(5 \div 15) \times \$100,000$	<u>33,333</u>	<u>30,000</u>
	<u>1,500,000</u>		<u>\$100,000</u>	<u>\$120,000</u>

Because two-thirds of the liters produced are chemical X, we allocate two-thirds of the joint cost to X. Likewise, one-third of the liters are chemical Y, so we allocate one-third of the cost to Y.

The physical-units method requires a common physical unit for measuring the output of each product. For example, board feet is a common unit for allocating the cost of logs to a variety of products in the lumber industry. However, sometimes a common physical unit is lacking. Consider the production of meat and hides from butchering a steer. You might use pounds as a common denominator, but pounds is not a good measure of the output of hides. As an alternative, many companies use the *relative-sales-value method* for allocating joint costs. The following allocation results from applying the relative-sales-value method to the Dow Chemical department:

	Relative Sales Value at Split-Off Point	Weighting	Allocation of Joint Costs
X	\$ 90,000	$(90 \div 120) \times \$100,000$	\$ 75,000
Y	<u>30,000</u>	$(30 \div 120) \times \$100,000$	<u>25,000</u>
	<u>\$120,000</u>		<u>\$100,000</u>

The weighting is based on the sales values of the individual products. Because the sales value of X at the split-off point is \$90,000 and total sales value at the split-off point is \$120,000, we allocate $90 \div 120$ of the joint cost to X.

This method might eliminate one problem, but it creates another. Note how the allocation of a cost to a particular product, such as Y, depends not only on the sales value of Y but also on the sales value of X. For example, suppose you were the product manager for Y. You planned to sell your 500,000 liters for \$30,000, achieving a profit of $\$30,000 - \$25,000 = \$5,000$. Everything went as expected except that the price of X fell to \$.07 per liter for revenue of \$70,000 rather than \$90,000. Instead of $30 \div 120$ of the joint cost, Y received $30 \div 100 \times \$100,000 = \$30,000$ and had a profit of \$0. Despite the fact that Y operations were exactly as planned, the cost-allocation method caused the profit on Y to be \$5,000 below plan.

We can also use the relative-sales-value method when we cannot sell one or more of the joint products at the split-off point. To apply the method, we approximate the sales value at split-off as follows:

$$\text{sales value at split-off} = \text{final sales value} - \text{separable costs}$$

For example, suppose the 500,000 liters of Y requires \$20,000 of processing beyond the split-off point, after which we can sell it for \$.10 per liter. The sales value at split-off would be $(\$0.10 \times 500,000) - \$20,000 = \$50,000 - \$20,000 = \$30,000$.

Avoid Using Allocated Joint Costs for Individual Product Decisions

We want to reemphasize the point made at the beginning of our discussion of joint costs: *Allocation of joint costs should not affect decisions about the individual products, such as selling a joint product or processing it further.* For example, the physical units approach showed that the \$33,333 joint cost of producing Y exceeds its \$30,000 sales value at the split-off point. This

might seem to indicate that the company should not produce Y. However, because we can only produce the two products jointly, decisions about the products must be made jointly, not individually. Thus, a decision to produce Y must be a decision to produce X and Y—the production decision must be viewed as a joint decision. Because total revenue of \$120,000 exceeds the total joint cost of \$100,000, we should produce both. The allocation showing that one of the joint products is “unprofitable” is not relevant for this joint decision.

By-Product Costs

By-products are similar to joint products. A **by-product** is a product that, like a joint product, is not individually identifiable until manufacturing reaches a split-off point. By-products differ from joint products because they have relatively insignificant total sales values in comparison with the other products emerging at split-off. In contrast, joint products have relatively significant total sales values at split-off in comparison with the other jointly produced items. Examples of by-products are glycerine from soap making and mill ends of cloth and carpets.

If we account for an item as a by-product, we allocate only separable costs to it. We allocate all joint costs to the main products. We deduct any revenues from by-products, less their separable costs, from the cost of the main products.

Consider a lumber company that sells sawdust generated in the production of lumber to companies making particle board. Suppose the company regards the sawdust as a by-product. In 20X1, sales of sawdust totaled \$30,000, and the cost of loading and shipping the sawdust (i.e., costs incurred beyond the split-off point) was \$20,000. The inventory cost of the sawdust would consist of only the \$20,000 separable cost. The company would allocate none of the joint cost of producing lumber and sawdust to the sawdust. It would deduct the difference between the revenue and separable cost, $\$30,000 - \$20,000 = \$10,000$, from the cost of the lumber produced.

by-product

A product that, like a joint product, is not individually identifiable until manufacturing reaches a split-off point, but has relatively insignificant total sales value.

Highlights to Remember

- 1. Describe the general framework for cost allocation.** Companies assign direct and indirect costs to various cost objects, including service departments, producing departments, products, and customers. All organizations allocate indirect costs to producing departments and to the products or services delivered to customers. These allocations often include the costs of service departments. Some organizations carry cost allocation one more step—to customers.
- 2. Allocate the variable and fixed costs of service departments to other organizational units.** Companies should use separate cost pools for variable and fixed costs when allocating service department costs. They should allocate variable costs using budgeted cost rates times the actual cost-driver level. They should allocate fixed costs using budgeted percent of capacity available times the total budgeted fixed costs.
- 3. Use the direct and step-down methods to allocate service department costs to user departments.** When service departments support other service departments in addition to producing departments, they can use either the direct or step-down method for allocation. The direct method ignores other service departments when allocating costs. The step-down method recognizes other service departments' use of services.
- 4. Allocate costs from producing departments to products or services using the traditional and ABC approaches.** When a company's products or services are the final cost object, it should integrate its service department allocation with the allocation system used to determine the cost of products and services. A traditional system traces the direct costs in each department to its products or services and allocates indirect costs using a cost-allocation base. The ABC approach uses three steps to assign costs to products or services: 1) Determine the key components and the relationship among them, 2) collect relevant data, and 3) calculate and interpret ABC information. The ABC approach provides more accurate estimates of product or service costs than the traditional approach but is more costly to maintain.

- 5. Allocate costs associated with customer actions to customers.** Customer profitability is a function of product mix and the cost to serve. Activities that can drive up the costs to serve customers include small order quantities, pre-sales support, order changes, returns, special delivery requirements, and post-sales support.
- 6. Allocate the central corporate costs of an organization.** Central costs include public relations, top corporate management overhead, legal, data processing, controller's department, and company-wide planning. Often, it is best to allocate only those central costs of an organization for which measures of usage by departments are available.
- 7. Allocate joint costs to products using the physical-units and relative-sales-value methods.** Companies often allocate joint costs to products for inventory valuation and income determination using the physical-units or relative-sales-value method. However, such allocations should not affect decisions.

Accounting Vocabulary

by-product, p. 527
 cost application, p. 508
 direct method, p. 505

producing departments, p. 499
 service departments, p. 499
 step-down method, p. 506

MyLab Accounting

Fundamental Assignment Material

12-A1 Direct and Step-Down Methods of Allocation; General Framework for Allocation

Swarez Tool and Die has three service departments:

Budgeted Department Costs	
Cafeteria, revenue of \$100,000 less expenses of \$250,000	\$ 150,000
Engineering	1,600,000
General factory administration	950,000

Cost-allocation bases are budgeted as follows:

Production Departments	Employees	Engineering Hours Worked for Production Departments	Total Labor Hours
Machining	120	50,000	300,000
Assembly	540	20,000	720,000
Finishing and painting	60	10,000	120,000

1. Swarez allocates all service department costs directly to the production departments without allocation to other service departments. Show how much of the budgeted costs of each service department are allocated to each production department. Choose the most logical cost-allocation base for each service department. To plan your work, examine number 2 before undertaking this question.
2. The company has decided to use the step-down method of cost allocation. General factory administration would be allocated first, then cafeteria, then engineering. Cafeteria employees work 36,000 labor hours per year. There were 60 engineering employees with 120,000 total labor hours. Recompute the results in number 1, using the step-down method. Show your computations. Compare the results in numbers 1 and 2. Which method of allocation do you favor? Why?
3. Refer to Exhibit 12-1 on p. 500. For each type of cost assignment made in number 2 using the step-down method, indicate the assignment type from Exhibit 12-1.

12-A2 Customer Profitability

The following table gives sales, product cost, and cost-to-serve data for a company that makes three product lines: A, B, and C. The company has two customer types.

	Product A	Product B	Product C
Sales	\$5,000	\$6,000	\$25,000
Cost of sales	4,500	4,800	15,000

	Customer Type 1	Customer Type 2	Total
Product A Sales	\$ 500	\$ 4,500	\$ 5,000
Product B Sales	1,000	5,000	6,000
Product C Sales	13,000	12,000	25,000
Manager Visits	4	16	20

The cost to serve all customers is \$12,000 and is allocated to customer types based on the number of manager visits to customer locations for pre- and post-sales support.

1. Determine the gross profit margin percentage of sales for each product. Which product is the most profitable?
2. Determine the gross profit margin and the gross profit margin percentage of sales for each customer type.
3. Determine the cost-to-serve percentage of sales for each customer type.
4. Determine the operating income and operating income percentage of sales for each customer type.
5. Which customer is the most profitable based the following profitability measures:
 - a. Gross margin
 - b. Gross margin percentage of sales
 - c. Operating income
 - d. Operating income percentage of sales

12-A3 Joint Products

Mesabi Metals buys raw ore on the open market and processes it into two products, A and B. The ore costs \$11 per pound, and the process separating it into A and B has a cost of \$4 per pound. During 20X1, Mesabi plans to produce 200,000 pounds of A and 800,000 pounds of B from 1,000,000 pounds of ore. A sells for \$30 a pound and B for \$15 a pound. The company allocated joint costs to the individual products for inventory valuation purposes.

1. Allocate all the joint costs to A and B using the physical-units method.
2. Allocate all the joint costs to A and B using the relative-sales-value method.
3. Suppose Mesabi cannot sell product B in the form in which it emerges from the joint process. Instead, it must be processed further at a fixed cost of \$200,000 plus a variable cost of \$1 per pound. Then, it can be sold for \$18.75 a pound. Allocate all the joint costs to A and B using the relative-sales-value method.

12-B1 Allocation of Service Department Costs; General Framework for Allocation

Texas Building Services provides cleaning services for a variety of clients. The company has two producing departments, residential and commercial, and two service departments, personnel and administrative. The company has decided to allocate all service department costs to the producing departments, personnel on the basis of number of employees and administrative costs on the basis of direct department costs. The budget for 20X2 shows the following:

	Personnel	Administrative	Residential	Commercial
Direct department costs	\$70,000	\$100,000	\$ 240,000	\$ 400,000
Number of employees	3	5	12	18
Direct-labor hours			24,000	36,000
Square feet cleaned			4,500,000	9,970,000

1. Allocate service department costs using the direct method.
2. Allocate service department costs using the step-down method. Personnel costs should be allocated first.
3. Suppose the company prices by the hour in the residential department and by the square foot cleaned in the commercial department. Using the results of the step-down allocations in number 2,
 - a. compute the cost of providing one direct-labor hour of service in the residential department.
 - b. compute the cost of cleaning one square foot of space in the commercial department.
4. Refer to Exhibit 12-1 on p. 500. For each type of cost assignment made in number 2 using the step-down method, indicate the assignment type from Exhibit 12-1.

12-B2 Customer Profitability

Blakely Company makes three product lines and has two customer types. The following table gives sales, product cost, and cost-to-serve data for Blakely:

	Product		
	Alpha	Beta	Gamma
Sales	\$4,000	\$8,000	\$20,000
Cost of goods sold	2,000	2,000	14,000

	Customer Type 1	Customer Type 2	Total
Product Alpha Sales	\$2,000	\$ 2,000	\$ 4,000
Product Beta Sales	5,000	3,000	8,000
Product Gamma Sales	1,000	19,000	20,000
Manager Visits	6	4	10

The cost to serve all customers is \$10,000 and is allocated to customer types based on the number of manager visits to customer locations for pre- and post-sales support.

1. Determine the gross profit margin percentage of sales for each product. Which product is the most profitable?
2. Determine the gross profit margin and the gross profit margin percentage of sales for each customer type.
3. Determine the cost-to-serve percentage of sales for each customer type.
4. Determine the operating income and operating income percentage of sales for each customer type.
5. Which customer is the most profitable based the following profitability measures:
 - a. Gross margin
 - b. Gross margin percentage of sales
 - c. Operating income
 - d. Operating income percentage of sales

12-B3 Joint Products

St. Paul Milling buys oats at \$0.80 per pound and produces SPM Oat Flour, SPM Oat Flakes, and SPM Oat Bran. The process of separating the oats into oat flour and oat bran costs \$0.40 per pound. The oat flour can be sold for \$1.50 per pound, the oat bran for \$2.00 per pound. Each pound of oats has 0.2 pounds of oat bran and 0.8 pounds of oat flour. A pound of oat flour can be made into oat flakes for a fixed cost of \$240,000 plus a variable cost of \$0.60 per pound. St. Paul Milling plans to process 1 million pounds of oats in 20X0, at a purchase price of \$800,000.

1. Allocate all the joint costs to oat flour and oat bran using the physical-units method.
2. Allocate all the joint costs to oat flour and oat bran using the relative-sales-value method.
3. Suppose there were no market for oat flour. Instead, it must be made into oat flakes to be sold. Oat flakes sell for \$2.90 per pound. Allocate the joint cost to oat bran and oat flakes using the relative-sales-value method.

Additional Assignment Material

MyLab Accounting

QUESTIONS

12-1 Why is the cost-allocation method used by an organization an important part of its cost accounting system?

12-2 What are the 10 types of cost assignments?

12-3 How will you treat a cost for which it is not possible to identify its base cause?

12-4 List three guidelines for the allocation of service department costs.

12-5 “Whether a particular cost of a department is a direct cost or an indirect cost depends on the cost object.” Explain.

12-6 Why should budgeted cost rates, rather than actual cost rates, be used for allocating the variable costs of service departments?

12-7 Why should fixed costs be allocated based on the capacity available rather than the actual usage?

12-8 How will you treat costs that are not related to a single cost driver?

12-9 Briefly describe the two popular methods for allocating service department costs.

12-10 What does the direct method of allocating service department costs ignore? Why do companies use the direct method despite this weakness?

12-11 “The step-down method allocates more costs to the producing departments than does the direct method.” Do you agree? Explain.

12-12 Name the four steps for allocating costs to product or service cost objectives by the traditional approach.

12-13 How are costs of various overhead resources allocated to products, services, or customers in an ABC system?

12-14 Give four examples of activities and related cost-allocation bases that can be used in an ABC system to allocate costs to products, services, or customers.

12-15 Name the three steps used to allocate producing department activity cost pools using the ABC approach.

12-16 “A diverse operating environment necessitates the implementation of an ABC system.” Explain.

12-17 When determining customer profitability, why is it important to directly trace and allocate customer-related service department costs to customers rather than assigning them first to producing departments and then to customers?

12-18 Why is it necessary to know the profitability of customers? If all the products of a company are profitable, shouldn’t its customers also be profitable? Explain.

12-19 How can an organization lower its cost to serve the customers?

12-20 What problem might arise when central corporate costs are allocated based on actual sales?

12-21 What is the “ability-to-bear” philosophy of cost allocation?

12-22 Chapter 6 explained that joint costs should not be allocated to individual products for decision purposes. For what purposes are such costs allocated to products?

12-23 Briefly explain each of the two conventional ways of allocating joint costs of products.

12-24 What are by-products and how do we account for them?

CRITICAL THINKING EXERCISES

12-25 Allocation and Cost Behavior

There are three general guidelines to use when allocating service department (support) costs. One of these guidelines deals with the cost behavior of support costs. Why do many companies allocate fixed support costs separately from variable support costs?

12-26 Allocation and the Sales Function

Confusion can arise when cost allocations to one consuming department depend on the activity of another consuming department. “A commonly misused basis for allocation of central support costs is actual dollar sales.” Explain.

12-27 Allocation and Marketing

Many companies are allocating more nonproduction costs because of the increasing magnitude of these value-chain costs. One value-chain function that is receiving more attention is marketing. How should national advertising costs be allocated to territories?

EXERCISES

12-28 Allocation of Computer Costs

Review the section Allocation of Service Department Costs, pp. 501–507, especially the example of the use of the computer by the university. Recall that the budget formula was €100,000 fixed cost monthly plus €200 per hour of computer time used. Based on long-run predicted usage, the fixed costs were allocated on a lump-sum basis, 30% to business and 70% to engineering.

1. Show the total allocation if business used 210 hours and engineering used 400 hours in a given month. Assume that the actual costs coincided exactly with the budgeted amount for total usage of 610 hours.
2. Assume the same facts as in number 1 except that the fixed costs were allocated on the basis of actual hours of usage. Show the total allocation of costs to each school. As the dean of the School of Business, would you prefer this method or the method in number 1? Explain.

12-29 Fixed- and Variable-Cost Pools

The city of Lancaster signed a lease for a photocopy machine at \$3,000 per month and \$0.02 per copy. Operating costs for toner, paper, operator salary, and so on are all variable at \$0.03 per copy. Departments had projected a need for 100,000 copies a month. The city planning department predicted its usage at 36,000 copies a month. It made 42,000 copies in August.

1. Suppose one predetermined rate per copy was used to allocate all photocopy costs. What rate would be used and how much cost would be allocated to the city planning department in August?
2. Suppose fixed- and variable-cost pools were allocated separately. Specify how each pool should be allocated. Compute the cost allocated to the city planning department in August.
3. Which method, the one in number 1 or the one in number 2, do you prefer? Explain.

12-30 Sales-Based Allocations

Oxford Bookstores has three stores in India. The company allocates central costs using sales as the cost-allocation base. The following are budgeted and actual sales during June.

	Kolkata	Bengaluru	Delhi
Budgeted sales	₹1,200,000	₹2,000,000	₹800,000
Actual sales	1,200,000	1,400,000	1,000,000

Central costs of ₹720,000 are to be allocated in June.

1. Compute the central costs allocated to each store with budgeted sales as the cost-allocation base.
2. Compute the central costs allocated to each store with actual sales as the cost-allocation base.
3. What advantages are there to using budgeted rather than actual sales for allocating central costs?

12-31 Direct and Step-Down Allocations, Activity-Based Allocation

M&O Partners provides consulting services for a variety of clients. The company has two producing divisions, one for retail companies and one for industrial companies, and two service departments, personnel and administrative. Until now the company has not allocated service department costs. However, M&O has decided to allocate these costs to the producing departments using an activity-based allocation system. The retail division has Activity 1 and Activity 2 and the industrial division has Activity 3, Activity 4, and Activity 5. The company has decided to allocate personnel costs on the basis of number of employees and administrative costs on the basis of the direct costs of the activities in each division. However, administrative services are provided only to activities 2 and 3, so no administrative costs are allocated to activities 1, 4, and 5. Data for the activities follow:

	Number of Personnel	Direct costs
Personnel	2	\$ 92,000
Administrative	5	170,000
Retail:		
Activity 1	3	60,000
Activity 2	12	240,000
Industrial:		
Activity 3	18	400,000
Activity 4	0	90,000
Activity 5	8	110,000

1. Determine the costs allocated to the retail and industrial divisions using the direct method.
2. Determine the costs allocated to the retail and industrial divisions using the step-down method.
The personnel department costs should be allocated first.

12-32 Direct and Step-Down Allocations

Exclusive Garments has two producing departments, cloth and garments, and two service departments, personnel and store. The company's budget for April 20X1 is as follows:

	Service Departments		Production Departments	
	Personnel	Store	Cloth	Garments
Direct department costs	\$180,000	\$280,000	\$2,400,000	\$3,200,000
Square feet	8,000	4,000	40,000	100,000
Number of employees	60	120	800	1,000

Exclusive Garments allocates personnel costs on the basis of number of employees and store costs on the basis of square feet.

1. Allocate personnel and store costs to the producing departments using the direct method.
2. Allocate personnel and store costs to the producing departments using the step-down method.
Allocate personnel costs first.

12-33 Customer Profitability; Strategy

Shoppers Stop is a shopping mall that sells groceries, beauty products, garments, office stationaries, and toys, among other items. The following table gives the sales, product cost, and cost-to-serve data for four of its products and three customer types.

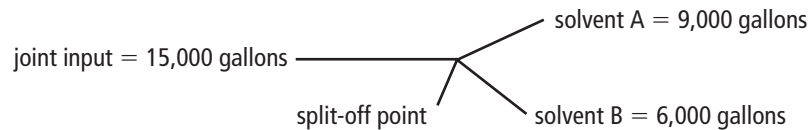
	Product A	Product B	Product C	Product D
Sales	£64,000	£176,000	£560,000	£286,000
Cost of sales	40,000	140,800	448,000	162,000
	Customer Type 1	Customer Type 2	Customer Type 3	Total Units Sold
Product A units	400	4,400	1,000	5,800
Product B units	200	2,400	6,000	8,600
Product C units	100	800	10,000	10,900
Product D units	800	1,600	800	3,200
Total units sold	1,500	9,200	17,800	28,500

The cost to serve all customers is £280,000 and is allocated to customer types based on the number of units sold.

1. Determine the gross profit margin percentage of sales for each product. Which product is the most profitable?
2. Determine the gross profit margin percentage of sales for each customer type.
3. Determine the cost-to-serve percentage of sales for each customer type.
4. Which customer is the most profitable?
5. Prepare a chart that shows the customer gross margin percentage and cost-to-serve percentage for the three customers. Recommend a strategy for profit improvement for each customer.

12-34 Joint Costs

Zephyr Chemical Company's production process for two of its solvents can be diagrammed as follows:



The cost of the joint input, including processing costs before the split-off point, is \$100,000. Solvent A can be sold at split-off for \$10 per gallon and solvent B for \$15 per gallon.

1. Allocate the \$100,000 joint cost to solvents A and B by the physical-units method.
2. Allocate the \$100,000 joint cost to solvents A and B by the relative-sales-value method.

12-35 Joint Costs

The output of a flour mill's production processes is two products, brown flour and white flour. The two products cannot be separated until \$60,000 of processing costs have been incurred. At that split-off point, there are 1,200 metric tons of brown flour that can be sold at \$400 per metric ton and 400 metric tons of white flour that can be sold at \$300 per metric ton.

1. Allocate the \$60,000 joint costs to brown flour and white flour by physical-units method.
2. Allocate the \$60,000 joint costs to brown flour and white flour by relative-sales-value method.

12-36 By-Product Costing

Rice husk, the coating that is left over after milling, is sold as livestock food. This livestock food is accounted for as a by-product.

During the 2020 fiscal year, BDK Rice, Inc., paid \$800,000 million to buy a high-yielding variety of seeds to produce 4,000 metric tons of rice. In the process, 200 metric tons of husk was obtained. The company spent \$4,000 to package and ship the husk, which was sold for \$30 per metric ton.

1. How much of the joint cost is allocated to the husk that is sold as livestock food?
2. Compute the total inventory cost (and therefore cost of goods sold) for the husk.
3. Assume that \$700,000 was spent on labor and additional \$500,000 was spent on irrigation, harvesting, threshing, winnowing, and milling. Compute the total cost of the rice produced.

PROBLEMS**12-37 General Framework for Allocation, Service Departments, ABC, Customer Profitability, and Process Maps**

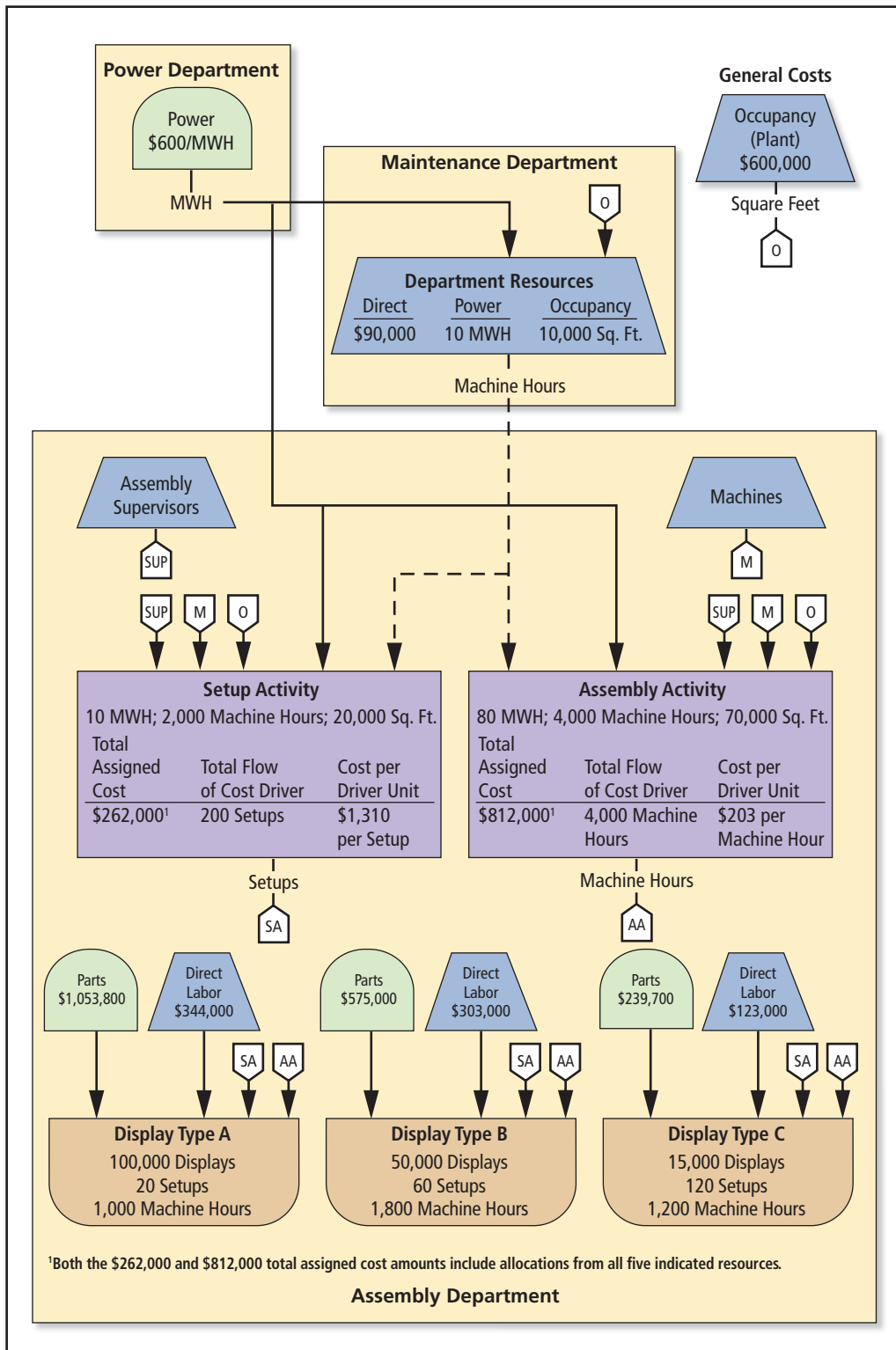
Consider one of **H.L. Display**'s manufacturing facilities. Suppose this facility assembles parts for displays to be sold to **Auchan**, **K-Supermarkets**, and **Budgens**. There are three departments—assembly, power, and maintenance. The assembly department uses an ABC system. The general cost of occupancy is allocated to the maintenance department and the assembly department based on the space occupied. Power department costs are allocated based on megawatt hours used. The assembly process produces three different types of displays with diverse demands on various activities and resources. Display type X consists of simple parts that are produced in high volume. Display type Y has parts that are of medium volume and complexity. Display type Z consists of complex parts that are produced in small lots.

Management implemented ABC in this facility using the three-step procedure outlined on pp. 513–515. The first steps have been completed, and the results are depicted in the process map shown in Exhibit 12-21.

1. Refer to Exhibit 12-1 on p. 500. For each type of cost assignment listed in Exhibit 12-1, give an example from H.L. Display. If no example exists, note as such.
2. What allocation method for service department costs does this facility use? Explain.
3. Calculate the allocations of service department and general costs to the assembly department activities.
4. Calculate the activity-based cost of each display type.

Exhibit 12-21

H.L. Display's Allocation of Service Department Costs in an ABC System

**12-38 Allocation of Automobile Costs**

The Marseille commune is one of the three large communes of France, divided further into 16 municipal arrondissements to ensure quality service. The commune is governed by an elected municipal council and headed by a mayor. Due to the size of the commune, different municipal department officials use hired cars to travel between arrondissements. The council employs the services of a car pool, which has 70 cars. The car pool owner incurs €5,100 annual fixed cost per car and €0.40 per mile variable cost to operate and maintain the cars.

Each month, the accounts section of the municipality allocates the costs of the car pool to the user departments on the basis of the miles covered. On an average, each car covers 18,000 miles annually

(1,500 miles monthly), although wide month-to-month variations occur. In July 2020, the 70 cars were driven a total of 90,000 miles. The car pool's total bill for that month was €81,000.

The chief of the tax collection department always seemed concerned about his department's car pool costs. He was especially upset in July when he was charged €27,000 for the 30,000 miles driven in the department's 15 cars. This is the normal monthly mileage in the department. He raised the issue with the accounts office, saying "How can you charge so much of the carpool cost to my department? Don't you think cars can be hired at less than €0.90 a mile?" The accounts officer explained that as per the policy, car pool costs are charged to the user departments on the basis of the miles driven. Since his department was responsible for $33\frac{1}{3}\%$ of the July usage (30,000 miles ÷ 90,000 miles), he has been charged with one-third of the total cost ($\frac{1}{3} \times €81,000 = €27,000$).

1. Calculate the commune's average annual cost per mile for owning, maintaining, and operating a car.
2. Explain why the allocated cost in July (€0.90 per mile) exceeds the average in number 1.
3. Describe any undesirable behavioral effects of the cost allocation method used.
4. How would you improve the cost-allocation method?

12-39 Allocation of Costs

Chelmsford Retail has two large merchandise stores in the city. Products purchased by the company are initially received in its central unit located in the outskirts, wherefrom they are sent to the retail locations in small shipments. The budgeted cost behavior pattern of the service department is £6,00,000 monthly in fixed costs plus £0.80 per shipment to the stores located in North and South zone. The actual monthly costs of the service department are allocated using number of shipments as the single cost-allocation base.

1. Chelmsford handled 600,000 shipments in June, half in each store. The actual costs of the service department were exactly equal to those predicted by the budget for 600,000 shipments. Compute the costs that would be allocated to each store on an actual number-of-shipments basis.
2. Suppose the North zone store was plagued by strikes, so that the sales were much lower than originally anticipated. The store handled only 180,000 shipments. The South zone store handled 300,000 shipments. The actual costs were exactly as budgeted for this lower level of activity. Compute the costs that would be allocated to the North and South zone stores on an actual-shipment basis. Note that the total costs will be lower.
3. Refer to the facts in number 1. Various inefficiencies caused the service department to incur total costs of \$1,500,000. Compute the costs to be allocated to the North and South zone stores. Are the allocations justified? If not, what improvement do you suggest?
4. Refer to the facts in number 2. Assume that assorted investment outlays for equipment and space in the service department were made to provide a basic maximum capacity to serve the North store at a level of 432,000 shipments and the South store at a level of 288,000 shipments. Suppose fixed costs are allocated on the basis of this capacity to serve. Variable costs are allocated by using a predetermined standard rate on per-shipment basis. Compute the costs to be allocated to each store. What are the advantages of this method over other methods?

12-40 Service Department Allocation and ABC, Product Costing

Green Star Air Solutions, Inc., manufactures air conditioning units. The company has three variants, Window ACs, Split ACs, and Inverter Split ACs. Green Star integrates its service department allocation system with its ABC system. There are two service departments—power and facilities management. Green Star allocates its two service department costs to the processing department using the direct method based on megawatt hours and machine hours consumed, respectively. The processing department has two activity centers—set up and assembly. Labor costs of the processing department are traced to every individual product. Set up costs are allocated based on number of setups, and assembly costs are allocated based on machine hours.

Data for the April–June quarter of 2020 are as follows:

	Product Variants		
	Window AC	Split AC	Inverter Split AC
Units produced and sold	200,000	20,000	2,000
Sales price per unit	€ 300	€ 500	€ 700
Total parts costs	€31,000,000	€5,160,000	€720,000
Total direct-labor costs	€11,600,000	€1,500,000	€240,000
Setups	40	24	16
Machine hours in assembly	4,000	800	200

Resource/Department	Total Cost	Driver Unit	Activity Centers' Use of Driver Unit	
			Setup	Assembly
Assembly supervisors	€180,000	%	3%	97%
Assembly machines	494,000	Machine hours	800	3,000
Facilities management department	190,000	Machine hours	800	3,000
Power department	108,000	Megawatt hours	20	160

Prepare a schedule that calculates the gross profit available to cover other value-chain costs for each product and Green Star as a whole company.

12-41 Service Department Allocation and ABC; Customer Profitability

(This problem should not be assigned unless Problem 12-40 is also assigned.) Refer to Problem 12-40. Green Star has two types of customers. Customer type 1 purchases mostly Window ACs. Customer type 2 purchases all three product variants but is the only customer type that purchases Inverter ACs. Data regarding the product mix for each customer follows:

Units Sold Across Product Variants				
	Window AC	Split AC	Inverter Split AC	Total
Customer type 1	150,000	10,000	0	160,000
Customer type 2	<u>50,000</u>	<u>10,000</u>	<u>2,000</u>	<u>62,000</u>
Total	<u>200,000</u>	<u>20,000</u>	<u>2,000</u>	<u>222,000</u>

Prepare a schedule that calculates the gross profit available to cover other value2-chain costs for each customer type.

12-42 Customer Profitability at a Distributor

Twin Cities Sports (TCS) is a distributor of sports footwear and equipment. TCS distributes many products to retail accounts but classifies products into just two product groups—footwear and equipment.

- Footwear items arrive at TCS in cases and are shipped to customers in these cases.
- TCS receives equipment in bulk shipments. TCS must unpack these products and then repack them to meet small order quantities for specific equipment. Examples include weight-training equipment and golf clubs and bags.

TCS has two types of customers:

1. Specialty stores: stores that order low volumes, the majority being footwear
2. Department stores: stores that order large volumes of both footwear and equipment

TCS's management has set a strategic goal to improve both product and customer profitability. A related subgoal that supports this strategy is to identify profitable products and customers using an accurate cost-accounting system.

TCS currently uses a simple cost-accounting system to calculate both product and customer profitability. The only direct costs are the purchase costs of footwear and equipment products. TCS allocates indirect costs to the product groups using a single indirect cost pool for all indirect costs with "pounds of product" as the cost-allocation base. Cost and operating data accumulated for the most recent year are in Exhibit 12-22.

1. Prepare a schedule that shows the gross margin of each product group.
2. Prepare a schedule that shows the gross margin of each customer type.
3. Based on your answers to numbers 1 and 2, recommend a strategy to improve customer profitability.

Exhibit 12-22Operating Data for
Twin Cities Sports

Product Data		
	Footwear	Equipment
Annual demand in cases	2,800	2,000
Average purchase cost per case	\$ 70	\$120
Average weight per purchased case	18.75 pounds	31.25 pounds
Average sales price per case	\$460	\$800
Customer Data		
Stores	Specialty Stores	Department
Footwear demand in cases	1,200	1,600
Equipment demand in cases	400	1,600
Total annual demand in cases	1,600	3,200
Orders	160	70
Other Data		

A single cost pool consists of resources needed to perform receiving, storing, picking, packing, shipping, order processing, and customer service activities. The annual cost of these resources is \$1,380,000. The cost-allocation base used to allocate this pool to the two product groups is pounds of product sold.

12-43 Customer Profitability and Allocation of Costs to Serve

(This problem is a continuation of Problem 12-42 and should be assigned only if 12-42 is also assigned.)

Based on a study of operations at TCS, it was determined that “number of orders” was a better cost-allocation base for the order processing and customer service activities. The cost of the resources used by these two activities is \$552,000 out of the total indirect cost pool of \$1,380,000. TCS now wants to refine its costing system by allocating order processing and customer service activities to customers rather than to products.

1. Prepare a schedule that shows product gross margin for each of the products made by TCS.
2. Prepare a schedule that shows customer product gross margin, customer cost to serve, and customer profitability.
3. Prepare a chart that shows customer product gross margin percentage versus customer cost-to-serve percentage for each of the customer types. Based on this chart, recommend a strategy that can be used to improve customer profitability for each customer type.
4. Compare customer profitability results determined by this refined costing system to the results obtained in Problem 12-42. Explain any significant differences.

12-44 Medical Equipment

San Jose Oncology Centre proposed the acquisition of some expensive chemotherapy equipment to be used for special cases. The equipment would be shared by the Oncology Department in the Main Hospital and the OPD Centre. The depreciation and related fixed costs of operating the equipment were predicted at \$28,000 per month. The variable costs were predicted at \$220 per patient procedure.

The management asked both the Oncology Department and the OPD to predict their usage of the equipment over its expected useful life of five years. The Oncology Department predicted an average of 90 chemotherapies per month while the OPD predicted 60 chemotherapies. The management regarded this information as critical to the size and degree of sophistication that would be justified. That is, if the number of chemotherapies exceeds a certain quantity per month, a different configuration of space, equipment, and personnel would be required that would mean higher fixed cost per month.

1. Suppose fixed costs are allocated on the basis of the predicted average use per month. Variable costs are allocated on the basis of \$220 per chemotherapy, the budgeted variable cost rate for the current fiscal year. In July, the in-house oncology department had 60 chemotherapies and the OPD had 60 chemotherapies. Compute the total cost allocated to each department.
2. Suppose the in-charge of the equipment had various operating efficiencies so that the total July costs were \$60,000. Would you change your answer in number 1? Why?
3. A traditional method of cost allocation does not use the method in number 1. Instead, an allocation rate depends on the actual cost and actual volume encountered. The actual costs are totaled for the month and divided by the actual number of chemotherapies during the month. Suppose the actual costs agreed exactly with the budget for a total of 120 actual chemotherapies in July. Compute the total costs allocated to the in-house oncology department and the OPD. Compare the

results with those in number 1. What is the major weakness in this traditional method? What are the some of its possible behavioral effects?

4. Describe any undesirable behavioral effects of the method described in number 1. How would you to counteract any tendencies toward deliberate false predictions of long-run usage?

12-45 Direct Method for Service Department Allocation

Bata Corporation is one of the largest producers of footwear in the world. It specializes in both traditional leather footwear and modern non-leather footwear. The company has two separate producing departments for two categories of footwear. In addition, there are two service departments, building services and materials receiving and handling. The company uses different indirect material components apart from leather and rexine.

The non-leather, rexine-based footwear division is highly automated. The manufacturing costs primarily depend on the number of subcomponents in each pair of footwear. In contrast, the traditional leather-based footwear division relies primarily on a large labor force to hand-assemble the products. Its costs depend on direct-labor hours.

The costs of building services depend primarily on the square footage occupied. The costs of materials receiving and handling depend primarily on the total number of components handled.

Shoes N1 and N2 are produced in the traditional leather footwear department and F1 and F2 are produced in the modern non-leather footwear department. Data about these products follow:

	Direct-Materials Cost	Number of Components	Direct-Labor Hours
N1	CHF74	11	2.4
N2	86	9	4.8
F1	63	10	1.2
F2	91	20	0.8

Budget figures for 2020 include the following:

	Building Service	Materials Receiving and Handling	Traditional Leather Shoes	Non-leather Shoes
Direct department costs (excluding direct materials cost)	CHF120,000	CHF96,000	CHF544,000	CHF438,400
Square footage occupied		2,500	25,000	12,500
No. of final shoes produced			4,000	5,000
Average no. of components per shoe			10	16
Direct labor hours			24,000	6,400

1. Allocate the costs of the service departments using the direct method.
2. Using the results of number 1, compute the cost per direct-labor hour in the leather shoes department and the cost per component in the non-leather shoes department.
3. Using the results of number 2, compute the cost per unit of product for shoes N1, N2, F1, and F2.

12-46 Step-Down Method for Service Department Allocation

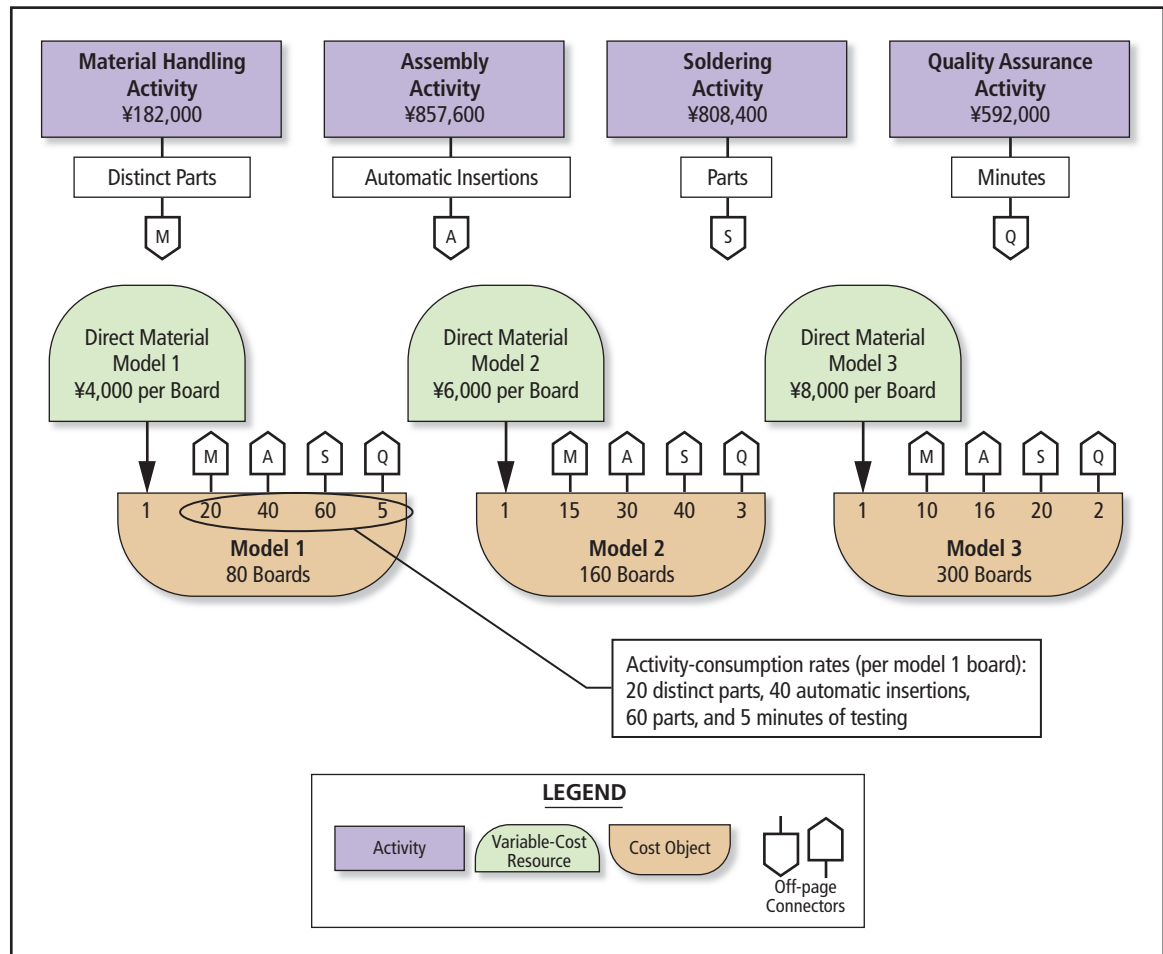
Refer to the data in Problem 12-45.

1. Allocate the costs of the service departments using step-down method.
2. Using the results of number 1, compute the cost per direct-labor hour in the leather shoes department and the cost per component in the non-leather shoes department.
3. Using the results of number 2, compute the cost per unit of product for shoes N1, N2, F1, and F2.

12-47 ABC Allocations; Process Map; What If Analysis

Tokuga Company makes printed circuit boards in a suburb of Tokyo. The production process is automated with computer-controlled robotic machines assembling each circuit board from a supply of parts and then soldering the parts to the board. Materials-handling and quality-assurance activities use a combination of labor and equipment. Although a few resources that are used are variable with respect to changes in the demand of boards, these costs are not material compared to the fixed-cost resources that are used.

Tokuga makes three types of circuit boards, models 1, 2, and 3. Steps 1 and 2 of the design process for an ABC system have been completed. Exhibit 12-23 shows the process-based map of Tokuga's operations.

**Exhibit 12-23**

Tokuga Company's Two-Stage ABC System

1. Compute the cost of production for each of the three types of circuit boards and the cost per circuit board for each type.
2. What if the design of model 1 could be simplified so that it required only 8 distinct parts (instead of 20) and took only 3 minutes of testing time (instead of five). Compute the cost of model 1 circuit boards and the cost per circuit board. Will the costs per circuit board for models 2 and 3 change? You do not need to compute the costs per circuit board for models 2 and 3, only note whether the costs will increase, decrease, remain unchanged, or cannot be determined. Explain.

12-48 Activity-Based Allocations

Cash and Carry Wholesalers uses an ABC system to determine the cost associated with the packaging and delivery of its products. The packaging and delivery activity is supported by three resources: (1) inspection, (2) packaging labor, and (3) shipments.

Inspection is a variable cost driven by the number of boxes received. Inspection costs are \$4.00 per box.

Packaging labor is driven by pounds of merchandise received. Because labor is hired in shifts, it is fixed for large ranges of volume. Currently, labor costs are running \$26,600 per month for handling 380,000 pounds. This same cost would apply to all volumes between 250,000 pounds and 420,000 pounds.

Finally, shipment is also a variable cost driven by the number of shipments. The costs per shipment are \$15.

One product distributed by Cash and Carry Wholesalers is packets of edible oil. There is a wide variety of edible oil, so many shipments are handled by the packaging and delivery section. In September 2020, the packaging section received 400 shipments consisting of 3,200 boxes weighing a total of 64,000 pounds.

1. Compute the cost of packaging and delivery associated with edible oil shipments during September 2020.
2. The management is considering elimination of brands of edible oil that have small sales levels. This would reduce the volume to 200 shipments, consisting of 2,700 boxes weighing 54,000 pounds. Compute the amount of savings from elimination of small-sales-level brands.

- Suppose the packaging and delivery costs were estimated on a per-pound basis. What was the total cost per pound of edible oil packed and delivered in September? If management had used this cost to estimate the effect of elimination of 10,000 pounds of edible oil, what mistake might be made?

12-49 Allocation of Central Costs

Bitburger Brewery, Germany, allocates all central corporate overhead costs to its divisions. Some costs such as specified internal auditing and legal costs are identified on the basis of time spent. However, other costs are hard to allocate, so the revenue achieved by each division is used as an allocation base. Examples of such costs are executive salaries, travel, secretarial, utilities, depreciation, corporate planning, and general marketing costs. The company has divided its countrywide business operation into three divisions namely Northern Division, Central Division, and Southern Division.

Allocations on the basis of revenue for 2019 are as follows (in millions):

Division	Revenue	Allocated Costs
Northern	€180	€ 9
Central	360	18
Southern	360	18
Total	€900	€45

In 2020, Northern Division's revenue remained unchanged. However, Southern Division's revenue increased to €390 million due to large corporate orders. The latter are troublesome to forecast. Central Division had expected a sharp rise in revenue, but severe competing conditions resulted in a decline to €330 million. The total central corporate overhead cost allocated on the basis of revenue was again €45 million, despite rises in many other costs. The CEO was pleased that central costs did not rise for the year.

- Compute the allocations of cost for each division for 2020.
- How would each division manager probably feel about the cost allocation in 2020 as compared to 2019? What are the weaknesses of using revenue as a basis of cost allocation?
- Suppose the budgeted revenues for 2020 were €180, €360, and €420 million respectively, and the budgeted revenues were used as a cost allocation base for allocation. Compute the allocations of costs to each division for 2020. Do you prefer this method to the one used in number 1? Why?
- Many accountants and managers oppose allocating any central costs. Why?

12-50 Joint Costs and Decisions

A chemical company has a batch process that takes 1,000 gallons of a raw material and transforms it into 80 pounds of X1 and 400 pounds of X2. Although the joint costs of their production are \$2,400, both products are worthless at their split-off point. Additional separable costs of \$700 are necessary to give X1 a sales value of \$2,000 as product A. Similarly, additional separable costs of \$400 are necessary to give X2 a sales value of \$2,000 as product B.

You are in charge of the batch process and the marketing of both products. (Show your computations for each answer.)

- Assuming that you believe in assigning joint costs on a physical basis, allocate the total profit of \$500 per batch to products A and B.
 - Would you stop processing one of the products? Why?
- Assuming that you believe in assigning joint costs on a net-realizable-value (relative-sales-value) basis, allocate the total operating profit of \$500 per batch to products A and B. If there is no market for X1 and X2 at their split-off point, a net realizable value is usually imputed by taking the ultimate sales values at the point of sale and working backward to obtain approximated "synthetic" relative sales values at the split-off point. These synthetic values are then used as weights for allocating the joint costs to the products.
 - You have internal product-profitability reports in which joint costs are assigned on a net-realizable-value basis. Your chief engineer says that, after seeing these reports, he has developed a method of obtaining more of product B and correspondingly less of product A from each batch, without changing the per-pound cost factors. Would you approve this new method? Why? What would the overall operating profit be if 40 pounds more of B were produced and 40 pounds less of A?

CASES

12-51 Customer Profitability

Distribution Solutions, Inc., (DSI) is a regional distributor providing logistical support for merchandisers over a tristate area. Its distribution centers have been profitable until recently. DSI provides logistics solutions in industries such as fashion apparel, electronics, housewares, building

materials, automotive tools, and beverages. Its locations are convenient to major ports and transportation hubs. DSI has an outstanding reputation for customer service.

Profit margins have declined over the past several years due mostly to a weak regional economy and competition from larger merchandisers such as **Home Depot**, **Lowe's**, and **Wal-Mart** who use logistic services of larger national distributors. Thus, the market share of merchandisers has declined along with their need for logistics support from DSI.

DSI orders supplies from a variety of manufacturers. All goods processed through the warehouse are stored on pallets and are handled by forklifts driven by forklift operators, who are assisted by warehouse labor. Processing of product consists of unloading at the receiving area (receiving activity), moving to the warehouse storage (put away activity), moving/shifting within the warehouse (warehousing activity), removal from racks (picking activity), and repacking (repacking activity). Customer-specific processing consists of order taking, customer service, order changes, returns, scheduling (regular or expedited), and shipping.

Prices at DSI are set using a cost-plus formula based on the average cost per case delivered during the previous year. Two markups are used. The first markup covers the cost of warehousing and distribution. The second markup covers the costs of general and selling expenses and an allowance for profit. Currently (2013) this price is \$7.25 per case. However, with the various discounts and promotions, this year's actual price averages \$4.75 per case for all products.

DSI has six distinct product groups:

1. Regular products are prepackaged arriving and leaving in cases.
2. Fragile products are prepackaged but require care in handling.
3. Bulk products arrive in loose lots in crates or cases and are repackaged in smaller boxes, polybags, or small cartons before packing in cases.
4. High-security products must be locked in high-security area.
5. Short shelf-life products are dated products.
6. Singles are received in bundles and will be unbundled and hand-stacked for storage.

Traditionally, the regular prepackaged product has generated both high margins and high volume. Fragile pre-packaged product has high margin but low volume. Bulk products and singles have poor margins but have been part of DSI's offerings because of customer demands for a full-line distributor. As DSI focused on increasing sales, mega stores and local small stores have increased their purchases of bulk products and singles. Until now, no premium has been charged for these products.

DSI has for many years classified its customer base into various types. Prior to 2008, almost all its customers were mega stores or large local stores. Since 2008, local small store and specialty store business has been aggressively pursued. The customer types can be described as follows:

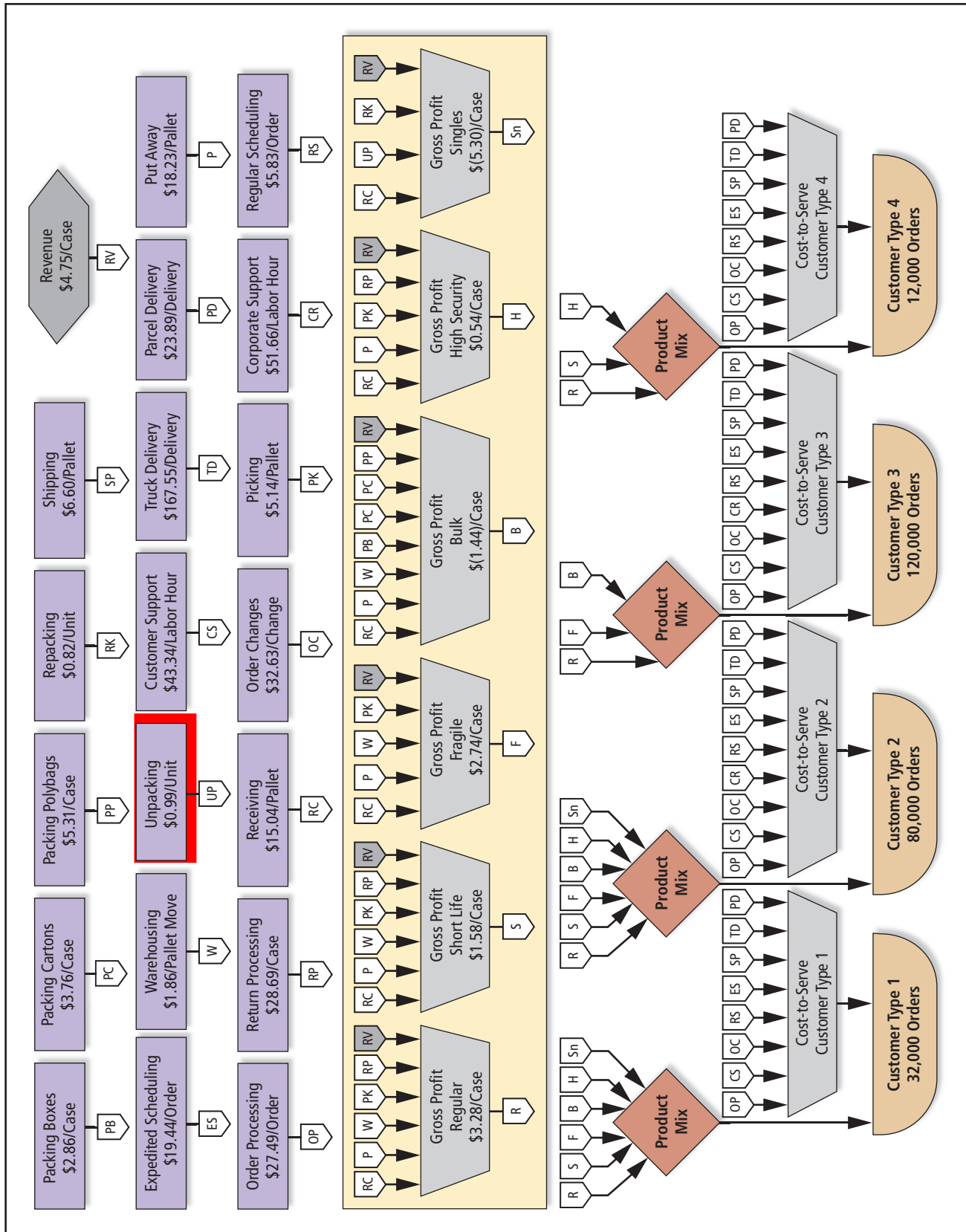
- Mega stores (CT1): a few very large stores that order large volumes of all product types (7,680,000 cases annually)
- Local small stores (CT2): many stores that order low volumes of all products for each store (6,000,000 cases annually)
- Local large stores (CT3): many stores that order large volumes of only regular, fragile, and bulk products (14,400,000 cases annually)
- Specialty stores (CT4): a few stores that order low volumes of only regular, high-security, and short shelf-life products (600,000 cases annually)

Over the past several months, Paul Doxey, controller, working closely with Jane Stratford, chief marketing officer, and a cross-functional implementation team have been developing the ABC system to include all costs as well as customer profitability. A study has been conducted to determine the key drivers of work associated with the various customer types. These drivers include order frequency, order size, pallets ordered, customer-specific service, and order changes.

Key activities associated with serving customers include the following:

- Shipping
- Parcel delivery
- Truck delivery
- Customer support
- Regular scheduling
- Expedited scheduling
- Order processing
- Order changes
- Corporate support

The implementation team headed by Paul Doxey has completed the activity analysis interviews, prepared a process map, collected data, and validated the new model both operationally and financially. The new process map is shown in Exhibit 12-24. In order to link the product and customer

**Exhibit 12-24**

Distribution Solutions, Inc. Process Map for Product/Customer Profitability

Exhibit 12-25
Distribution Solutions, Inc.
Product Mix Data for Product/
Customer Profitability Model

	Product Mix (%)					
	Regular	Short Lived	Fragile	Bulk	High Security	Singles
Customer Type 1 Mega Stores	60%	5%	5%	20%	5%	5%
Customer Type 2 Local Small Stores	50	5	5	30	8	2
Customer Type 3 Local Large Stores	80	—	10	10	—	—
Customer Type 4 Specialty Stores	10	20	—	—	70	—

	Cost-to-Serve Activities								
	Order Processing	Customer Support	Order Changes	Corporate Support	Scheduling—Regular	Scheduling—Expedited	Shipping	Delivery—Truck	Delivery—Parcel
Cost Driver	Orders	Labor Hours	Number of Changes	Labor Hours	Orders	Orders	Pallets	Deliveries	Deliveries
Cost per Driver Unit	\$27.49	\$43.34	\$32.63	\$51.66	\$5.83	\$19.44	\$6.60	\$167.55	\$23.89
Number of Driver Units (Thousands)									
CT1	32	18.7	3.2	0	29	3	416	25.6*	1.6*
CT2	80	100.0	8.0	20	72	8	640	68.0	8.0
CT3	120	70.0	2.4	80	108	12	840	90.0	6.0
CT4	12	30.0	1.2	0	10	2	60	4.8	2.4

*The sum of deliveries (25.6 + 1.6 = 27.2 on average) is less than the number of orders (29 + 3) because a few customers picked up their order at the distribution center.

Exhibit 12-26
Distribution Solutions, Inc. Cost Driver Data by Customer Type and Cost-to-Serve Activity

models the product mix for each customer is specified giving the gross profit for each customer. Exhibit 12-25 shows the product mix for each of the four customer types. Exhibit 12-26 shows the cost-to-serve data for each driver.

1. Using Excel, construct an exhibit that calculates customer gross margin percentage and customer cost-to-serve percentage for the four customer types. Plot these points along with one for customer type 2 on a graph similar to Exhibit 12-20 on p. 524.
2. For each customer type, recommend a strategy to improve profitability.

12-52 Allocation of Data Processing Costs

The Gibraltar Insurance Co. (GIC) established a systems department to implement and operate its own data processing systems. GIC believed that its own system would be more cost-effective than the service bureau it had been using.

GIC’s three departments—claims, records, and finance—have different requirements with respect to hardware and other capacity-related resources and operating resources. The system was designed to recognize these differing needs. In addition, the system was designed to meet GIC’s long-term capacity needs. The excess capacity designed into the system would be sold to outside users until needed by GIC. The estimated resource requirements used to design and implement the system are shown in the following schedule:

	Hardware and Other Capacity-Related Resources	Operating Resources
Records	25%	60%
Claims	50	15
Finance	20	20
Expansion (outside use)	5	5
Total	100%	100%

GIC currently sells the equivalent of its expansion capacity to a few outside clients.

At the time the system became operational, management decided to redistribute total expenses of the systems department to the user departments based on actual computer time used. The actual costs for the first quarter of the current fiscal year were distributed to the user departments as follows:

Department	Percentage Utilization	Amount
Records	60%	\$330,000
Claims	15	82,500
Finance	20	110,000
Outside	<u>5</u>	<u>27,500</u>
Total	<u>100%</u>	<u>\$550,000</u>

The three user departments have complained about the cost-distribution method since the systems department was established. The records department's monthly costs have been as much as three times the costs experienced with the service bureau. The finance department is concerned about the costs distributed to the outside user category because these allocated costs form the basis for the fees billed to the outside clients.

Mostafa Al Rashed, GIC's controller, decided to review the cost-allocation method. The additional information he gathered for his review is reported in Tables 1, 2, and 3 in Exhibit 12-27.

TABLE 1 Systems Department Costs and Activity Levels

	First Quarter					
	Annual Budget		Budget		Actual	
	Hours	Dollars	Hours	Dollars	Hours	Dollars
Hardware and other capacity-related costs	—	\$ 600,000	—	\$150,000	—	\$155,000
Software development	18,750	562,500	4,725	141,750	4,250	130,000
Operations						
Computer related	3,750	750,000	945	189,000	920	187,000
Input/output related	<u>30,000</u>	<u>300,000</u>	<u>7,560</u>	<u>75,600</u>	<u>7,900</u>	<u>78,000</u>
Total		<u>\$2,212,500</u>		<u>\$556,350</u>		<u>\$550,000</u>

TABLE 2 Historical Usage

	Hardware and other capacity needs	Software development		Operations			
		Range	Average	Computer		Input/output	
				Range	Average	Range	Average
Records	25%	0%–30%	15%	55%–65%	60%	10%–30%	15%
Claims	50	15–60	40	10–25	15	60–80	75
Finance	20	25–75	40	10–25	20	3–10	5
Outside	<u>5</u>	0–25	<u>5</u>	3–8	<u>5</u>	3–10	<u>5</u>
	<u>100%</u>		<u>100%</u>		<u>100%</u>		<u>100%</u>

TABLE 3 Usage of Systems Department's Services First Quarter (in hours)

	Software Development	Operations	
		Computer Related	Input/Output
Records	450	540	1,540
Claims	1,800	194	5,540
Finance	1,600	126	410
Outside	<u>400</u>	<u>60</u>	<u>410</u>
Total	<u>4,250</u>	<u>920</u>	<u>7,900</u>

Exhibit 12-27

Data for Gibraltar Insurance Co.

Al Rashed has concluded that the method of cost allocation should be changed. He believes that the hardware and capacity-related costs should be allocated to the user departments in proportion to the planned long-term needs. Any difference between actual and budgeted hardware costs would not be allocated to the departments, but would remain with the systems department.

The costs for software development and operations would be charged to the user departments based on actual hours used. A predetermined hourly rate based on the annual budget data would be used. The hourly rates that would be used for the current fiscal year are as follows:

Function	Hourly Rate
Software development operations	\$ 30
Computer related	200
Input/output related	10

Al Rashed plans to use first-quarter activity and cost data to illustrate his recommendations. The recommendations will be presented to the systems department and the user departments for their comments and reactions. He then expects to present his recommendations to management for approval.

1. Calculate the amount of data-processing costs that would be included in the claims department's first-quarter budget according to the method Al Rashed has recommended.
2. Prepare a schedule to show how the actual first-quarter costs of the systems department would be charged to the users if GIC adopts Al Rashed's recommended method.
3. Explain whether Al Rashed's recommended system for charging costs to the user departments will
 - a. improve cost control in the systems department.
 - b. improve planning and cost control in the user departments.

NIKE 10-K PROBLEM

12-53 Allocation of Corporate Expenses

Footnote 17 to Nike's 2021 financial statements in Appendix C shows net corporate expenses of \$2,261 million as well as revenues and earnings before interest and taxes by geographical areas. Suppose that Nike wants to allocate its net corporate expenses to the following four geographic regions on the basis of the revenues of the regions: North America, Europe, Middle East, & Africa (EMA), Greater China, and Asia Pacific & Latin America. Compute the earnings before interest and taxes for each region after the allocation. Comment on the desirability of this allocation.

EXCEL APPLICATION EXERCISE

12-54 Allocating Costs Using Direct and Step-Down Methods

Goal: Create an Excel spreadsheet to allocate costs using the direct method and the step-down method. Use the results to answer questions about your findings.

Scenario: Texas Building Services has asked you to help it determine the best method for allocating costs from its service departments to its producing departments. Additional background information for your spreadsheet appears in Fundamental Assignment Material 12-B1. Exhibit 12-4 on p. 506 illustrates the types of calculations that are used for allocating costs using the step-down method.

When you have completed your spreadsheet, answer the following questions:

1. What are the total costs for the residential department using the direct method?
What are the total costs for the commercial department using the direct method?
2. What are the total costs for the residential department using the step-down method?
3. What are the total costs for the commercial department using the step-down method?
4. Which method would you recommend that Dallas Cleaning use to allocate its service departments' costs to its producing departments? Why?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 12 Decision Guideline
Row 2: Texas Building Services
Row 3: Cost Allocations from Service Departments to Producing Departments
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–H.
4. In row 7, create the following bold-faced, center-justified column headings:
Column B: Personnel
Column C: Administrative
Column D: Residential
Column E: Commercial
Column F: Total Res/Comm
Column G: Total Admin/Res/Comm
Column H: Grand Total
5. Change the format of the column headings in row 7 to permit the titles to be displayed on multiple lines within a single cell.

Alignment tab:

Wrap Text:

Checked

Note: Adjust column widths so that headings use only two lines.

Adjust row height to ensure that row is same height as adjusted headings.

6. In column A, create the following row headings:
Row 8: Direct Department Costs
Row 9: Number of Employees
Skip two rows.

Note: Adjust the width of column A to 27.14.

7. In column A, create the following bold-faced, underlined row heading:
Row 12: Direct Method:
8. In column A, create the following row headings:
Row 13: Direct Department Costs
Row 14: Personnel Allocation
Row 15: Administrative Allocation
Row 16: Total Costs
Skip two rows.
9. In column A, create the following bold-faced, underlined row heading:
Row 19: Step-Down Method:
10. In column A, create the following row headings:
Row 20: Direct Department Costs
Row 21: Step 1—Personnel Allocation
Row 22: Step 2—Administrative Allocation
Row 23: Total Costs
11. Use data from Fundamental Assignment 12-B1 to enter the amounts in columns B–E for rows 8, 9, 13, and 20.
12. Use the appropriate calculations to do the totals in row 8 for columns F and H.
Use the appropriate calculations to do the totals in row 9 for columns F and G.
13. Use the appropriate formulas to allocate the costs from the service departments to the producing departments using each of the methods.
14. Use the appropriate calculations to do the totals in columns B–E and in column H, rows 16 and 23.

15. Format amounts in columns B–H, rows 8, 13, 16, 20, and 23 as follows:

Number tab:	Category:	Accounting
	Decimal:	0
	Symbol:	\$

16. Format the amount in columns B–E, rows 14, 15, 21, and 22 as follows:

Number tab:	Category:	Accounting
	Decimal:	0
	Symbol:	None

17. Change the format of the total costs amounts in columns B–E, rows 16 and 23, to display a top border, using the default line style.

Border tab:	Icon:	Top Border

18. Change the format of the amounts in row 9, columns B–G to center justified.

19. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

12-55 Library Research on ABC and Customer Profitability

Form groups of three to five people each. Each member of the group should pick one of the following industries:

- Manufacturing
- Insurance
- Healthcare
- Government
- Service

Each person should explore the Internet for an example of a company that implemented ABC and ABM with a focus on determining customer profitability. Prepare and give a briefing for your group. Do this by completing the following:

1. Describe the company and its business.
2. What was the scope of the ABC/ABM project?
3. What were the goals for the ABC/ABM project?
4. Summarize the results of the project.

After each person has briefed the group on his or her company, discuss within your group the commonalities between the ABC/ABM applications.

INTERNET EXERCISE

12-56 Cost Allocation at Transformco

Allocating indirect costs can be a challenging task. Almost all firms have some type of cost centers (departments), whether it is the administration overseeing the corporation as a whole or the accounting department processing billing and invoicing customers. Deciding what to do with the costs generated by these cost centers can be difficult. Let's take a look at **Transformco**.

1. Go to the home page for Transformco at <https://transformco.com/>. How many brands are listed under the umbrella of Transformco? What are these brands? How many stores do the brands operate? How many of them are located in the area where you are located? If one or more is not located in your area, have you heard of it before?
2. If Transformco allocates the selling and administrative costs to the major segments based on total segment revenue, what percent of selling and administrative expenses is allocated to each segment? What would be the allocation if the company used the total assets as the allocation basis? Do these differ from the actual allocation bases that are implied by the segment selling and administrative expenses?

Accounting for Overhead Costs

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Compute budgeted factory-overhead rates and apply factory overhead to production.
2. Determine and use appropriate cost-allocation bases for overhead application to products and services.
3. Use normalized variable- and fixed-overhead application rates and explain the disposition of overhead variances.
4. Compare variable- and absorption-costing systems.
5. Construct an income statement using the variable-costing approach.
6. Construct an income statement using the absorption-costing approach.
7. Distinguish between product-costing and planning-and-control purposes in accounting for variable and fixed costs.
8. Compute the production-volume variance and show how it should appear in the income statement.
9. Reconcile variable- and absorption-costing operating income and explain why a company might prefer to use a variable-costing approach.

► DELL

Dell is the world's leading direct-sale marketer of made-to-order computer systems. Dell does not manufacture computer components (e.g., circuit boards, hard drives), but instead assembles them into computers on a made-to-order basis.

Dell pioneered the “direct business model”—selling directly to end users instead of using a network of dealers, which avoids the dealer markup and gives Dell a competitive price advantage. Customers can design their own computer systems to specifications they desire, choosing from among a full complement of options. Before ordering, customers can receive advice and price quotes for a wide variety of computer configurations.

Once an order is taken, Dell assembles it in a manufacturing work cell called a “mod.” There is a separate mod for each of Dell's lines of business (e.g., Vostro Desktop PCs, OptiPlex Desktops for networked environments, Inspiron and XPS Notebooks, PowerEdge network servers, and Precision workstation products). Rapid response to customer orders is key to maintaining Dell's competitive edge.

Dell takes orders over the phone or over the Internet. Dell reached approximately \$94.22 billion revenue in 2021, its fifth year of steadily increasing income, and derived a large portion of these revenues from the company's Web site, www.dell.com. Customers may review, configure, and price systems within Dell's entire product line. Dell's Web site also offers personalized system-support pages and technical services. Customers of all kinds prefer Dell's direct business model, and the Internet affords Dell a perfect way to implement this model. They like the immediacy, convenience, savings, and personal touches the Internet-direct customer experience provides.

Why are managers at a profitable company like Dell interested in knowing as much as possible about the cost of their individual product lines? With strong profits being reported over the years, is there a clear need for costs for other management purposes? The answer is yes. Most of the reason why Dell's profitability has been strong is the strategic and operational decisions its managers make. These decisions are based on detailed cost information. For example, Dell's cost accounting systems supply product costs to managers for evaluating pricing policy and product lines. Dell managers need to know the cost of each kind of computer being produced to set prices, to determine marketing and production strategies for various models, and to evaluate production operations. At the same time, product costs appear as cost of goods sold in income statements and as finished-goods inventory values in balance sheets. Although it would be possible to have two product-costing systems, one for management decision making and one for financial reporting, seldom do the benefits of using two completely separate systems exceed the costs. Therefore, both decision-making and financial-reporting needs influence the design of a company's product-costing system.

In Chapter 4, you learned about three types of costs in a manufacturing company: direct materials, direct labor, and factory overhead (or indirect manufacturing) costs. You also learned that for many organizations, indirect costs account for as much as 40% of total operating costs. Thus, this is an important area of concern for managers. In this chapter, we focus on overhead. ■

Accounting for Factory Overhead

Years ago, direct materials and direct labor were the largest costs for most companies. Today, automated companies such as **Dell** have lower direct labor costs but much larger overhead costs. Thus, methods for assigning overhead costs to products are an important part of accurately measuring product costs.

How to Apply Factory Overhead to Products

Managers need to know product costs in order to make ongoing decisions, such as which products or services to emphasize or deemphasize and how to price each product or service. Ideally, managers would know all costs precisely, including overhead, when they make these decisions. Because accountants directly trace direct materials and direct labor costs to products and services, these costs are available immediately on completion of production, and they are known precisely. In contrast, because it is not economically feasible to know all of the indirect manufacturing costs immediately, accountants must estimate them. For this reason, accountants use budgeted (predetermined) overhead rates to apply overhead to jobs. As a result, estimates of total product cost are immediately available. Besides this product costing benefit, budgeted overhead rates also provide planning and control benefits to the firm, as these rates (1) require managers to develop cost forecasts and (2) determine estimated costs that they can compare to actual costs. When overhead costs are large, it is important to have an accurate system for factory overhead accounting.

Dell has increased the accuracy of its product cost information by converting some of its factory-overhead costs from indirect to direct costs. How did the company do this? By dedicating assembly labor and factory equipment to specific product lines. Work cells (mods) do the assembly and software loading for specific product lines. This makes it easier to trace some of the equipment costs to products. Nevertheless, significant overhead costs remain to be allocated. So let's consider how companies such as Dell allocate these overhead costs to products and services.

Budgeted Overhead Application Rates

The following steps summarize how to account for factory overhead:

1. Select one or more cost-allocation bases for applying overhead costs to products or services. In this chapter, we often use the term *apply* instead of *allocate* when assigning overhead costs to a product or service. However, the concept is essentially the same—determining the amount of each cost pool to assign to each cost object. Examples of cost-allocation bases include direct-labor hours, direct-labor costs, machine hours, and



© Jonathan Weiss/Shutterstock

Dell sells computers directly to customers around the world.

Objective 1

Compute budgeted factory-overhead rates and apply factory overhead to production.

production setups. The cost-allocation base should be a measure of the amount of overhead resources—a cost or a group of costs such as machinery cost, set-up costs, or energy cost—used by each product. The cost-allocation base(s) should be the most plausible and reliable measure(s) available of the cause-and-effect relationships between overhead costs and production volume.

budgeted factory-overhead rate

The budgeted total overhead for each cost pool divided by the budgeted cost-allocation base level.

2. Prepare a factory-overhead budget for the planning period, ordinarily a year. The two key items are (a) budgeted overhead and (b) budgeted volume of the cost-allocation base. There will be a set of budgeted overhead costs and an associated budgeted cost-allocation base level for each overhead cost pool.¹ In businesses with simple production systems, there may be just one set.
3. Compute the **budgeted factory-overhead rate(s)** by dividing the budgeted total overhead for each cost pool by the budgeted cost-allocation base level.
4. Obtain actual cost-allocation base data (such as direct-labor hours or machine hours) used for each product.
5. Apply the budgeted overhead to the products or services by multiplying the budgeted rate(s) in step 3 times the actual cost-allocation base data from step 4.
6. At the end of the year, account for any differences between the amount of overhead actually incurred and overhead applied to products.

Illustration of Overhead Application

Now that you know the steps in accounting for factory overhead, let's examine how they work in a realistic example. Consider the Enriquez Machine Parts Company.² Its manufacturing-overhead budget for 2023 follows:

	Machining	Assembly
Indirect labor	€ 75,600	€ 36,800
Supplies	8,400	2,400
Utilities	20,000	7,000
Repairs	10,000	3,000
Factory rent	10,000	6,800
Supervision	42,600	35,400
Depreciation on equipment	104,000	9,400
Insurance, property taxes, etc.	7,200	2,400
Total	<u>€277,800</u>	<u>€103,200</u>

Enriquez selected a single cost-allocation base in each department, machine hours in machining and direct-labor cost in assembly, for applying overhead. As Enriquez works on a product, it applies the factory overhead to the product using a budgeted overhead rate, computed as follows:

$$\text{budgeted overhead application rate} = \frac{\text{total budgeted factory overhead}}{\text{total budgeted amount of cost driver}}$$

The overhead rates for the two departments are as follows:

	Year 2023	
	Machining	Assembly
Budgeted manufacturing overhead	€277,800	€103,200
Budgeted machine hours	69,450	
Budgeted direct-labor cost		€206,400
Budgeted overhead rate per machine hour: €277,800 ÷ 69,450 =	\$ 4	
Budgeted overhead rate per direct labor euro: €103,200 ÷ €206,400 =		50%

¹Cost pools were defined in Chapter 4, p. 146, as a group of individual costs that a company allocates to activities or cost objects using a single cost driver.

²The Enriquez Machine Parts Company example used here and in the Chapter 14 discussion of job-order-costing are the same, with all data completely compatible.

Note that the overhead rates are budgeted; they are estimates. Accountants at Enriquez then use these budgeted rates to apply overhead based on actual events. That is, the total overhead applied to a particular product is the result of multiplying the budgeted overhead rates by the actual machine hours or labor cost used by that product. Thus, we would apply €44 of overhead to a product that uses 6 machine hours in machining and incurs direct-labor cost of €40 in assembly:

Machining: 6 actual machine hours $\times$ €4 per machine hour	€24
Assembly: €40 of direct-labor cost $\times$ 50%	20
Total overhead	<u>€44</u>

Suppose Enriquez had used 70,000 machine hours in machining and incurred €190,000 of direct-labor cost in assembly during the year. It would have applied a total of €375,000 of overhead to the products produced:

Machining: 70,000 actual machine hours $\times$ €4	€280,000
Assembly: €190,000 actual direct-labor cost $\times$ 50%	95,000
Total factory overhead applied	<u>€375,000</u>

This €375,000 is an estimate of Enriquez's overhead for the year, and it will become part of the cost of goods sold expense on Enriquez's income statement when the units produced are subsequently sold. If the actual overhead costs differ from €375,000, the company will usually charge the difference to expense in the period of production. For example, if Enriquez's actual overhead in 2023 was €392,000, it would add €392,000 – €375,000 = €17,000 additional expense to cost of goods sold on the income statement in 2023.

This completes our six steps. Next let's go back to step 1 and explore how a company might choose appropriate cost-allocation bases.

Choice of Cost-Allocation Bases

As you have seen several times in this text, no single cost-allocation base is appropriate in all situations. The accountant's goal is to find the cost-allocation base that best links cause and effect. In the Enriquez machining department, use of machines causes most overhead cost, such as depreciation and repairs. Therefore, machine hours represent the most appropriate cost-allocation base for applying overhead costs. Thus, Enriquez must keep track of the machine hours used for each product, creating an added data collection cost. That is, it must accumulate machine hours in addition to direct-materials costs and direct-labor costs for each product.

In contrast, direct labor is the principal cost-allocation base in the Enriquez assembly department because employees assemble parts by hand. Suppose the company records the time each worker spends on each product (or batch of products). Then, Enriquez simply applies the 50% overhead rate to the cost of direct labor already recorded. No additional data are needed.

If the hourly labor rates for workers differ greatly for individuals performing identical tasks, Enriquez might use the hours of labor, rather than the euros spent for labor, as a base. Otherwise, Enriquez would apply more overhead to a product when a €10-per-hour worker works an hour than when an €8-per-hour worker works an hour, even though each employee uses the same facilities and generally consumes the same overhead support. However, sometimes direct-labor cost is the best overhead cost-allocation base even if wage rates vary within a department. For example, higher-skilled (and consequently higher-paid) labor may use more costly equipment and have more indirect labor support than low-skilled (lower-paid) workers. Moreover, many factory-overhead costs include expensive labor fringe benefits such as pensions and payroll taxes. Direct-labor cost rather than direct-labor hours often drive such fringe-benefit costs.

If a department identifies more than one cost-allocation base for overhead costs, it should accumulate a separate cost pool for each cost-allocation base and put each overhead cost into the appropriate cost pool. In practice, such a system is too costly for many organizations. Instead, these organizations select a few cost-allocation bases (often only one) to serve as a basis for allocating overhead costs. We often use the 80–20 rule in these situations—20% of the cost-allocation bases drive 80% of the overhead costs. For example, suppose a company identifies 10 separate overhead pools with 10 different cost-allocation bases. Often, it can accurately apply approximately 80% of the total overhead cost with only two allocation bases. It may be too costly to devise separate cost pools for the other 20%, so it arbitrarily assigns those costs to the two main cost pools.

Objective 2

Determine and use appropriate cost-allocation bases for overhead application to products and services.

Consider **Dell**. As we mentioned earlier, Dell has converted many of its overhead costs into direct costs. However, two important costs that it cannot directly trace (that is, that remain indirect costs) are facilities and engineering. Facilities costs include occupancy costs such as depreciation, insurance, and taxes on the factory. Dell applies these costs using the cost-allocation base “square footage used by each line of business (assembly line).” Dell incurs large product and process engineering costs as part of the design phase of the company’s value chain. It applies these costs to lines of business using a “complexity” cost-allocation base such as number of distinct parts in the motherboard. Server computer products, for example, require much more engineering time and effort due to the number of distinct parts in the motherboard (complexity of the product) compared to laptops or PCs. Thus, server products receive a much greater allocation of engineering costs than laptops or PCs.

Another example is **Harley-Davidson**, which changed from using direct labor as a cost-allocation base to using process hours, as described in the Business First box on p. 555.

Problems of Overhead Application

Normalized Overhead Rates

The Enriquez illustration demonstrated what we call the normal costing approach. Why the term *normal*? Because we use an annual average overhead rate consistently throughout the year for product costing, without altering it from day to day and from month to month. The resultant “normal” product costs include an average or normalized chunk of overhead. Hence, in a **normal costing system** the cost of the manufactured product is composed of actual direct material, actual direct labor, and normal applied overhead.

A department’s applied overhead will rarely equal the actual overhead incurred. Managers can analyze this variance between applied and incurred cost. The most common—and important—contributor to these variances is operating at a different level of volume than the level used as a denominator in calculating the budgeted overhead rate (for instance, using 100,000 budgeted direct-labor hours as the denominator and then actually working only 80,000 hours). Other frequent causes include poor forecasting, inefficient use of overhead items, price changes in individual overhead items, erratic behavior of individual overhead items (e.g., repairs made only during slack time), and calendar variations (e.g., 20 workdays in one month, 22 in the next).

Companies generally prefer to use an annual budgeted factory-overhead rate regardless of the month-to-month peculiarities of specific overhead costs. Such an approach is more defensible than, for example, applying the actual overhead for each month. Why? Because a normal product cost is more useful for decisions, and more representative for inventory-costing purposes, than an “actual” product cost that is distorted by month-to-month fluctuations in production volume and by the erratic behavior of many overhead costs. For example, the employees of a gypsum plant using an “actual” product cost system had the privilege of buying company-made items “at cost.” Employees joked about the benefits of buying “at cost” during high-volume months, when unit costs were lower because volume was higher, as the following table illustrates:

	Actual Overhead			Direct-Labor Hours	Actual Overhead Application Rate per Direct-Labor Hour*
	Variable	Fixed	Total		
Peak-volume month	\$60,000	\$40,000	\$100,000	100,000	\$1.00
Low-volume month	30,000	40,000	70,000	50,000	1.40

*Divide total overhead by direct-labor hours. Note that the presence of fixed overhead causes the fluctuation in unit overhead costs from \$1.00 to \$1.40. The variable component is \$.60 an hour in both months, but the fixed component is \$.40 in the peak-volume month (\$40,000 ÷ 100,000) and \$.80 in the low-volume month (\$40,000 ÷ 50,000).

Disposition of Underapplied or Overapplied Overhead

The last of the six steps on p. 552 dealt with differences between actual and applied overhead. Let’s look in more detail at options for accounting for such differences. Recall that Enriquez applied €375,000 to the products produced during the period. This amount is part of the cost of goods sold expense for those units that were sold and is included in ending inventory for those units that remain unsold at the end of 2023. However, Enriquez actually incurred €392,000 of overhead costs. The difference is a €17,000 variance (the amount of actual cost not yet applied

Objective 3

Use normalized variable- and fixed-overhead application rates and explain the disposition of overhead variances.

normal costing system

The cost system in which the cost of the manufactured product is composed of actual direct material, actual direct labor, and normal applied overhead.

Overhead Allocation at Harley-Davidson

Milwaukee-based **Harley-Davidson**, the motorcycle manufacturer, recently celebrated its one hundredth birthday. As happy as everyone at Harley-Davidson is today, it is a bit surprising to some how far the company has come over the past several decades. From near collapse, Harley-Davidson turned its business around during the 1980s and 1990s, and in 1999 captured the number one market position from **Honda** for the first time in three decades. Harley-Davidson (2011 sales of \$5.3 billion) is the only major U.S.-based motorcycle producer. One of the keys to the company's return to competitiveness was the adoption of a JIT philosophy. It is not unusual for a company to discover that a change in an important component of operations requires a corresponding change in the company's accounting system. The main focus of the old accounting system was direct labor, which not only made up a part of product cost itself but also functioned as an all-purpose base for allocating overhead. However, direct labor was only 10% of total product cost. It certainly did not generate a majority of overhead costs. Although Harley-Davidson's production process had changed, the accounting system remained static.

The JIT system served to emphasize that detailed information on direct-labor costs was not useful to managers. It was costly to have each direct laborer record the time spent on each product or part and then enter the information from these time cards into the accounting system. For example, if each of 500 direct laborers works on 20 products per day, the system must record 10,000 entries per day, which equates to 200,000 entries per month. The time spent by direct laborers to record the time, by clerks to enter the data into the system, and by accountants to check the data's accuracy, is enormous—all to produce product cost information that was used for financial reporting but was useless to managers.

The JIT system forced manufacturing managers to focus on satisfying customers and minimizing non-value-added activities. Gradually, accountants began to focus on the same objectives. Accounting's customers were the managers who used the accounting information, and effort devoted to activities that did not help managers was deemed counterproductive (non-value-added). Therefore, eliminating the costly, time-consuming recording of detailed labor costs became a priority. Harley-Davidson eliminated direct labor as a direct cost, and consequently could not use it for overhead application. After considering process hours, flow-through time, materials value, and individual cost per unit as possible cost-allocation bases for applying overhead, the company selected process hours. Direct labor and overhead were combined to form conversion costs, which accountants applied to products on the basis of total process hours. This did not result in costs significantly different from the old system, but the new system was much simpler and less costly. The company traced only direct material directly to the product. It applied conversion costs at completion of production based on a simple measure of process time.

Accounting systems should generate benefits greater than their costs. More sophisticated systems are not necessarily better systems. Harley-Davidson's main objective in changing its accounting system was simplification—elimination of unnecessary tasks and streamlining others. These changes resulted in a revitalized accounting system.

Sources: Adapted from W.T. Turk, "Management Accounting Revitalized: The Harley-Davidson Experience," in B.J. Brinker, Ed., *Emerging Practices in Cost Management* (Boston: Warren, Gorham & Lamont, 1990), pp. 155–166; K. Barron, "Hog Wild," *Forbes*, May 15, 2000; and *Harley-Davidson 2011 Annual Report*.

to product), which we call **underapplied overhead** because the amount applied is less than the amount incurred. The opposite, **overapplied overhead**, occurs when the amount applied exceeds the amount incurred. At the end of a given period, the company needs to produce its financial statements, which require production costs based on the actual costs incurred. To yield this result, it must dispose of any under- or overapplied overhead. Accountants use one of two methods to perform this adjustment: 1) A simple but imprecise approach disposes of the entire amount as a write-off to cost of goods sold, or 2) a better but more complex approach is **proration**, which means apportioning over- or underapplied overhead to cost of goods sold, work-in-process inventory, and finished-goods inventory in proportion to the ending balances of each account.

IMMEDIATE WRITE-OFF The immediate write-off method regards the €17,000 underapplied overhead as a reduction in current income by adding it to cost of goods sold. By the same logic, we would deduct any overapplied overhead from cost of goods sold.

The reasoning behind this method is that the company has probably sold most of the goods produced during the period, so that prorating part of the variance to inventory accounts would not produce a materially different result. Another justification is that, if extra overhead costs result from inefficiencies in the current period, they should not be included as part of ending inventory costs because they do not represent assets. Because of its simplicity, the immediate write-off method is most commonly used.

underapplied overhead

The difference between actual and applied overhead when the amount applied is less than the amount incurred.

overapplied overhead

The difference between actual and applied overhead when the amount applied exceeds the amount incurred.

proration

To assign underapplied overhead or overapplied overhead to cost of goods sold, work-in-process inventory, and finished-goods inventory in proportion to the ending balances of each account.

PRORATION AMONG INVENTORIES If the objective is to obtain as accurate an application of actual costs as possible, theoretically we should recompute all the overhead costs of the individual products using the actual, rather than the budgeted, rates. This approach is rarely feasible, so proration apportions over- or underapplied overhead among work-in-process (WIP), finished goods (FG), and cost of goods sold because these are the accounts where the applied factory overhead resides at the end of the period. While prorating over- or underapplied overhead means to assign it in proportion to the magnitude of applied factory overhead in the ending balances of these accounts, a more practical approach is to prorate on the basis of the ending balances in each of the three accounts. Assume that the ending balances for Enriquez are WIP, €155,000; FG, €32,000; and cost of goods sold, €2,480,000 (a total of €2,667,000). The results of proration follow:

	(1) Unadjusted Balance, End of 2023	(2) Proration of Underapplied Overhead	(3) Adjusted Balance, End of 2023
WIP	€ 155,000	$(155,000 \div 2,667) \times €17,000 =$ € 988	€ 155,988
Finished goods	32,000	$(32 \div 2,667) \times 17,000 =$ 204	32,204
Cost of goods sold	2,480,000	$(2,480 \div 2,667) \times 17,000 =$ 15,808	2,495,808
Total	<u>€2,667,000</u>	<u>€17,000</u>	<u>€2,684,000</u>

The amounts prorated to inventories are not significant, so proration is probably not cost beneficial here. In actual practice, companies generally prorate overhead variances only when it would materially affect inventory valuations and net income. For simplicity, we will assume for the rest of this chapter that companies immediately write off any over- or underapplied overhead.

The Use of Variable and Fixed Application Rates

The cost of a product or service is the sum of direct costs and allocated costs. As we have seen, overhead application is the most troublesome aspect of product costing. The presence of fixed costs is a major reason for the costing difficulties. Many companies make no distinction between variable- and fixed-cost behaviors in the design of their accounting systems. For instance, the machining department at Enriquez Machine Parts Company developed the following rate that includes both variable and fixed costs:

$$\begin{aligned}
 \text{budgeted overhead application rate} &= \frac{\text{budgeted total overhead}}{\text{budgeted machine hours}} \\
 &= \frac{€277,800}{69,450} \\
 &= €4 \text{ per machine hour}
 \end{aligned}$$

Some companies, though, do distinguish between variable overhead and fixed overhead for product costing as well as for control purposes. Suppose the machining department at Enriquez had made this distinction. Managers determined that rent, supervision, depreciation, and insurance were fixed costs and indirect labor, supplies, utilities, and repairs were variable costs. The department developed two rates:

$$\begin{aligned}
 \text{budgeted variable-overhead application rate} &= \frac{\text{budgeted total variable overhead}}{\text{budgeted machine hours}} \\
 &= \frac{€114,000}{69,450} \\
 &= €1.64 \text{ per machine hour} \\
 \text{budgeted fixed-overhead application rate} &= \frac{\text{budgeted total fixed overhead}}{\text{budgeted machine hours}} \\
 &= \frac{€163,800}{69,450} \\
 &= €2.36 \text{ per machine hour}
 \end{aligned}$$

Some companies use such rates for product costing. However, it is more important to make distinctions between variable- and fixed-overhead application rates for control purposes. Why? Because the explanations for over- or underapplied overhead are usually quite different for variable and fixed costs.

After the following summary problem, we will turn our attention to some other issues arising from differences between fixed and variable overhead.

Summary Problem for Your Review

PROBLEM

Review the Enriquez illustration. Suppose Enriquez had sales in 2023 of €5,000,000. There were no beginning or ending inventories. That is, Enriquez sold everything it produced in 2023. The company used the budgeted factory-overhead rates on p. 552. Production in 2023 required 85,000 machine hours in machining and €260,000 direct-labor cost in assembly. The materials used in 2023 cost €2,400,000, and the total direct-labor cost was €490,000. Actual factory-overhead cost was €455,000. Prepare an income statement for 2023 through the gross profit line. Include a separate line for the immediate write-off method for overapplied or underapplied overhead.

SOLUTION

See Exhibit 13-1. You can compute the overhead component of cost of goods sold as follows:

Machining: 85,000 machine hours × €4 per machine hour	€340,000
Assembly: €260,000 direct-labor cost × 50% of direct-labor dollars	<u>130,000</u>
Total overhead	<u>€470,000</u>

Overapplied overhead is €470,000 – €455,000 = €15,000.

Sales		€ 5,000,000
Cost of goods sold:		
Direct materials	€ 2,400,000	
Direct labor	490,000	
Factory overhead	<u>470,000</u>	
Total		(3,360,000)
Overapplied overhead		<u>15,000</u>
Gross profit		<u>€ 1,655,000</u>

Exhibit 13-1

Enriquez Machine Parts Company

Income Statement, 2023

Variable Versus Absorption Costing

Accounting for Fixed-Manufacturing Overhead

We compare two major methods of product costing in this section: variable costing (the contribution approach) and absorption costing (the functional, full-costing, or financial-reporting approach). You encountered these methods already in Chapter 5, but here we will provide more details. They differ in only one major respect: Fixed manufacturing overhead is excluded from the cost of products under variable costing but is included in the cost of products under absorption costing.

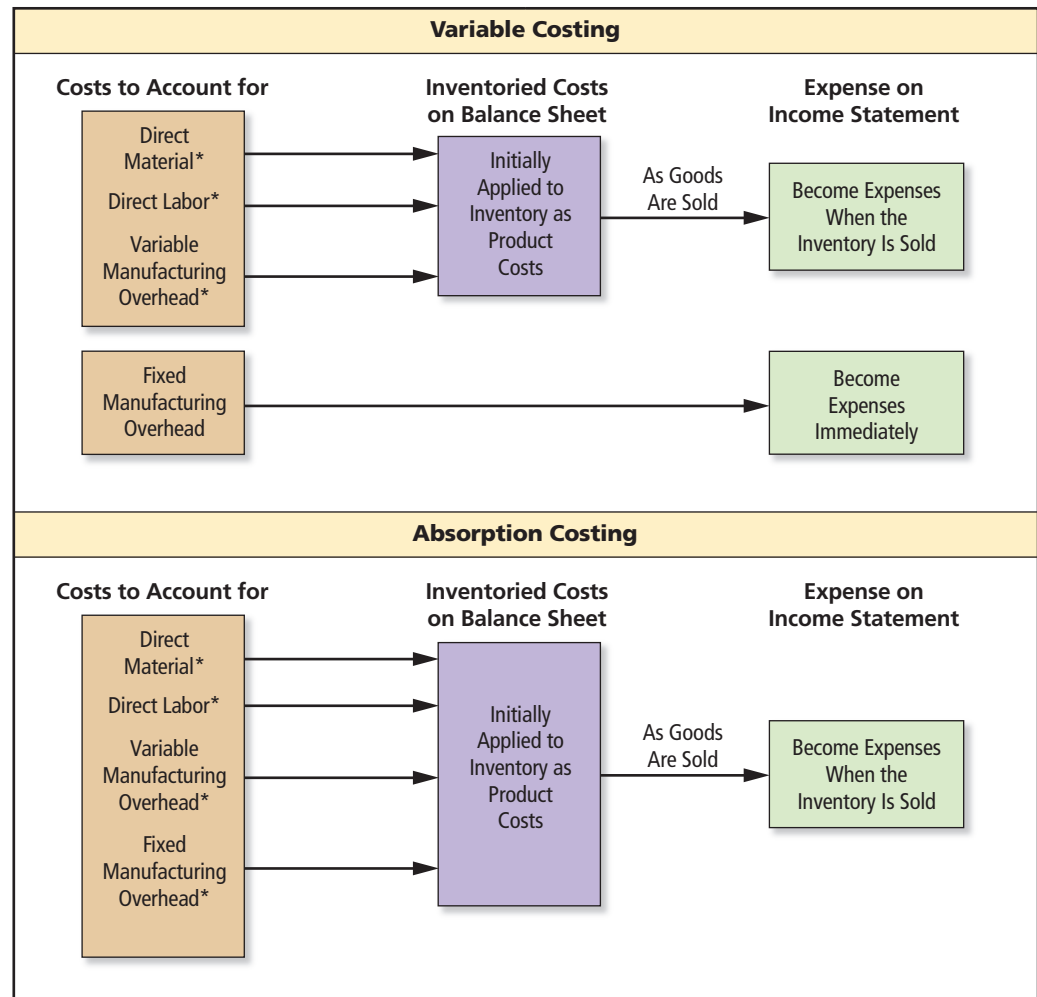
As Exhibit 13-2 shows, a variable-costing system charges fixed manufacturing overhead (fixed factory overhead) as a period cost that is an immediate expense on the income statement—not as a product cost that is added to inventory and charged against sales as cost of goods sold

Objective 4

Compare variable- and absorption-costing systems.

Exhibit 13-2

Comparison of Flow of Costs



*As goods are manufactured, the costs are "applied" to inventory, usually via the use of unit costs.

when the company sells the inventory. Note that the only difference between variable- and absorption-costing net incomes is the accounting for fixed manufacturing overhead.³

Absorption costing is more widely used than variable costing. Why? Because variable costing is not allowed for either external-reporting or tax purposes. An example of how one company uses variable costing is shown in the Business First box on p. 559.

Nonetheless, the growing use of the contribution approach in performance measurement and cost analysis has led to increasing use of variable costing for internal-reporting purposes. Over half the major firms in the United States use variable costing for some internal reporting, and nearly a quarter use it as the primary internal format. For example, the Muncie, Indiana, plant of **BorgWarner** changed its product-line performance reporting from an absorption-costing approach to variable costing. Why? Because management believes variable costing links manufacturing performance more closely with measures of that performance by removing the impact of changing inventory levels from financial results.

Until the last decade or two, use of variable costing for internal reporting was expensive. It requires a company to process information two ways, one for external reporting and one for internal reporting. The increasing use and decreasing cost of computers has reduced the added cost of a variable-costing system. Most managers no longer face the question of whether to invest in a separate variable-costing system. Rather, they simply choose a variable-costing or absorption-costing format for reports. Many well-designed accounting systems used today can produce either format.

³Variable costing is sometimes called direct costing. However, variable costing is a more descriptive term, so we will use it exclusively in this text.

Variable Costing at Nortel Networks

Nortel Networks was at one time a Canada-based “global leader in telephone, data, wireless, and wireline solutions for the Internet,” with revenues of \$10.4 billion in 2008. In 2009 the company filed for bankruptcy and began to sell its assets, which is ongoing as of 2012. In the 1990s, while still known as Northern Telecom, Nortel gradually came to understand that its standard absorption costing income statement did not provide the information that managers needed. The company also realized the information needed for a more meaningful income statement was in the accounting system, but the traditional reported income statement did not present the information in the most useful way. Therefore, Nortel’s accountants adopted a “variable costing” approach to the income statement.

Statutory and regulatory reporting requirements did not allow Northern Telecom to completely abandon absorption costing. The company’s solution left the top line—revenue—and the bottom line—earnings before tax—unchanged. But everything in between was reported differently, in the following format:

Revenue
Product cost
Product margin
Manufacturing/operational costs
Inventory provisions
New product introduction
Selling and marketing
Direct margin
Administrative cost
Other operating (income) expense
Operating profit
Corporate assessments
Other nonoperating (income) expense
Earnings before balance sheet adjustments
Balance sheet adjustment
Earnings before tax

This format represents an extreme application of variable costing. Only direct-materials costs are considered product costs. All other costs, including direct labor and variable overhead, are period costs that are charged to expense when incurred, not added to inventory. For example, direct labor is part of manufacturing costs. The amount charged in any period is the amount actually incurred during that period, regardless of whether the labor is related to goods sold or those still in inventory. Managers used four measures of “profit”: product margin (to measure the value added), direct margin (to measure results of product production and sales), operating profit (to measure total results of operations), and earnings before balance sheet adjustments (to measure the effect on company-wide profits).

The main difference between the old absorption-costing system and the new system is that the new system expenses all costs except materials costs, whereas the old system capitalized all production costs. Reconciling the two systems was an accounting problem, unrelated to operating the business. Therefore, a final line was added to the income statement to provide a reconciliation—balance sheet adjustment. This represents the difference between the absorption and variable costing statements, but it can be ignored by managers.

Nortel’s efforts illustrate two important points. First, it is possible to adapt accounting methods to meet the specific needs of managers. Second, companies often do not have to choose between absorption and variable costing—either format can be produced by the same basic accounting system.

Sources: From P. Sharman, “Time to Re-examine the P&L,” *CMA Magazine*, September 1991, pp. 22–25; Nortel Networks 2011 10-K.

Facts for Illustration

To see exactly how these two product costing systems work, we will use a hypothetical division of **Dell**—let’s call it the Desk PC division—as an illustration. The division makes a variety of desktop computers, but for simplicity we will consider all the computers to be identical. The division had the following standard costs for the production of computers:

Basic Production Data at Standard Cost	
Direct materials	\$205
Direct labor	75
Variable manufacturing overhead	20
Standard variable costs per computer	<u>\$300</u>

The annual budget for fixed manufacturing overhead is \$1,500,000. Expected (or budgeted) production is 15,000 computers per year, and the sales price is \$500 per computer. For simplicity, we will assume that number of computers produced is the single cost-allocation base for the \$20 per computer variable-manufacturing overhead. Also, we will assume that annual budgeted fixed selling and administrative expenses are \$650,000 and the only variable

selling and administrative cost is a sales commission of 5% of dollar sales. Actual product quantities are as follows:

	20X0	20X1
In units (computers)		
Opening inventory	—	3,000
Production	17,000	14,000
Sales	14,000	16,000
Ending inventory	3,000	1,000

There are no variances from the standard variable manufacturing or selling and administrative costs, the actual fixed manufacturing overhead incurred is exactly \$1,500,000 each year, and the actual fixed selling and administrative cost is \$650,000 each year.

Based on this information, we can

1. prepare income statements for 20X0 and 20X1 under variable costing,
2. prepare income statements for 20X0 and 20X1 under absorption costing, and
3. show a reconciliation of the difference in operating income for 20X0, 20X1, and the two years as a whole.

Variable-Costing Method

We begin by preparing income statements under variable costing. The variable-costing statement shown in Exhibit 13-3 has a familiar contribution-approach format, the same format introduced in Chapter 5. The only new characteristic of Exhibit 13-3 is the presence of a detailed calculation of cost of goods sold, which is affected by changes in the beginning and ending inventories. In contrast, the income statements in earlier chapters assumed that there were no changes in the beginning and ending inventories.

We account for the costs of the product by applying all variable manufacturing costs to the goods produced at a rate of \$300 per computer. This values inventories at standard variable costs. We do not apply any fixed manufacturing costs to products; instead we regard them as expenses in the period they are incurred.

Objective 5

Construct an income statement using the variable-costing approach.

	20X0	20X1
Sales, 14,000 and 16,000 computers, respectively	\$7,000,000	\$8,000,000
Variable expenses:		
Variable manufacturing cost of goods sold		
Opening inventory, at standard variable costs of \$300	\$ —	\$ 900,000
Add: variable cost of goods manufactured at standard, 17,000 and 14,000 computers, respectively	<u>5,100,000</u>	<u>4,200,000</u>
Available for sale, 17,000 computers in each year	\$5,100,000	\$5,100,000
Deduct: ending inventory, at standard variable cost of \$300	<u>900,000*</u>	<u>300,000†</u>
Variable manufacturing cost of goods sold	\$4,200,000	\$4,800,000
Variable selling expenses, at 5% of dollar sales	<u>350,000</u>	<u>400,000</u>
Total variable expenses	<u>4,550,000</u>	<u>5,200,000</u>
Contribution margin	\$2,450,000	\$2,800,000
Fixed expenses:		
Fixed factory overhead	\$1,500,000	\$1,500,000
Fixed selling and administrative expenses	<u>650,000</u>	<u>650,000</u>
Total fixed expenses	<u>2,150,000</u>	<u>2,150,000</u>
Operating income, variable costing	<u>\$ 300,000</u>	<u>\$ 650,000</u>

*3,000 computers at \$300 = \$900,000.

†1,000 computers at \$300 = \$300,000.

Exhibit 13-3

Desk PC Division: Comparative Income Statements Using Variable Costing
Years 20X0 and 20X1

Before reading on, be sure to trace the facts from our Desk PC division example to the presentation in Exhibit 13-3, step-by-step. Note that we deduct both variable cost of goods sold and variable selling and administrative expenses in computing the contribution margin. However, variable selling and administrative expenses are not inventoriable. Why? They are not incurred in production and so are not considered to be product costs. Only the level of sales, not changes in inventory, affect them.

Absorption-Costing Method

Exhibit 13-4 shows the standard absorption-costing framework. As you can see, it differs from the variable-costing format in three ways.

First, the unit product cost used for computing cost of goods sold is \$400, not \$300. Why? Because we add fixed manufacturing overhead of \$100 to the \$300 variable manufacturing cost. The \$100 of fixed manufacturing overhead applied to each unit is the **fixed-overhead rate**. We determine this rate by dividing the budgeted fixed overhead by the expected cost-allocation base activity. The expected cost-allocation base activity selected to determine the fixed-overhead rate is labeled the **denominator level**. In this case the denominator level is the expected volume of production for the budget period:

$$\begin{aligned}\text{fixed-overhead rate} &= \frac{\text{budgeted fixed manufacturing overhead}}{\text{expected volume of production}} \\ &= \frac{\$1,500,000}{15,000 \text{ units}} \\ &= \$100\end{aligned}$$

Second, fixed factory overhead does not appear as a separate line in an absorption-costing income statement. Instead, the fixed factory overhead appears in two places: as part of the cost of goods sold and as a **production-volume variance**.⁴ A production-volume variance (which we explain further in the next section) appears whenever actual production deviates from the expected volume of production used in computing the fixed overhead rate:

$$\text{production-volume variance} = (\text{actual volume} - \text{expected volume}) \times \text{fixed-overhead rate}$$

	20X0	20X1
Sales	\$7,000,000	\$8,000,000
Cost of goods sold:		
Opening inventory, at standard absorption cost of \$400*	\$ —	\$1,200,000
Cost of goods manufactured at standard of \$400	6,800,000	5,600,000
Available for sale	6,800,000	6,800,000
Deduct: ending inventory at standard absorption cost of \$400	1,200,000	400,000
Cost of goods sold, at standard	5,600,000	6,400,000
Gross profit at standard	1,400,000	1,600,000
Production-volume variance [†]	200,000 F	100,000 U
Gross margin or gross profit, at "actual"	1,600,000	1,500,000
Selling and administrative expenses	1,000,000	1,050,000
Operating income	\$ 600,000	\$ 450,000

*Variable cost \$300

Fixed cost (\$1,500,000 ÷ 15,000) 100

Standard absorption cost \$400

[†]Computation of production-volume variance based on expected volume of production of 15,000 computers:

20X0 \$200,000 F (17,000 – 15,000) × \$100

20X1 100,000 U (14,000 – 15,000) × \$100

Two years together \$100,000 F (31,000 – 30,000) × \$100

U = Unfavorable, F = Favorable

Objective 6

Construct an income statement using the absorption-costing approach.

fixed-overhead rate

The amount of fixed manufacturing overhead applied to each unit of production. It is determined by dividing the budgeted fixed overhead by the expected cost-allocation base activity for the budget period.

Denominator level

The expected cost-allocation base activity selected to determine the fixed-overhead rate.

production-volume variance

A variance that appears whenever actual production deviates from the expected volume of production used in computing the fixed overhead rate. It is calculated as (actual volume – expected volume) × fixed-overhead rate.

Exhibit 13-4

Desk PC Division: Comparative Income Statements Using Absorption Costing Years 20X0 and 20X1

⁴In general, this will be a cost-driver activity variance. In our example, production volume is the only cost driver, so it can be called a production-volume variance.

For example, the production-volume variance for 20X1 is $(14,000 - 15,000) \times \$100 = -\$100,000$, an underapplied overhead. At \$100 per computer, Dell applies only \$1,400,000 of fixed overhead to production while actual overhead is exactly equal to its budget of \$1,500,000. Assuming it uses the immediate write-off approach, Dell must add the \$100,000 to the 20X1 cost of goods sold.

Finally, the format for an absorption-costing income statement separates costs into the major categories of manufacturing and nonmanufacturing. In contrast, a variable-costing income statement separates costs into the major categories of fixed and variable. In an absorption-costing statement, revenue less manufacturing cost (both fixed and variable) is gross profit or gross margin. In a variable-costing statement, revenue less all variable costs (both manufacturing and nonmanufacturing) is the contribution margin. We illustrate this difference by a condensed comparison of 20X1 income statements:

Variable Costing		Absorption Costing	
Revenue	\$8,000,000	Revenue	\$8,000,000
All variable costs	<u>5,200,000</u>	All manufacturing costs*	<u>6,500,000</u>
Contribution margin	2,800,000	Gross margin	1,500,000
All fixed costs	<u>2,150,000</u>	All nonmanufacturing costs	<u>1,050,000</u>
Operating income	<u>\$ 650,000</u>	Operating income	<u>\$ 450,000</u>

*Standard absorption cost of goods sold $(16,000 \times \$400)$ plus the production-volume variance (\$100,000 U).

Making Managerial Decisions

When making decisions, it is important for managers to distinguish between gross margin and contribution margin. List the ways in which these two margins differ.

Answer

Among the differences are the following:

- Gross margin appears in an absorption-costing income statement; contribution margin is in a variable-costing income statement.
- Gross margin is revenue less manufacturing cost; contribution margin is revenue less all variable costs.
- Gross margin is based on a categorization of costs by function (manufacturing versus non-manufacturing); contribution margin is based on a categorization of costs by cost behavior pattern (variable versus fixed).
- Gross margin is required for external financial reporting; contribution margin is most useful for short-term management decisions and other settings where the variable versus fixed cost distinction is relevant.

Objective 7

Distinguish between product-costing and planning-and-control purposes in accounting for variable and fixed costs.

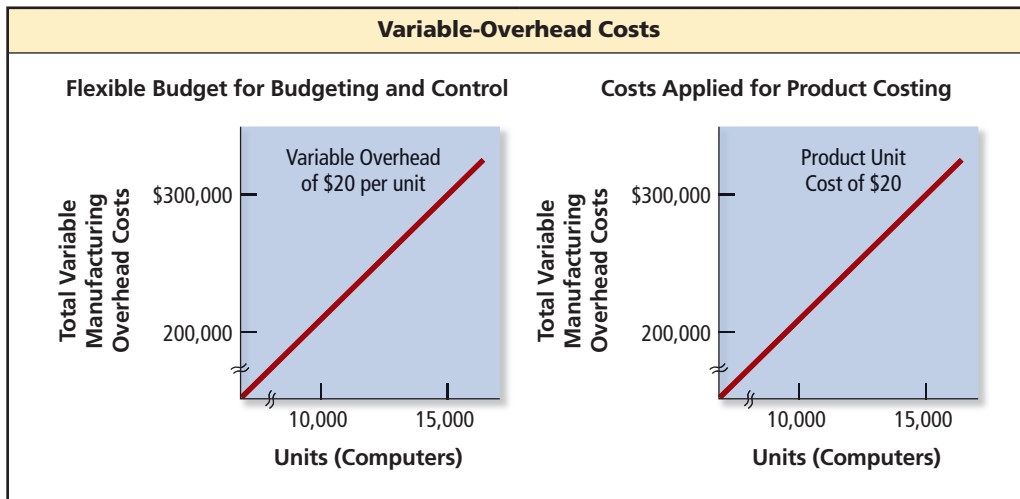
Fixed Overhead and Absorption Costs of Product

The differences between variable- and absorption-costing formats arise because the two formats treat fixed manufacturing overhead differently. In this and subsequent sections, we explore how to account for manufacturing overhead in an absorption-costing system. We do not further examine this issue under variable costing because its treatment of fixed manufacturing overhead is straightforward—we simply deduct the total amount of actual fixed factory overhead on the current-period income statement.

Variable and Fixed Unit Costs

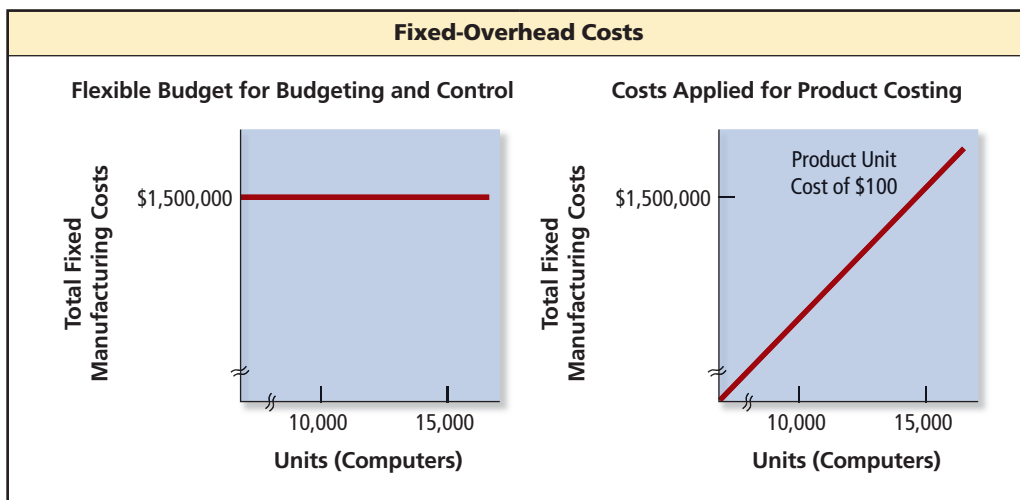
Continuing our example of the Desktop PC division, we begin by comparing (1) the manufacturing overhead costs in the flexible budget used for departmental budgeting and control purposes with (2) the manufacturing overhead costs applied to products under an absorption-costing system. To stress the basic assumptions behind absorption costing, we will also split manufacturing overhead into variable and fixed components.

Consider the following graphs of variable-overhead costs:



Note that the two graphs are identical. The expected variable-overhead costs from the flexible budget are the same as the variable-overhead costs applied to the products. Both budgeted and applied variable overhead are \$20 per computer. Each time we produce 1,000 additional computers, we expect to incur an additional \$20,000 of variable overhead, and we add \$20,000 of variable-overhead cost to the inventory account for computers. The variable costs used for budgeting and control are the same as those used for product costing.

In contrast, the graph for applied fixed-overhead costs differs from that for the flexible budget:



The flexible budget for fixed overhead is a lump-sum budgeted amount of \$1,500,000. Volume does not affect it. In contrast, the applied fixed cost depends on actual volume and the predicted volume (denominator level) used to set the budgeted rate for fixed factory overhead.

$$\begin{aligned}
 \text{Fixed cost applied} &= \text{actual volume} \times \text{fixed-overhead rate} \\
 &= \text{units produced} \times \$100
 \end{aligned}$$

Suppose actual volume equals the expected volume of 15,000 computers. Applied fixed overhead would be 15,000 computers $\times$ \$100 per computer = \$1,500,000, the same as the flexible-budget amount. However, if actual volume differs from expected volume, the costs used for budgeting and control differ from those used for product costing. For budgeting and control purposes, managers use the true cost behavior pattern for fixed costs. In contrast, as the graphs indicate, the absorption product-costing approach applies these fixed costs as though they had a variable-cost behavior pattern. The difference between applied and budgeted fixed overhead is the production-volume variance.

Objective 8

Compute the production-volume variance and show how it should appear in the income statement.

volume variance

A common name for the production-volume variance.

Nature of Production-Volume Variance

We calculate the production-volume variance as follows:

$$\begin{aligned}\text{production-volume variance} &= \text{applied fixed overhead} - \text{budgeted fixed overhead} \\ &= (\text{actual volume} \times \text{fixed-overhead rate}) \\ &\quad - (\text{expected volume} \times \text{fixed-overhead rate})\end{aligned}$$

or

$$\text{production-volume variance} = (\text{actual volume} - \text{expected volume}) \times \text{fixed-overhead rate}$$

In practice, accountants often call the production-volume variance simply the **volume variance**. We use the term *production-volume variance* because it is a more precise description of the fundamental nature of the variance. Using production-volume variance also distinguishes it from the sales-activity variance described in Chapter 8. Despite similar nomenclature, they are completely different concepts.

A production-volume variance arises when the actual production volume achieved does not coincide with the expected volume of production used as a denominator for computing the fixed-overhead rate for product-costing purposes:

1. When expected production volume and actual production volume are identical, there is no production-volume variance.
2. When actual volume is less than expected volume, the production-volume variance is unfavorable because usage of facilities is less than expected and fixed overhead is underapplied. It is measured in Exhibit 13-4 for 20X1 as follows:

$$\begin{aligned}\text{production-volume variance} &= (\text{actual volume} - \text{expected volume}) \times \text{budgeted fixed-overhead rate} \\ &= (14,000 \text{ units} - 15,000 \text{ units}) \times \$100 \\ &= -\$100,000 \text{ or } \$100,000 \text{ U}\end{aligned}$$

or

$$\begin{aligned}\text{production-volume variance} &= \text{budget minus applied} \\ &= \$1,500,000 - \$1,400,000 = \$100,000 \text{ U}\end{aligned}$$

The \$100,000 unfavorable production-volume variance increases the manufacturing costs shown on the income statement. Why? Recall that the department incurred \$1,500,000 of fixed manufacturing cost, but applied only \$1,400,000 to inventory. Therefore, the department will charge only \$1,400,000 as expense when it sells the inventory. But eventually it must charge the actual cost of \$1,500,000 to the income statement as expense. Recall for simplicity that we assumed any variance is not prorated, so **Dell** writes off the extra \$100,000 to cost of goods sold in the current income statement.

3. When actual volume exceeds expected volume, as was the case in 20X0, the production-volume variance is favorable because use of facilities is better than expected, and fixed overhead is overapplied.

$$\text{production-volume variance} = (17,000 \text{ units} - 15,000 \text{ units}) \times \$100 = \$200,000 \text{ F}$$

In this case, the department will charge \$1,700,000 through inventory. Because the department incurs actual costs of only \$1,500,000, future expenses will be overstated by \$200,000. Therefore, we reduce current period expenses by the \$200,000 favorable variance.

The production-volume variance is the conventional measure of the cost of departing from the level of activity originally used to set the fixed-overhead rate. Most companies consider production-volume variances to be beyond immediate control, although sometimes a manager responsible for volume has to do some explaining or investigating. Sometimes, idle facilities caused by disappointing total sales, poor production scheduling, unusual machine breakdowns, shortages of skilled workers, strikes, storms, and the like are responsible for the failure to reach the expected volume.

There is no production-volume variance for variable overhead. Why? The concept of production-volume variance arises for fixed overhead because of the conflict between accounting for control (by flexible budgets) and accounting for product costing (by application rates), and there is no such conflict for variable-overhead costs as they are incurred in direct proportion

to volume. Unlike variable costs, fixed costs are simply not divisible. Rather, they come in large lump sums and are related to the provision of large amounts of production or sales capability, not to the production or sale of a single unit of product.

Making Managerial Decisions

Some accountants claim that the production-volume variance is a good measure of how well a company uses its capacity: Favorable (unfavorable) variances imply effective (ineffective) use of capacity. As a manager, why would you want to be careful not to fall into that trap?

Answer

The production volume variance tells you one thing and only one thing—whether actual production was above or below the

predicted volume used in setting the fixed overhead rate. Suppose a manager can avoid an unfavorable production-volume variance by lowering the product's selling price to increase sales volume enough to use up the idle capacity. However, if the result is a decline in total contribution margin, this would not be an effective use of the capacity. Similarly, a favorable production-volume variance is not desirable if it occurs because management forces excess production through the facility, despite quality declines or other inefficiencies caused by overburdened production facilities.

Reconciliation of Variable Costing and Absorption Costing

We can easily reconcile the operating incomes shown in Exhibits 13-3 and 13-4. The difference in income equals the difference in the total amount of fixed manufacturing overhead charged as an expense during a given year. Examine Exhibit 13-5. The total fixed manufacturing overhead incurred (\$1,500,000 in 20X1) is always recognized as an expense on a variable-costing income statement. Under absorption costing, fixed manufacturing overhead appears in two places on the income statement: cost of goods sold and production-volume variance.

Objective 9

Reconcile variable- and absorption-costing operating income and explain why a company might prefer to use a variable-costing approach.

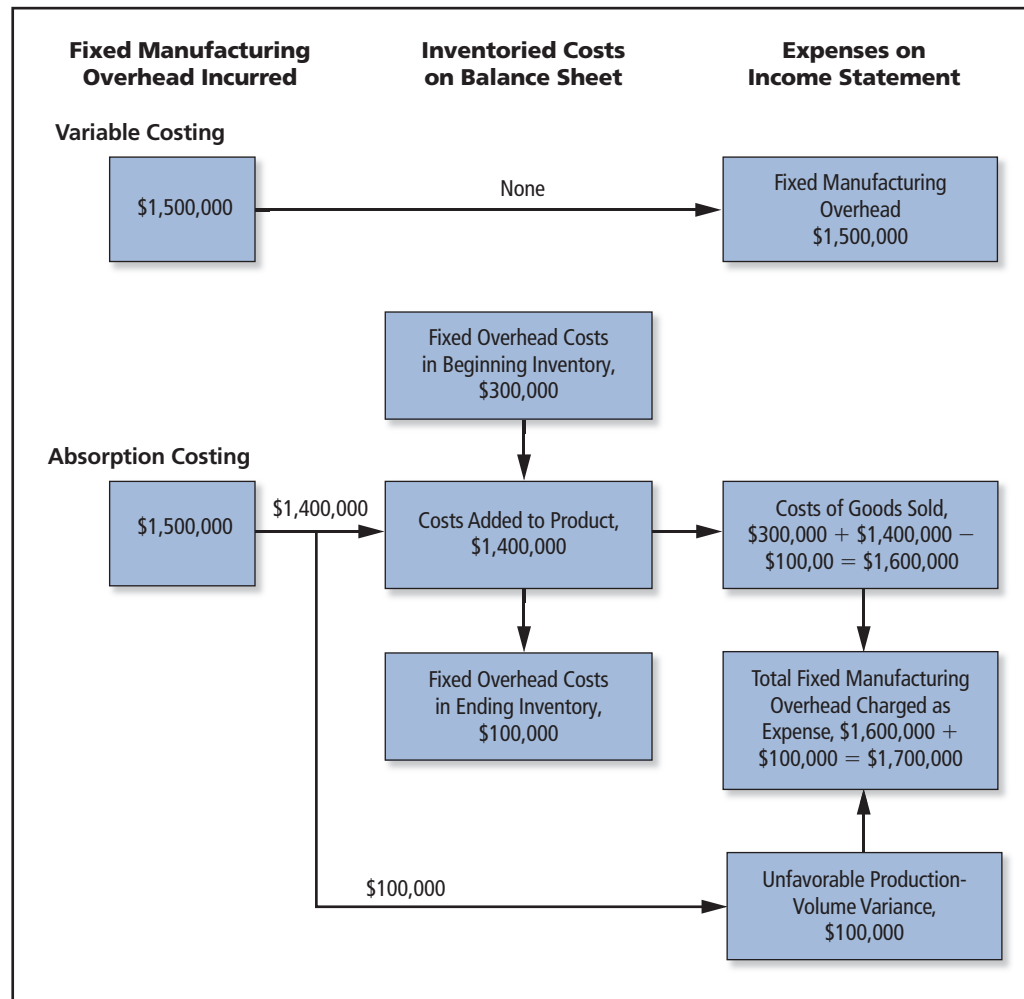


Exhibit 13-5

Flow of Fixed Manufacturing Overhead Costs During 20X1

Under absorption costing, the beginning inventory includes \$300,000 of fixed costs incurred before 20X1. During 20X1, accountants added \$1,400,000 of fixed manufacturing overhead to inventory, and \$100,000 remained in the ending inventory of 20X1 (1,000 units in ending inventory times the \$100 fixed factory overhead rate applied to them). Thus, the fixed manufacturing overhead included in cost of goods sold for 20X1 was $\$300,000 + \$1,400,000 - \$100,000 = \$1,600,000$. In addition, the production-volume variance is \$100,000, unfavorable. The total fixed manufacturing overhead charged as 20X1 expenses under absorption costing is \$1,700,000, or \$200,000 more than the \$1,500,000 charged under variable costing. Therefore, 20X1 variable-costing income is higher by \$200,000.

We can quickly explain the difference in variable-costing and absorption-costing operating income by multiplying the fixed-overhead product-costing rate by the change in the total units in the beginning and ending inventories. Consider 20X1: The change in inventory was 2,000 units, so the difference in net income would be $2,000 \text{ units} \times \$100 = \$200,000$.

Remember that it is the relationship between sales and production that determines the difference between variable-costing and absorption-costing income. Whenever units sold are greater than units produced—that is when inventories decrease—variable-costing income is greater than absorption-costing income. Whenever units produced are greater than units sold—that is when inventories increase—absorption-costing income is greater than variable-costing income.

Why Use Variable Costing?

Why do many companies use variable costing for internal statements? One reason is that production volume affects absorption-costing income but has no effect on variable-costing income. Consider the 20X1 absorption-costing statement in Exhibit 13-4, which shows operating income of \$450,000. Suppose a manager decides to produce 1,000 additional units in December 20X1 even though they will remain unsold. Will this affect operating income? First, note that the gross profit will not change because both revenue and goods sold are based on units sold, not on production volume. However, the production-volume variance will change:

$$\begin{aligned} \text{If production} &= 14,000 \text{ units} \\ \text{Production-volume variance} &= (15,000 - 14,000) \times \$100 = \$100,000 \text{ U} \\ \text{If production} &= 15,000 \text{ U} \\ \text{Production-volume variance} &= (15,000 - 15,000) \times \$100 = \$0 \end{aligned}$$

Because there is no production-volume variance when the department produces 15,000 units, the new operating income equals gross profit less selling and administrative expenses, $\$1,600,000 - \$1,050,000 = \$550,000$. Therefore, increasing production by 1,000 units without any increase in sales increases absorption-costing operating income by \$100,000, from \$450,000 to \$550,000. The general rule under absorption costing is that each additional unit produced will increase operating income by the amount of the fixed-overhead rate—in this case, by \$100 per unit.

How will such an increase in production affect the variable-costing statement in Exhibit 13-3? Nothing will change. Production does not affect operating income under variable costing.

Suppose the evaluation of a manager's performance is based primarily on operating income. If the company uses the absorption-costing approach, a manager might be tempted to produce additional unneeded units just to increase reported operating income. No such incentive exists with variable costing.

Companies also choose variable or absorption costing based on which system they believe gives a better signal about performance. A sales-oriented company may prefer variable costing because the level of sales is the primary effect on its income. In contrast, a production-oriented company—for example, a company that can easily sell all the units it produces (such as a gold mining company)—might prefer absorption costing. Why? Because additional production increases operating income with absorption costing but not with variable costing.

Effect of Other Variances

So far, our example has deliberately ignored the possibility of any variance except the production-volume variance, which appears only on an absorption-costing statement. All other variances appear on both variable- and absorption-costing income statements. In this section, we will consider these other variances that you encountered in Chapter 8.

Flexible-Budget Variances

Returning again to the Desk PC division, we will assume some additional facts for 20X1 (the second of the 2 years covered by our example):

Flexible-budget variances	
Direct materials	None
Direct labor	\$ 170,000 U
Variable factory overhead	\$ 30,000 U
Fixed factory overhead	\$ 70,000 U
Supporting data (used to compute the preceding variances as shown in Appendix 13):	
Standard direct-labor hours allowed for 14,000 units of output produced	87,500
Standard direct-labor rate per hour	\$ 12.00
Actual direct-labor hours of inputs	100,000
Actual direct-labor rate per hour	\$ 12.20
Variable manufacturing overhead actually incurred	\$ 310,000
Fixed manufacturing overhead actually incurred	\$1,570,000

As Chapter 8 explained, flexible-budget variances may arise for both variable overhead and fixed overhead. Consider the following:

	Actual Amounts	Flexible Budget Amounts at 14,000 Units	Flexible Budget Variances
Variable factory overhead	\$ 310,000	\$ 280,000	\$30,000 U
Fixed factory overhead	1,570,000	1,500,000	70,000 U

Exhibit 13-6 shows the relationship between the fixed-overhead flexible-budget variance and the production-volume variance. The difference between the actual fixed overhead and that applied to products is the underapplied (or overapplied) overhead. Because the actual fixed overhead of \$1,570,000 exceeds the \$1,400,000 applied, fixed overhead is underapplied by \$170,000, which means that the variance is unfavorable. The \$170,000 underapplied fixed overhead has two components: (1) a production-volume variance of \$100,000 U and (2) a fixed-overhead flexible-budget variance (also called the fixed-overhead spending variance) of \$70,000 U.

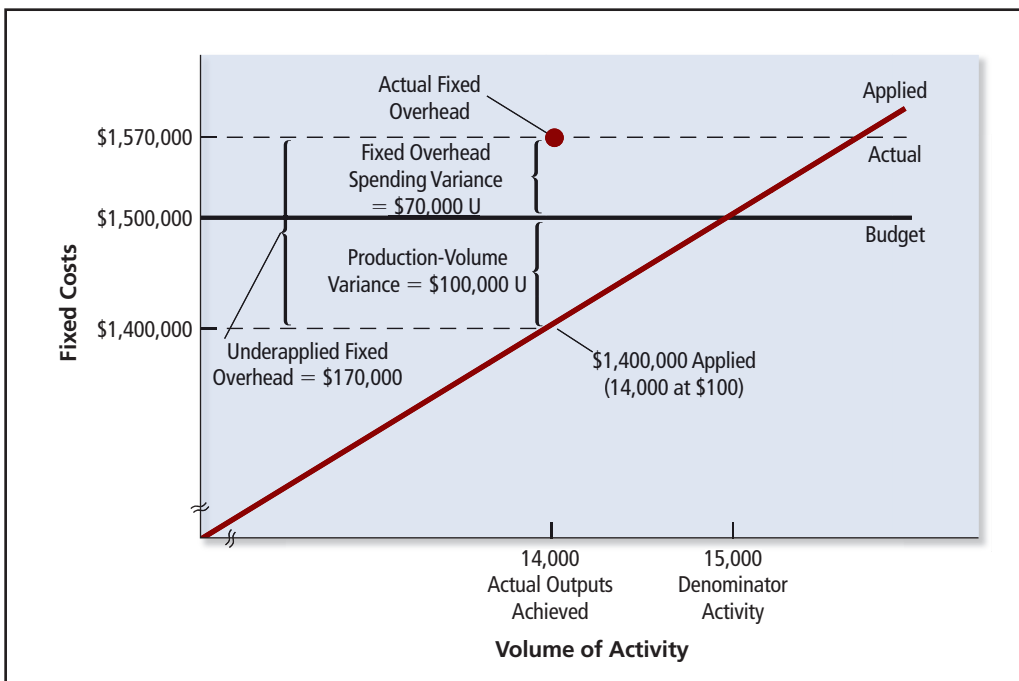


Exhibit 13-6

Fixed-Overhead Variances
for 20X1

Data are from Exhibit 13-4

Exhibit 13-7 contains the income statement under absorption costing that incorporates these new facts. These new variances decrease income by \$270,000 because, like the production-volume variance, they are all unfavorable variances that are charged against income in 20X1. If any cost variances were favorable, they would increase operating income.

Exhibit 13-7

Absorption Costing Modification of Exhibit 13-4 for 20X1
(additional facts are in text)

Sales, 16,000 at \$500		\$8,000,000
Opening inventory at standard, 3,000 at \$400	\$1,200,000	
Cost of goods manufactured at standard, 14,000 at \$400	5,600,000	
Available for sale, 17,000 at \$400	<u>\$6,800,000</u>	
Deduct ending inventory at standard, 1,000 at \$400	<u>400,000</u>	
Cost of goods sold at standard, 16,000 at \$400		<u>6,400,000</u>
Gross profit at standard		\$1,600,000
Flexible-budget variances, both unfavorable		
Variable manufacturing costs (\$170,000 + \$30,000)	\$ 200,000	
Fixed factory overhead	70,000	
Production-volume variance (arises only because of fixed overhead), unfavorable	<u>100,000</u>	
Total variances		<u>370,000</u>
Gross profit at "actual"		\$1,230,000
Selling and administrative expenses		<u>1,050,000</u>
Operating income		<u>\$ 180,000</u>

Summary Problem for Your Review

PROBLEM

1. Reconsider Exhibits 13-3 and 13-4 on pp. 560 and 561. Suppose production in 20X1 was 14,500 units instead of 14,000 units, but sales remained at 16,000 units. Assume that the net variances for all variable manufacturing costs were \$200,000, unfavorable. Regard these variances as adjustments to the standard cost of goods sold for the year. Also assume that actual fixed costs were \$1,570,000. Prepare income statements for 20X1 under variable costing and under absorption costing.
2. Explain why operating income was different under variable costing from what it was under absorption costing. Show your calculations.
3. Without regard to number 1, would variable costing or absorption costing give a manager more flexibility in influencing short-run operating income through production-scheduling decisions? Why?

SOLUTION

1. See Exhibit 13-8 and Exhibit 13-9. Note that the ending inventory will be 1,500 units instead of the 1,000 units in Exhibits 13-3 and 13-4.
2. The decline in inventory levels is 3,000 – 1,500, or 1,500 units. The fixed-overhead rate per unit in absorption costing is \$100. Therefore, \$150,000 more fixed overhead was charged against operations under absorption costing than under variable costing. The variable-costing statement shows fixed factory overhead of \$1,570,000, whereas the absorption-costing statement includes fixed factory overhead in three places: \$1,600,000 in cost of goods sold, \$70,000 U in fixed factory-overhead flexible-budget variance, and \$50,000 U as a production-volume variance—for a total of \$1,720,000. Generally, (1) when inventories decline, absorption costing will show less income than will variable costing; (2) when inventories rise, absorption costing will show more income than variable costing.
3. Absorption costing will give a manager more discretion in influencing operating income via production scheduling. Operating income will fluctuate in harmony with changes in net sales under variable costing, but both production and sales influence it under absorption costing. For example, compare the variable costing operating income in Exhibits 13-3 and 13-8. As the second note to Exhibit 13-8 indicates, all variances except the production-volume

Sales		\$8,000,000	
Opening inventory, at variable standard cost of \$300	\$ 900,000		
Add: Variable cost of goods manufactured	4,350,000		
Available for sale	<u>\$5,250,000</u>		
Deduct: Ending inventory, at variable standard cost of \$300	450,000		
Variable cost of goods sold, at standard		\$4,800,000	
Net flexible-budget variances for all variable costs, unfavorable		200,000	
Variable cost of goods sold, at actual		<u>\$5,000,000</u>	
Variable selling expenses, at 5% of dollar sales		400,000	
Total variable costs charged against sales			5,400,000
Contribution margin			<u>\$2,600,000</u>
Fixed factory overhead	\$1,570,000*		
Fixed selling and administrative expenses	650,000		
Total fixed expenses			<u>2,220,000</u>
Operating income			<u>\$ 380,000†</u>

*This could be shown in two lines, \$1,500,000 budget plus \$70,000 variance.

†The difference between this and the \$650,000 operating income in Exhibit 13-3 occurs because of the \$200,000 unfavorable variable-cost variances and the \$70,000 unfavorable fixed-cost flexible-budget variance.

Exhibit 13-8

Desk PC Division
*Income Statement (variable
costing), Year 20X1*

Sales		\$8,000,000	
Opening inventory, at standard cost of \$400	\$1,200,000		
Cost of goods manufactured, at standard	5,800,000		
Available for sale	<u>\$7,000,000</u>		
Deduct: Ending inventory, at standard	600,000		
Cost of goods sold, at standard	<u>\$6,400,000</u>		
Net flexible-budget variances for all variable manufacturing costs, unfavorable	\$200,000		
Fixed factory overhead flexible-budget variance, unfavorable	70,000		
Production-volume variance, unfavorable	<u>50,000*</u>		
Total variances		320,000	
Cost of goods sold, at "actual"			6,720,000†
Gross profit, at "actual"			<u>\$1,280,000</u>
Selling and administrative expenses			
Variable	400,000		
Fixed	<u>650,000</u>		1,050,000
Operating income			<u>\$ 230,000‡</u>

*Production-volume variance is $100 \times (15,000 \text{ expected volume} - 14,500 \text{ actual production})$.

†This format differs slightly from Exhibit 13-7. The difference is deliberate; it illustrates that the formats of income statements are not rigid.

‡Compare this result with the \$180,000 operating income in Exhibit 13-7. The only difference is traceable to the production of 14,500 units instead of 14,000 units, resulting in an unfavorable production-volume variance of \$50,000 instead of \$100,000.

Exhibit 13-9

Desk PC Division
*Income Statement (absorption
costing), Year 20X1*

variance affect operating income under variable costing, reducing income by \$200,000 + \$70,000 = \$270,000, from \$650,000 to \$380,000. However, none of these variances, and thus none of the differences in operating income, is a result of production scheduling decisions, so the increase in units produced has no effect on operating income.

On the other hand, compare the operating income of Exhibits 13-4 and 13-9. As the third note to Exhibit 13-9 explains, production scheduling and sales influence operating income. Without the increase in production, operating income would have decreased by the same \$270,000 as under variable costing, from \$450,000 to \$180,000. However, production was 14,500 rather than 14,000 units. So \$50,000 of fixed overhead became a part of ending inventory (an asset) instead of part of the production-volume variance (an expense)—that is, the production-volume variance is \$50,000 lower, which increases income by \$50,000 to \$230,000. Each additional unit produced adds \$100 to inventory instead of to expense, thus increasing operating income by \$100.

Highlights to Remember

- 1. Compute budgeted factory-overhead rates and apply factory overhead to production.** Accountants usually apply indirect manufacturing costs (factory overhead) to products using budgeted overhead rates. They compute the rates by dividing total budgeted overhead by a measure of cost-allocation base activity such as expected machine hours.
- 2. Determine and use appropriate cost-allocation bases for overhead application to products and services.** There should be a strong cause-and-effect relationship between cost-allocation bases and the overhead costs that are applied using these bases.
- 3. Use normalized variable- and fixed-overhead application rates and explain the disposition of overhead variances.** Budgeted overhead rates are usually annual averages. The resulting product costs are normal costs, consisting of actual direct materials, actual direct labor, and applied overhead using the budgeted rates. Normal product costs are often more useful than actual costs for decision-making and inventory-costing purposes. Variances under a normal costing system are either prorated or written-off to cost of goods sold.
- 4. Compare variable- and absorption-costing systems.** Two major methods of product costing are variable (contribution approach) and absorption costing. They differ in how they account for fixed manufacturing overhead. Variable costing cannot be used for financial reporting or tax purposes, but it is used internally by many companies.
- 5. Construct an income statement using the variable-costing approach.** The variable-costing method emphasizes the effects of cost behavior on income. This method excludes fixed manufacturing overhead from the cost of products and expenses it immediately.
- 6. Construct an income statement using the absorption-costing approach.** The absorption or traditional approach ignores cost behavior distinctions. As a result, all costs incurred in the production of goods become part of the inventory cost. Thus, we add fixed manufacturing overhead to inventory and it appears on the income statement only when the company sells the goods.
- 7. Distinguish between product-costing and planning-and-control purposes in accounting for variable and fixed costs.** Variable-overhead costs are the same for product-costing and planning-and-control purposes. In contrast, fixed costs are a lump sum for planning-and-control purposes but are unitized and therefore vary with production volume for product-costing purposes.
- 8. Compute the production-volume variance and show how it should appear in the income statement.** Whenever a company employs the absorption method and the actual production volume does not equal the budgeted volume (denominator level) that it used for computing the fixed-overhead rate, a production-volume variance arises. When the actual production volume is less than budgeted, the variance is unfavorable; when actual volume exceeds budgeted volume, the variance is favorable. The amount of the variance is equal to the fixed-overhead rate times the difference between the budgeted and actual volume. Companies usually dispose of this variance by adjusting the current-period income. Favorable variances increase current-period income and unfavorable variances reduce current-period income.
- 9. Reconcile variable- and absorption-costing operating income and explain why a company might prefer to use a variable-costing approach.** Whenever sales volume exceeds production volume, variable-costing operating income exceeds absorption-costing operating income; when production exceeds sales, absorption-costing operating has the greater operating income. Companies that use operating income to measure results may prefer variable costing. This is because changes in production volume affect absorption-costing income but not variable-costing income. A company that wants to focus managers' energies on sales would prefer to use variable costing, since the level of sales is the primary driver of variable-costing income.

Appendix 13: Comparisons of Production-Volume Variance with Other Variances

The only new variance introduced in this chapter is the production-volume variance, which arises because companies using absorption costing apply fixed overhead to units produced using a fixed-overhead rate. Let's examine this variance in perspective by using the approach originally demonstrated in Exhibit 8-11 of Chapter 8 (p. 346). The results of the approach appear in Exhibit 13-10, which deserves your careful study, particularly the two footnotes. Please examine the exhibit before reading on.

Inputs	(A) Costs Incurred: Actual Inputs × Actual Price	(B) Predicted Overhead Based on Actual Driver Use × Standard Prices	(C) Flexible Budget: Standard Driver Use Allowed for Output Achieved × Standard Prices	(D) Product Costing: Applied to Product
Direct labor	100,000 × \$12.20 = \$1,220,000	100,000 × \$12 = \$1,200,000	(87,500 × \$12) or (14,000 × \$75) = \$1,050,000*	(87,500 × \$12) or (14,000 × \$75) = \$1,050,000*
	↑ 100,000 × (\$12.20 – \$12) = price variance, \$20,000 U	↑ 12,500 × \$12 = usage variance, \$150,000 U	↑ Never a variance	↑ Never a variance
Variable overhead: Supplies	(given) \$310,000	Flexible-budget variance, \$170,000 U	↑ Never a variance	↑ Never a variance
	↑ 100,000 × \$3.20 = \$320,000	↑ (87,500 × \$3.20 or 14,000 × \$20) = \$280,000*	↑ Never a variance	↑ Never a variance
	↑ Spending variance, \$10,000 F	↑ 12,500 × \$3.20 = efficiency variance, \$40,000 U	↑ Never a variance	↑ Never a variance
	↑ Flexible-budget variance, \$30,000 U	↑ Never a variance	↑ Never a variance	↑ Never a variance
	↑ Underapplied overhead, \$30,000 U	↑ Never a variance	↑ Never a variance	↑ Never a variance
Fixed overhead: Factory supervision	\$1,570,000	Lump sum \$1,500,000†	Lump sum \$1,500,000†	14,000 × \$100 = \$1,400,000
	↑ Spending variance, \$70,000 U	↑ Never a variance	↑ Production-volume variance, \$100,000 U	↑ Production-volume variance, \$100,000 U
	↑ Flexible-budget variance, \$70,000 U	↑ Underapplied overhead, \$170,000 U	↑ Production-volume variance, \$100,000 U	↑ Production-volume variance, \$100,000 U
	↑ Underapplied overhead, \$170,000 U	↑ Underapplied overhead, \$170,000 U	↑ Underapplied overhead, \$170,000 U	↑ Underapplied overhead, \$170,000 U

U = Unfavorable, F = Favorable.

*Note especially that the flexible budget for variable costs rises and falls in direct proportion to production. Note also that the control-budget purpose and the product-costing purpose harmonize completely.

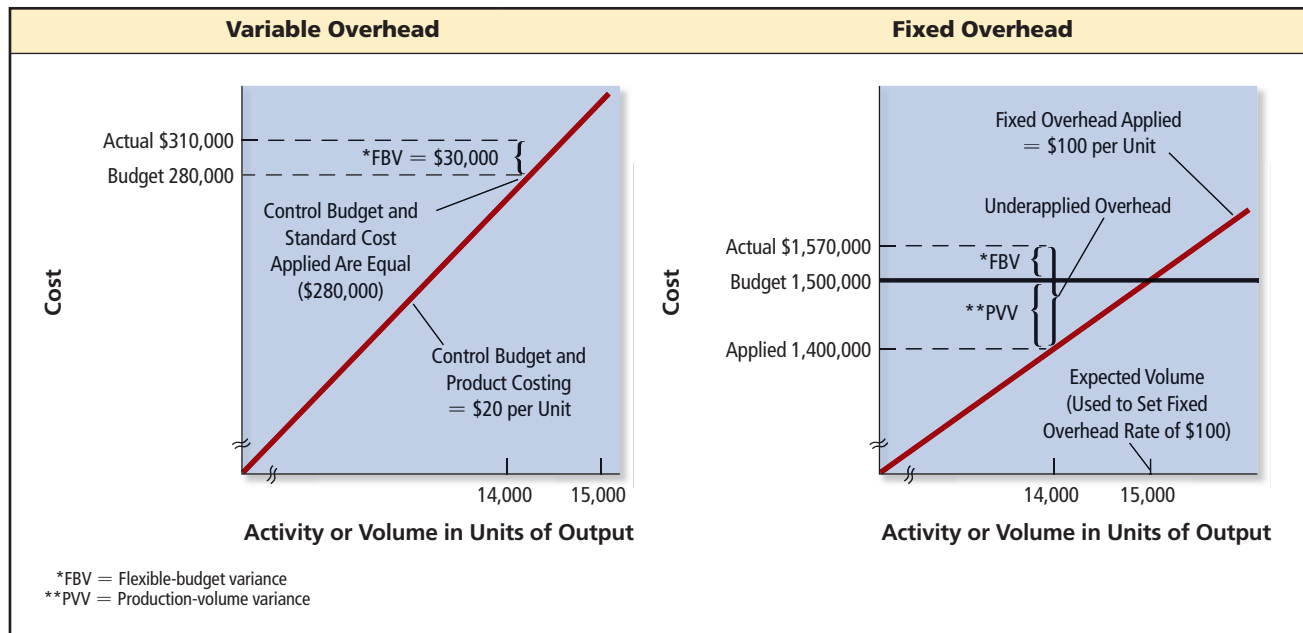
The total costs in the flexible budget will always agree with the standard-variable costs applied to the product because they are based on standard costs per unit multiplied by units produced.

†In contrast with variable costs, the flexible-budget total for fixed costs will always be the same regardless of the units produced. However, the control-budget purpose and the product-costing purpose conflict; whenever actual production differs from expected production, the standard costs applied to the product will differ from the flexible budget. This difference is the production-volume variance. In this case, the production-volume variance may be computed by multiplying the \$100 rate times the difference between the 15,000 expected volume and the 14,000 units of output achieved.

Exhibit 13-10

Analysis of Variances

(data are from text for 20X1)

**Exhibit 13-11**

Comparison of Control and Product-Costing Purposes, Variable Overhead, and Fixed Overhead (not to scale)

Exhibit 13-11 graphically compares the variable- and fixed-overhead costs analyzed in Exhibit 13-10. Note how the control-budget line and the product-costing line (the applied line) are superimposed in the graph for variable overhead but differ in the graph for fixed overhead.

Underapplied or overapplied overhead is always the difference between the actual overhead incurred and the overhead applied. An analysis may then be made:

$$\text{underapplied overhead} = \left(\begin{array}{c} \text{flexible-budget} \\ \text{variance} \end{array} \right) + \left(\begin{array}{c} \text{production-volume} \\ \text{variance} \end{array} \right)$$

$$\text{for variable overhead} = \$30,000 + 0 = \$30,000$$

$$\text{for fixed overhead} = \$70,000 + \$100,000 = \$170,000$$

Accounting Vocabulary

budgeted factory-overhead rate, p. 552
denominator level, p. 561
fixed-overhead rate, p. 561

normal costing system, p. 554
overapplied overhead, p. 555
production-volume variance, p. 561

proration, p. 555
underapplied overhead, p. 555
volume variance, p. 564

MyLab Accounting

Fundamental Assignment Material

13-A1 Accounting for Overhead; Budgeted Rates

Kevin Aeronautics Company uses a budgeted overhead rate in applying overhead to products on a machine-hour basis for department A and on a direct-labor hour basis for department B. At the beginning of 20X0, the company's management made the following budget predictions:

	Department A	Department B
Direct-labor cost	\$1,540,000	\$1,230,000
Factory overhead	\$1,936,000	\$1,020,600
Direct-labor hours	88,000	126,000
Machine hours	352,000	18,000

Cost records of recent months show the following accumulations for product M89:

	Department A	Department B
Material placed in production	\$12,500	\$19,529
Direct-labor cost	\$10,600	\$ 9,600
Direct-labor hours	880	1,260
Machine hours	3,520	130

1. What is the budgeted overhead rate that should be applied in department A? In department B?
2. What is the total overhead cost of product M89?
3. If 105 units of product M89 are produced, what is its unit cost?
4. At the end of 20X0, actual results for the year's operations were as follows:

	Department A	Department B
Actual overhead costs incurred	\$1,390,000	\$1,230,000
Actual direct-labor hours	83,000	117,000
Actual machine hours	304,000	22,000

Find the underapplied or overapplied overhead for each department and for the factory as a whole.

13-A2 Disposition of Overhead

Gammaro Precision Tooling applies factory overhead using machine hours and number of component parts as cost-allocation bases. In 20X0, actual factory overhead incurred was \$119,000 and applied factory overhead was \$126,000. Before disposition of underapplied or overapplied factory overhead, the cost of goods sold was \$505,000, gross profit was \$55,000, and ending inventories were as follows:

Direct materials	\$ 20,000
WIP	72,000
Finished goods	99,000
Total inventories	<u>\$191,000</u>

1. Was factory overhead overapplied or underapplied? By how much?
2. Assume that Gammaro writes off overapplied or underapplied factory overhead as an adjustment to cost of goods sold. Compute adjusted gross profit.
3. Assume that Gammaro prorates overapplied or underapplied factory overhead based on end-of-the-year unadjusted balances. Compute adjusted gross profit.
4. Assume that actual factory overhead was \$128,000 instead of \$119,000, and that Gammaro writes off overapplied or underapplied factory overhead as an adjustment to cost of goods sold. Compute adjusted gross profit.

13-A3 Comparison of Variable Costing and Absorption Costing

Consider the following information pertaining to a year's operation of Blair Company:

Units produced	2,500
Units sold	2,100
Direct labor	\$4,000
Direct materials used	\$3,000
Selling and administrative expenses (all fixed)	\$ 900
Fixed manufacturing overhead	\$5,000
Variable manufacturing overhead	\$2,500
All beginning inventories	\$ 0
Gross margin (gross profit)	\$2,200
Direct-materials inventory, end	\$ 400
Work-in-process inventory, end	\$ 0

1. What is the ending finished-goods inventory cost under variable costing?
2. What is the ending finished-goods inventory cost under absorption costing?
3. Would operating income be higher or lower under variable costing? By how much? Why? (Answer: \$800 lower, but explain why.)

13-A4 Comparison of Absorption and Variable Costing

Examine Hoffman Company's simplified income statement based on variable costing. Assume that the budgeted volume for absorption costing in 20X0 and 20X1 was 1,470 units and that total fixed costs were identical in 20X0 and 20X1. There is no beginning or ending work in process.

Income Statement Year Ended December 31, 20X1	
Sales, 1,250 units at \$15	\$18,750
Deduct variable costs	
Beginning inventory, 80 units at \$9	\$ 720
Variable manufacturing cost of goods manufactured, 1,220 units at \$9	10,980
Variable manufacturing cost of goods available for sale	\$11,700
Ending inventory, 50 units at \$9	450
Variable manufacturing cost of goods sold	\$11,250
Variable selling and administrative expenses	450
Total variable costs	11,700
Contribution margin	\$ 7,050
Deduct fixed costs	
Fixed factory overhead at budget	\$ 5,145
Fixed selling and administrative expenses	300
Total fixed costs	5,445
Operating income	\$ 1,605

1. Prepare an income statement based on absorption costing. Assume that actual fixed costs were equal to budgeted fixed costs.
2. Explain the difference in operating income between absorption costing and variable costing. Be specific.

13-B1 Disposition of Overhead

Richie Manufacturing had underapplied overhead of \$42,000 in 20X0. Before adjusting for overapplied or underapplied overhead, the ending inventories for direct materials, WIP, and finished goods were \$71,000, \$161,000, and \$138,000, respectively. Unadjusted cost of goods sold was \$276,000.

1. Assume that the \$42,000 was written off solely as an adjustment to cost of goods sold. Compute the adjusted cost of goods sold.
2. Management has decided to prorate the \$42,000 to the appropriate accounts (using the unadjusted ending balances) instead of writing it off solely as an adjustment of cost of goods sold. Would gross profit be higher or lower than in requirement 1? By how much?

13-B2 Application of Overhead Using Budgeted Rates

The Eaton Clinic computes a cost of treating each patient. It allocates costs to departments and then applies departmental overhead costs to individual patients using a different budgeted overhead rate in each department. Consider the following predicted 20X0 data for two of Eaton's departments:

	Pharmacy	Medical Records
Department overhead cost	\$216,000	\$246,400
Number of prescriptions filled	80,000	
Number of patient visits		44,000

The cost-allocation base for overhead in the pharmacy is number of prescriptions filled; in medical records it is number of patient visits.

In June 20X0, Zack Pierce paid one visit to the clinic and had five prescriptions filled at the pharmacy.

1. Compute departmental overhead rates for the two departments.
2. Compute the overhead costs applied to the patient Zack Pierce in June 20X0.

3. At the end of 20X0, actual overhead costs were as follows:

Pharmacy	\$240,000
Medical records	\$305,000

The pharmacy filled 82,000 prescriptions, and the clinic had 65,000 patient visits during 20X0. Compute the overapplied or underapplied overhead in each department.

13-B3 Comparison of Variable Costing and Absorption Costing

Consider the following information pertaining to a year's operations of Hartford Manufacturing:

Units sold	1,600
Units produced	2,300
Direct labor	\$4,400
Direct materials used	3,900
Fixed manufacturing overhead	3,000
Variable manufacturing overhead	400
Selling and administrative expenses (all fixed)	850
Beginning inventories	0
Contribution margin	5,500
Direct-material inventory, end	850

There are no work-in-process inventories.

1. What is the ending finished-goods inventory cost under absorption costing?
2. What is the ending finished-goods inventory cost under variable costing?

13-B4 Extension of Chapter Illustration

Reconsider Exhibits 13-3 and 13-4, pp. 560 and 561. Suppose that in 20X1 production was 15,500 computers instead of 14,000 computers, and sales were 15,000 computers. Also assume that the net variances for all variable manufacturing costs were \$18,000, unfavorable. Also assume that actual fixed manufacturing costs were \$1,560,000.

1. Prepare income statements for 20X1 under variable costing and under absorption costing. Use a format similar to Exhibits 13-8 and 13-9, on p. 569.
2. Explain why operating income was different under variable costing and absorption costing. Show your calculations.

Additional Assignment Material

MyLab Accounting

QUESTIONS

13-1 How is factory overhead applied to production?

13-2 "Each department must choose one cost-allocation base to be used for cost application." Do you agree? Explain.

13-3 What should be the principle behind selecting a cost-allocation base?

13-4 Identify four cost-allocation bases that a manufacturing company might use to apply factory overhead costs to jobs.

13-5 Is the comparison of actual overhead costs to budgeted overhead costs part of the product-costing process or part of the control process? Explain.

13-6 What are some reasons for differences between the amounts of incurred and applied overhead?

13-7 "Under actual overhead application, unit costs soar as volume increases, and vice versa." Do you agree? Explain.

13-8 What is the composition of the cost of a manufactured product under normal costing?

13-9 What is the best theoretical method of allocating underapplied or overapplied overhead, assuming that the objective is to obtain as accurate a cost application as possible?

13-10 What is the objective behind proration?

13-11 Compare variable and absorption costing regarding the treatment of fixed manufacturing costs.

13-12 Compare variable and absorption costing regarding the treatment of production-volume variance.

13-13 Why are more and more companies migrating to variable costing from absorption costing?

13-14 “With variable costing, only direct materials and direct labor are inventoried.” Do you agree? Why?

13-15 “Absorption costing regards more categories of costs as product costs.” Explain. Be specific.

13-16 “In an absorption costing income statement fixed factory overhead appears in two places.” Explain.

13-17 Why is variable costing used only for internal reporting and not for external financial reporting or tax purposes?

13-18 “Variable costing is consistent with cost-volume-profit analysis.” Explain.

13-19 Compare the contribution margin with the gross margin.

13-20 How is fixed overhead applied to products?

13-21 Name the three ways that an absorption-costing format differs from a variable-costing format.

13-22 “The flexible budget for budgeting and control differs from the costs applied for product costing.” What type of cost is being described? Explain.

13-23 “In a standard absorption-costing system, the amount of fixed manufacturing overhead applied to the products rarely equals the budgeted fixed manufacturing overhead.” Do you agree? Explain.

13-24 What is known as denominator level?

13-25 Why is there no production-volume variance for direct labor?

13-26 “An unfavorable production-volume variance means that fixed manufacturing costs have not been well controlled.” Do you agree? Explain.

13-27 “The fixed cost per unit is directly affected by the expected volume selected as the denominator.” Do you agree? Explain.

13-28 “Absorption-costing income exceeds variable-costing income when the number of units sold exceeds the number of units produced.” Do you agree? Explain.

13-29 What are the possible reasons for an adverse production volume variance?

13-30 Why are companies with small levels of inventory generally unconcerned with the choice of variable or absorption costing?

13-31 Do all overhead variances appear in both variable-costing and absorption-costing systems?

CRITICAL THINKING EXERCISES

13-32 Relationship Between Cost-Allocation Bases and Factory Overhead

“There should be a strong relationship between the factory overhead incurred and the cost-allocation base chosen for its application.” Why?

13-33 Cost Application in Service Firms

“Service firms trace only direct-labor costs to jobs. All other costs are applied as a percentage of direct-labor cost.” Do you agree? Explain.

13-34 Accounting for Fixed Costs

Applying fixed costs to products seems to cause all kinds of problems. Why do companies continue to use accounting systems that assign fixed costs to products on a per unit basis?

13-35 Marketing Decisions and Absorption Costing

Product pricing and promotion decisions should usually be based on their effect on contribution margin, not on gross margin. Explain how using an absorption costing format for the income statement can provide misleading information on the effect of pricing and promotion decisions.

13-36 Evaluating Production Using the Production-Volume Variance

The sales-volume variance (see Chapter 8) highlights the effect on income of sales exceeding or falling short of sales targets. Does the production-volume variance provide parallel information for evaluating the effect of exceeding or falling short of production targets? Explain.

13-37 Absorption Costing and the Value Chain

Many costs on a product’s value chain, such as R&D and product design costs, are considered period costs and are not assigned to units of product. An absorption-costing system could be expanded to apply such costs to the products. What would be the advantages and disadvantages of doing so? Would this help managers make better decisions?

EXERCISES

13-38 Discovery of Unknowns

The Monachino Manufacturing Company has the following budgeted overhead cost and other data for its machining department for the month of December:

Budgeted Data:	
Indirect labor and supplies	\$69,000
Factory rent	\$22,000
Supervision	\$88,000
Depreciation on equipment	\$21,000
Cost-allocation base for overhead application	Machine hours
Budgeted overhead application rate	\$4 per machine hour
Other Data:	
Actual machine hours during December	62,000
Actual overhead cost incurred during December	\$260,000

Compute the total budgeted machine hours, total applied overhead cost, and indicate how any difference between the actual overhead cost incurred and applied overhead would be treated on Monachino's income statement for the month of December.

13-39 Discovery of Unknowns

Manchester Automobiles Inc. has the following budgeted overhead cost and other data for its assembly department for the month of June 2020:

Budgeted Data:	
Indirect materials	£ 85,000
Factory rent	£ 26,000
Supervision	£ 33,500
Depreciation on equipment	£108,000
Cost-allocation base for overhead application	Machine hours
Total budgeted machine-hours	25,000
Other Data:	
Total applied overhead costs for June 2020	£308,050
Actual overhead cost incurred during June 2020	£288,500

Compute the budgeted factory overhead rate, actual machine hours, and indicate how the difference between actual overhead cost incurred and applied overhead would be treated on Manchester's income statement for the month of June 2020.

13-40 Relationship Among Overhead Items

Fill in the unknowns:

	Case 1	Case 2
a. Budgeted factory overhead	€323,000	€207,500
b. Cost-allocation base, budgeted direct-labor cost	212,500	?
c. Budgeted factory-overhead rate	?	125%
d. Direct-labor cost incurred	277,500	?
e. Factory overhead incurred	425,000	210,000
f. Factory overhead applied	?	?
g. Underapplied (overapplied) factory overhead	?	15,000

13-41 Underapplied and Overapplied Overhead

Jupiter Iron Works applies factory overhead at a rate of \$4.10 per direct-labor hour. Selected data for 2020 operations are as follows (in thousands of dollars):

	Case 1	Case 2
Direct-labor hours	100	140
Direct-labor cost	\$448	\$500
Indirect-labor cost	58	86
Sales commissions	44	20
Depreciation, manufacturing equipment	32	66
Direct-materials cost	456	494
Factory fuel costs	72	98
Depreciation, finished-goods warehouse	16	38
Cost of goods sold	830	1,010
All other factory costs	274	414

Compute for both cases

1. factory overhead applied.
2. total factory overhead incurred.
3. amount of underapplied or overapplied factory overhead.

13-42 Disposition of Year-End Underapplied Overhead

Tammy's Cosmetics uses a normal costing system and has the following balances at the end of its first year's operations.

WIP inventory	\$231,000
Finished-goods inventory	198,000
Cost of goods sold	396,000
Actual factory overhead	416,000
Factory overhead applied	456,000

Compute cost of goods sold for two different ways to dispose of the year-end overhead balances. By how much would gross profit differ?

13-43 Simple Comparison of Variable and Absorption Costing

Evergreen Toy Manufacturing Company started business in January 2018, with assets of €306,000 cash and equities of €306,000 capital stock. In 2018, it manufactured some inventory at a cost of €112,000 cash, including €38,000 for factory rent and other fixed factory overhead. Unfortunately, its plans failed thereafter and the company decided to wind up the business after selling the existing inventory. Accordingly, in 2019, the company manufactured nothing and sold half of the inventory for €88,000 cash. In 2020 again, it manufactured nothing and sold the remaining half for another €88,000 cash. The company had no fixed expenses in 2019 or 2020.

There are no other transactions of any kind. Ignore income taxes.

Prepare an ending balance sheet plus an income statement for 2018, 2019, and 2020 under (1) absorption costing and (2) variable costing (direct costing). Explain the differences in net income between absorption and variable costing.

13-44 Comparisons over Four Years

Sysko Electricals began operation on January 1, 2017, to produce and sell a single product. Reported operating income figures under both absorption and variable costing for the first four years of operation are as follows:

Year	Absorption Costing	Variable Costing
2017	¥772,500	¥721,000
2018	669,500	669,500
2019	618,000	463,500
2020	412,000	618,000

Standard production costs per unit, sales prices, application (absorption) rates, and expected volume levels were the same in each year. There were no flexible-budget variances for any type of cost. All non-manufacturing expenses were fixed, and there were no nonmanufacturing cost variances in any year.

1. In what year(s) did “units produced” equal “unit sold”?
2. In what year(s) did “units produced” exceed “unit sold”?
3. What is the yen amount of the December 31, 2020, finished-goods inventory? (Give absorption-costing value.)
4. What is the difference between “units produced” and “unit sold” in 2020 if you know that the absorption-costing fixed-manufacturing overhead application rate is ¥412 per unit? (Give answer in units.)

13-45 Variable and Absorption Costing

Rennes Manufacturing Company, France, provides the following data for 2020:

Sales: 22,000 units at €19 each	
Actual production	31,000 units
Expected volume of production	30,000 units
Manufacturing costs incurred	
Variable	€248,000
Fixed	108,000
Nonmanufacturing costs incurred	
Variable	22,000
Fixed	35,600

1. Determine operating income for 2020, assuming the firm uses the variable-costing approach to product costing. (Do not prepare a statement.)
2. Assume that there is no January 1, 2020, inventory; no variances are allocated to inventory; and the firm uses a “full absorption” approach to product costing. Compute (a) the cost assigned to December 31, 2020, inventory, and (b) operating income for the year ended December 31, 2020. (Do not prepare a statement.)

13-46 Computation of Production-Volume Variance

Kagawa Manufacturing Company budgeted its 20X0 variable overhead at ¥13,800,000 and its fixed overhead at ¥24,192,000. Expected 20X0 volume was 5,600 units. Actual costs for production of 5,700 units during 20X0 were as follows:

Variable overhead	¥14,400,000
Fixed overhead	27,250,000
Total overhead	<u>¥41,650,000</u>

Compute the production-volume variance. Be sure to label it favorable or unfavorable.

13-47 Reconciliation of Variable-Costing and Absorption-Costing Operating Income

Morphy Richards, a well-known producer of consumer durables, produced 18,000 electric hand blenders during 2020. Expected production was only 15,750 hand blenders. The company’s fixed-overhead rate is £7 per blender. Absorption-costing operating income for the year is £27,000, based on sales of 16,500 blenders.

1. Compute the following:
 - a. Budgeted fixed overhead
 - b. Production-volume variance
 - c. Variable-costing operating income
2. Reconcile absorption-costing operating income and variable-costing operating income. Include the amount of the difference between the two and an explanation for the difference.

13-48 Overhead Variances

Study Appendix 13. Consider the following data for the Hamlin Company:

	Factory Overhead	
	Fixed	Variable
Actual incurred	\$12,800	\$14,400
Budget for standard hours allowed for output achieved	12,000	10,200
Applied	11,800	10,200
Budget for actual hours of input	12,000	10,800

From the preceding information, fill in the following blanks. Be sure to mark your variances F for favorable and U for unfavorable.

a. Flexible-budget variance	\$_____	Fixed	\$_____
		Variable	\$_____
b. Production-volume variance	\$_____	Fixed	\$_____
		Variable	\$_____
c. Spending variance	\$_____	Fixed	\$_____
		Variable	\$_____
d. Efficiency variance	\$_____	Fixed	\$_____
		Variable	\$_____

13-49 Variances

Study Appendix 13. Consider the following data regarding factory overhead:

	Variable	Fixed
Budget for actual hours of input	\$45,000	\$70,000
Applied	41,000	64,800
Budget for standard hours allowed for actual output achieved	?	?
Actual incurred	48,100	66,500

Using the preceding data, fill in the following blanks with the variance amounts. Use F for favorable or U for unfavorable for each variance.

	Total Overhead	Variable	Fixed
1. Spending Variance	_____	_____	_____
2. Efficiency Variance	_____	_____	_____
3. Production-Volume Variance	_____	_____	_____
4. Flexible-budget variance	_____	_____	_____
5. Underapplied Overhead	_____	_____	_____

PROBLEMS**13-50 Choice of Cost-Allocation Base at Enriquez Machine Parts Company**

Refer to the chapter discussion of Enriquez Machine Parts Company beginning on p. 552. Suppose Enriquez decided to use only one overhead cost pool for both departments with machine hours as the single cost-allocation base.

1. Compute the budgeted overhead application rate for the factory using the budgeted data on p. 552.
2. If Enriquez used 70,000 machine hours during 2023, what was the total factory overhead applied to products?
3. The applied factory overhead based on separate application rates for the machining and assembly departments was €375,000. Explain why this amount is different than the applied amount from requirement 2.

13-51 Choice of Cost-Allocation Base at Enriquez Machine Parts Company

Refer to the chapter discussion of Enriquez Machine Parts Company beginning on p. 552. Suppose Enriquez decided to use only one overhead cost pool for both departments with direct labor cost as the single cost-allocation base.

1. Compute the budgeted overhead application rate for the factory using the budgeted data on p. 552.
2. If Enriquez incurred €190,000 of direct labor cost during 2023, what was the total factory overhead applied to products?
3. The applied factory overhead based on separate application rates for the machining and assembly departments was €375,000. Explain why this amount is different than the applied amount from requirement 2.

13-52 Choice of Cost-Allocation Bases in Accounting Firm

Brenda McCoy, the managing partner of McCoy, Brennan, and Cable, a public accounting firm, is considering the desirability of tracing more costs to jobs than just direct labor. In this way, the firm will be able to justify billings to clients.

Last year's costs were as follows:

Direct-professional labor	\$ 5,000,000
Overhead	<u>10,000,000</u>
Total costs	<u><u>\$15,000,000</u></u>

The following costs were included in overhead:

Computer time	\$ 750,000
Secretarial cost	700,000
Photocopying	250,000
Fringe benefits to direct labor	800,000
Phone call time with clients (estimated but not tabulated)	<u>500,000</u>
Total	<u><u>\$3,000,000</u></u>

The firm's data processing techniques now make it feasible to document and trace these costs to individual jobs.

As an experiment, in December Brenda McCoy arranged to trace these costs to six audit engagements. Two job records showed the following:

	Engagement	
	Eagledale Company	First Valley Bank
Direct-professional labor	\$15,000	\$15,000
Fringe benefits to direct labor	3,000	3,000
Phone call time with clients	1,500	500
Computer time	3,000	700
Secretarial costs	2,000	1,500
Photocopying	<u>500</u>	<u>300</u>
Total direct costs	<u><u>\$25,000</u></u>	<u><u>\$21,000</u></u>

1. Compute the overhead application rate based on last year's costs.
2. Suppose last year's costs were reclassified so that \$3 million would be regarded as direct costs instead of overhead. Compute the overhead application rate as a percentage of direct labor and as a percentage of total direct costs.
3. Using the three rates computed in numbers 1 and 2, compute the total costs of engagements for Eagledale Company and First Valley Bank.
4. Suppose that client billing was based on a 30% markup of total job costs. Compute the billings that would be forthcoming in number 3.
5. Which method of costing and overhead application do you favor? Explain.

13-53 Allocated Costs and Public Services

The Lyon Commune is one of the three large communes of France, divided further into several municipal arrondissements to ensure quality service. Recently, the Commune has been charged by the local administrative court with overbilling customers for water supply. The city allocated “administrative overhead” to the water department’s budget. These costs were then added to the “jobs”—that is, to the accounts of the customers of the water department. The court called the allocation of €153,162 unwarranted and merely a “rush” to generate funds to cover city expenses that were unrelated to water services.

The mayor of the Commune explained that the overhead allocation was the way in which the city bills the water department for time that other departments spend on water issues. In a municipal council meeting, he concluded that “it was very clear that they didn’t know what they were talking about.”

1. Was the overhead charge to the water department a legitimate cost to be covered by water bills? Explain your reasoning.
2. Assume that at least part of the overhead charge is a legitimate cost of the water department. Suggest possible changes in the accounting system that would provide a more accurate measure of the cost of services provided to the water department by other departments.

13-54 Overhead Accounting for Control and for Product Costing

ITC India produces and sells ready-to-eat food under the brand name Kitchen of India. The company has an overhead rate of ₹400 per direct-labor hour, based on expected variable overhead of ₹12,000,000 per year, expected fixed overhead of ₹28,000,000 per year, and expected direct-labor hours of ₹100,000 per year.

Data for the operation of 2020 follow:

	Direct-Labor Hours Used	Overhead Costs Incurred*
First 6 months	52,000	₹21,120,000
Last 6 months	42,000	₹19,120,000

*Fixed costs incurred were exactly equal to budgeted amounts throughout the year.

1. What is the underapplied or overapplied overhead for each 6-month period? Label your answer as underapplied or overapplied.
2. Explain briefly (no more than 50 words for each part) the probable causes for the underapplied or overapplied overhead. Focus on variable and fixed costs separately. Give the exact figures attributable to causes you cite.

13-55 Comparison of Variable Costing and Absorption Costing

Simple numbers are used in this problem to highlight the concepts covered in the chapter.

Assume that the Perth Woolen Company produces a rug that sells for \$20. Perth uses a standard cost system. Total standard variable costs of production are \$8 per rug, fixed manufacturing costs are \$150,000 per year, and selling and administrative expenses are \$30,000 per year, all fixed. Expected production volume is 25,000 rugs per year.

1. For each of the following nine combinations of actual sales and production (in thousands of units) for 20X0, prepare condensed income statements under variable costing and under absorption costing.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sales units	15	20	25	20	25	30	25	30	35
Production units	20	20	20	25	25	25	30	30	30

Use the following formats:

Variable Costing			Absorption Costing		
Revenue	\$ aa		Revenue	\$ aa	
Cost of goods sold	(bb)		Cost of goods sold	(uu)	
Contribution margin	\$ cc		Gross profit at standard	\$ vv	
Fixed manufacturing costs	(dd)		Favorable (unfavorable)		
Fixed selling and administrative expenses	(ee)		production-volume variance	ww	
			Gross profit at “actual”	\$ xx	
			Selling and administrative expenses	(yy)	
Operating income	\$ ff		Operating income	\$ zz	

2. a. In which of the nine combinations is variable-costing income greater than absorption-costing income? In which is it lower? The same?
- b. In which of the nine combinations is the production-volume variance unfavorable? Favorable?
- c. How much profit is added by selling one more unit under variable costing? Under absorption costing?
- d. How much profit is added by producing one more unit under variable costing? Under absorption costing?
- e. Suppose sales, rather than production, is the critical factor in determining the success of Perth Woolen Company. Which format, variable costing or absorption costing, provides the better measure of performance?

13-56 All-Fixed Costs

Domenico is a French multinational food products company based in Paris. The company packages and sells natural spring water under the brand name “aqua.” The company has built a massive bottling plant near a natural spring. The plant is completely automated and uses sustainable energy for its operations. All producing and other operating costs are fixed; they do not vary with output because the volume is governed by adjusting a few dials on a control panel. The employees have fixed annual salaries.

The packaged spring water is sold to customers at an average rate of \$0.165 per liter. The price is expected to remain unchanged for quite some time.

The following are data regarding the first 2 years of operations:

	In liter		Costs (All Fixed)	
	Sales	Production	Manufacturing	Other
2019	6,800,000	13,600,000	\$750,000	\$230,000
2020	6,800,000	0	\$750,000	\$230,000

Orders can be processed in 4 hours so the management decided, in early 2020, to gear production strictly to sales.

1. Prepare three-column income statements for 2019, for 2020, and for the 2 years together using (a) variable costing and (b) absorption costing.
2. What is the break-even point under (a) variable-costing and (b) absorption costing?
3. What inventory costs would be carried on the balance sheets on December 31, 2019 and 2020, under each method?
4. Comment on your answers in numbers 1 and 2. What costing method appears more useful?

13-57 Semifixed Costs

NaturePure Company differs from the Domenico (described in Problem 13-56) in only one respect: It has both variable and fixed manufacturing costs. Its variable costs are \$0.035 per liter and its fixed manufacturing costs are \$1,020,000 per year.

1. Using the same data as in the preceding problem, except for the change in production-cost behavior, prepare three-column income statements for 2019, for 2020, and for 2 years together using (a) variable costing and (b) absorption costing.
2. What inventory costs would be carried on the balance sheets on December 31, 2019 and 2020, under each method?

13-58 Absorption and Variable Costing

The Twin Lakes Company had the following actual data for 20X0 and 20X1:

	20X0	20X1
Units of finished goods		
Opening inventory	—	3,600
Production	17,200	13,600
Sales	13,600	15,600
Ending inventory	3,600	1,600

The basic production data at standard unit costs for the 2 years were as follows:

Direct materials	\$16
Direct labor	20
Variable factory overhead	<u>4</u>
Standard variable costs per unit	<u>\$40</u>

Fixed factory overhead was budgeted at \$146,000 per year. The expected volume of production was 14,600 units so the fixed overhead rate was $\$146,000 \div 14,600 = \$10$ per unit.

Budgeted sales price was \$79 per unit. Selling and administrative expenses were budgeted at variable, \$11 per unit sold, and fixed, \$83,000 per year.

Assume that there were absolutely no variances from any standard variable costs or budgeted selling prices or budgeted fixed costs in 20X0.

There were no beginning or ending inventories of work in process.

1. For 20X0, prepare income statements based on standard variable (direct) costing and standard absorption costing. (The next problem deals with 20X1.)
2. Explain why operating income differs between variable costing and absorption costing. Be specific.

13-59 Absorption and Variable Costing

Assume the same facts as in the preceding problem. In addition, consider the following actual data for 20X1:

Direct materials	\$ 262,000
Direct labor	171,000
Variable factory overhead	38,000
Fixed factory overhead	143,500
Selling and administrative costs	
Variable	165,100
Fixed	83,000
Sales	<u>1,252,400</u>

1. For 20X1, prepare income statements based on standard variable (direct) costing and standard absorption costing.
2. Explain why operating income differs between variable costing and absorption costing. Be specific.

13-60 Fundamentals of Overhead Variances

The Durant Company is installing an absorption standard-cost system and a flexible-overhead budget. Standard costs have recently been developed for its only product and are as follows:

Direct materials, 3 pounds at \$20	\$60
Direct labor, 2 hours at \$14	28
Variable overhead, 2 hours at \$5	10
Fixed overhead	<u>?</u>
Standard cost per unit of finished product	<u>\$?</u>

Expected production activity is expressed as 7,500 standard direct-labor hours per month. Fixed overhead is expected to be \$60,000 per month. The predetermined fixed-overhead rate for product costing is not changed from month to month.

1. Calculate the proper fixed-overhead rate per standard direct-labor hour and per unit.
2. Graph the following for expected production activity from 0 to 10,000 hours:
 - a. Budgeted variable overhead
 - b. Variable overhead applied to product
3. Graph the following for expected production activity from 0 to 10,000 hours:
 - a. Budgeted fixed overhead
 - b. Fixed overhead applied to product

4. Assume that 6,000 standard direct-labor hours are allowed for the output achieved during a given month. Actual variable overhead of \$31,000 was incurred; actual fixed overhead amounted to \$62,000. Calculate the following:
 - a. Fixed-overhead flexible-budget variance
 - b. Fixed-overhead production-volume variance
 - c. Variable-overhead flexible-budget variance
5. Assume that 7,800 standard direct-labor hours are allowed for the output achieved during a given month. Actual overhead incurred amounted to \$99,700, \$62,000 of which was fixed. Calculate the following:
 - a. Fixed-overhead flexible-budget variance
 - b. Fixed-overhead production-volume variance
 - c. Variable-overhead flexible-budget variance

13-61 Production-Volume Variance at Mobility Furnitures

Mobility Furnitures, headquartered in Liverpool in the United Kingdom, produces and sells molded plastic furniture for homes and offices. The annual turnover of the company is about £720 million. Accounting for fixed manufacturing overhead is a challenge for the company. Suppose a manufacturing division of the company has the following budgeted cost for producing 800,000 large, three-shelved plastic wardrobe units in 2020.

Direct materials	£19,200,000
Direct labor	£ 2,880,000
Other variable manufacturing costs	£ 2,400,000
Fixed manufacturing costs	<u>£12,000,000</u>
Total manufacturing costs	<u>£36,480,000</u>

During 2020, this division of Mobility Furnitures produced 850,000 units of plastic wardrobe and sold 820,000 of them for £54 million. Assume that the company does not allocate selling and administrative costs to the individual products.

1. Compute the following budgeted unit cost for 2020:

Variable manufacturing costs per unit	<u>?</u>
Fixed manufacturing costs per unit	<u>?</u>
Total manufacturing costs per unit	<u>?</u>

2. Compute the problem production-volume variance for 2020. Be sure to label it favorable or unfavorable.
3. Compute the 2020 profit from the production and sales of plastic wardrobe using absorption costing. Ignore selling and distribution costs.
4. Compute the 2020 profit from the production and sales of plastic wardrobe using variable costing. Ignore selling and distribution costs.

Which measure of profit, absorption-costing profit or variable-costing profit, is a better measure of performance during 2020? Explain.

13-62 Fixed Overhead and Practical Capacity

Prime Steel Company produces steel bars that are manufactured by a unique metallurgical process known as Thermo Mechanical Treatment (TMT). Prime Steel's expected activity level was 116,800 machine hours per month. Practical capacity was 146,000 machine hours per month. The standard machine hours allowed for the actual output achieved in July 2020 were 122,000. The budgeted fixed-factory-overhead items were as follows:

Depreciation, equipment	€ 678,000
Depreciation, factory building	€ 132,000
Supervision	€ 102,000
Indirect labor	€ 464,000
Insurance	€ 40,000
Property taxes	<u>€ 44,000</u>
Total	<u>€1,460,000</u>

Because of unanticipated scheduling difficulties and the need for more indirect labor, the actual fixed factory overhead was €1,514,000.

1. Using practical capacity as the base for applying fixed factory overhead, prepare a summary analysis of fixed-overhead variances for July.
2. Using expected activity as the base for applying fixed factory overhead, prepare a summary analysis of fixed-overhead variances for July.
3. Explain why some of your variances in numbers 1 and 2 are the same and some differ.

13-63 Selection of Expected Volume

Heidi Brooke is a consultant for Colorado Paper Products Company. She is helping one of the company's divisions to install a standard cost system for 20X0. For product-costing purposes, the system must apply fixed factory costs to products manufactured. She has decided that the fixed-overhead rate should be based on machine hours, but she is uncertain about the appropriate volume to use in the denominator. Colorado Paper has grown rapidly; the division has added production capacity approximately every 4 years. The last addition was completed in early 20X0, and the total capacity is now 3,000,000 machine hours per year. Brooke predicts the following operating levels (in machine hours) through 20X4:

Year	Capacity Used
20X0	2,200,000 hours
20X1	2,500,000 hours
20X2	2,850,000 hours
20X3	3,000,000 hours
20X4	3,100,000 hours

The current plan is to add another 500,000 machine hours of capacity in 20X4.

Brooke has identified three alternatives for the application base:

- a. Predicted volume for the year in question
 - b. Average volume over the 4 years of the current production setup
 - c. Practical (or full) capacity
1. Suppose annual fixed factory overhead is expected to be \$36,000,000 through 20X3. For simplicity, assume no inflation. Calculate the fixed-overhead rates (to the nearest cent) for 20X1, 20X2, and 20X3, using each of the three alternative application bases.
 2. Provide a brief description of the effect of using each method of computing the application base.
 3. Which method do you prefer? Why?

13-64 Analysis of Operating Results

Leeds Tool Company produces and sells a variety of machine-tooled products. The company employs a standard cost accounting system for record-keeping purposes.

At the beginning of 20X0, the president of Leeds Tool presented the budget to the company's board of directors. The board accepted a target 20X0 profit of £16,800 and agreed to pay the president a bonus if profits exceeded the target. The president has been confident that the year's profit would exceed the budget target, since the monthly sales reports that he has been receiving have shown that sales for the year will exceed budget by 10%. The president is both disturbed and confused when the controller presents an adjusted forecast as of November 30, 20X0, indicating that profit will be 14% under budget:

Leeds Tool Company		
Forecasts of Operating Results		
	Forecasts as of	
	1/1/X0	11/30/X0
Sales	£156,000	£171,600
Cost of sales at standard	108,000*	118,800
Gross margin at standard	£ 48,000	£ 52,800
Over- (under-) absorbed fixed manufacturing overhead	0	(6,000)
Actual gross margin	£ 48,000	£ 46,800
Selling expenses	£ 11,200	£ 12,320
Administrative expenses	20,000	20,000
Total operating expenses	£ 31,200	£ 32,320
Earnings before tax	£ 16,800	£ 14,480

*Includes fixed manufacturing overhead of £30,000.

There have been no sales price changes or product-mix shifts since the January 1, 20X0, forecast. The only cost variance on the income statement is the underapplied manufacturing overhead. This arose because the company produced only 16,000 standard machine hours (budgeted machine hours were 20,000) during 20X0, as a result of a shortage of raw materials while its principal supplier was closed by a strike. Fortunately, Leeds Tool's finished-goods inventory was large enough to fill all sales orders received.

1. Analyze and explain why the profit has declined despite increased sales and good control over costs. Show computations.
2. What plan, if any, could Leeds Tool adopt during December to improve its reported profit at year-end? Explain your answer.
3. Illustrate and explain how Leeds Tool could adopt an alternative internal cost-reporting procedure that would avoid the confusing effect of the present procedure. Show the revised forecasts under your alternative.
4. Would the alternative procedure described in number 3 be acceptable to the board of directors for financial-reporting purposes? Explain.

13-65 Standard Absorption and Standard Variable Costing

Schlusser Company has the following results for a certain year. All variances are written off as additions to (or deductions from) the standard cost of goods sold. Find the unknowns, designated by letters.

Sales: 150,000 units, at \$20	\$3,000,000
Net variance for standard variable manufacturing costs	\$ 33,000 unfavorable
Variable standard cost of goods manufactured	\$ 11 per unit
Variable selling and administrative expenses	\$ 3 per unit
Fixed selling and administrative expenses	\$ 650,000
Fixed manufacturing overhead	\$ 165,000
Maximum capacity per year	190,000 units
Expected production volume for year	150,000 units
Beginning inventory of finished goods	15,000 units
Ending inventory of finished goods	10,000 units
Beginning inventory: Variable-costing basis	a
Contribution margin	b
Operating income: Variable-costing basis	c
Beginning inventory: Absorption-costing basis	d
Gross margin	e
Operating income: Absorption-costing basis	f

13-66 Disposition of Variances

In September 2020, Astro AI Company started a division for making ice scrappers and extendable snow brushes with squeegee. The management hoped that these ice scrappers were significantly better than most competitors in the market. During 2020, it produced 195,000 ice scrappers. Financial results were as follows:

- Sales: 156,000 units at \$40
- Direct labor at standard: $195,000 \times \$18 = \$3,510,000$
- Direct-labor variances: \$132,000 U
- Direct materials at Standard: $195,000 \times \$8 = \$1,560,000$
- Direct-material variances: \$46,000 U
- Overhead incurred at Standard: $195,000 \times \$4 = \$780,000$
- Overhead variances: \$10,000 F

Astro AI uses an absorption-costing system and allows divisions to choose one of the two methods of accounting for variances:

- a. Direct charge to income.
- b. Proration to the production of the period; method b requires variances to be sprayed equally over the units produced during the period.

1. Calculate the division's operating income (a) using method a and (b) using method b. Assume no selling and administrative expenses.
2. Calculate ending inventory value (a) using method a and (b) using method b. Note that there was no beginning inventory.
3. What is the major argument in support of each method?

13-67 Straightforward Problem on Standard Cost System

Study Appendix 13. The Winnipeg Chemical Company uses flexible budgets and a standard cost system.

- Direct-labor costs incurred, 12,000 hours, \$150,000
- Variable-overhead costs incurred, \$37,000
- Fixed-overhead flexible-budget variance, \$1,600, favorable
- Finished units produced, 1,800
- Fixed-overhead costs incurred, \$38,000
- Variable overhead applied at \$3 per hour
- Standard direct-labor cost, \$13 per hour
- Denominator production per month, 2,000 units
- Standard direct-labor hours per finished unit, 6

Prepare an analysis of all variances (similar to Exhibit 13-10, p. 571).

13-68 Straightforward Problem on Standard Cost System

Study Appendix 13. The München Company uses a standard cost system. The month's data regarding its single product follow (where € is the symbol for the euro, the currency of most countries of the European Union):

- Fixed-overhead costs incurred, €6,300
- Variable overhead applied at €11 per hour
- Standard direct-labor cost, €44 per hour
- Denominator production per month, 220 units
- Standard direct-labor hours per finished unit, 5
- Direct-labor costs incurred, 1,000 hours, €42,500
- Variable-overhead costs incurred, €10,400
- Fixed-overhead flexible-budget variance, €300, favorable
- Finished units produced, 180

Prepare an analysis of all variances (similar to Exhibit 13-10, p. 571).

CASES**13-69 Multiple Overhead Rates and Activity-Based Costing**

A division of **Hewlett-Packard** assembles and tests printed circuit (PC) boards. The division has many different products. Some are high volume; others are low volume. For years, manufacturing overhead was applied to products using a single overhead rate based on direct-labor dollars. However, direct labor has shrunk to 6% of total manufacturing costs.

Managers decided to refine the division's product-costing system. Abolishing the direct-labor category, they included all manufacturing labor as a part of factory overhead. They also identified several activities and the appropriate cost-allocation base for each. The cost-allocation base for the first activity, the start station, was the number of raw PC boards. The application rate was computed as follows:

$$\begin{aligned}
 \text{application rate for start station activity} &= \frac{\text{budgeted total factory overhead at the activity}}{\text{budgeted raw PC boards for the year}} \\
 &= \frac{\$150,000}{125,000} \\
 &= \$1.20
 \end{aligned}$$

Each time a raw PC board passes through the start station activity, \$1.20 is added to the cost of the board. The product cost is the sum of costs directly traced to the board plus the indirect costs (factory overhead) accumulated at each of the manufacturing activities undergone.

Using assumed numbers, consider the following data regarding PC board 37:

Direct materials	\$55.00
Factory overhead applied	<u>?</u>
Total manufacturing product cost	<u><u>?</u></u>

The activities involved in the production of PC board 37 and the related cost-allocation bases were as follows:

Activity	Cost-Allocation Base	Factory-Overhead Costs Applied for Each Activity
1. Start station	Number of raw PC boards	$1 \times \$1.20 = \$1.20$
2. Axial insertion	Number of axial insertions	$39 \times 0.07 = ?$
3. Dip insertion	Number of dip insertions	$? \times 0.20 = 5.60$
4. Manual insertion	Number of manual insertions	$15 \times ? = 6.00$
5. Wave solder	Number of boards soldered	$1 \times 3.20 = 3.20$
6. Backload	Number of backload insertions	$8 \times 0.60 = 4.80$
7. Test	Standard time board is in test activity	$0.15 \times 80.00 = ?$
8. Defect analysis	Standard time for defect analysis and repair	$0.05 \times ? = 4.50$
Total		<u>\$?</u>

1. Fill in the numbers where there are question marks.
2. How is direct labor identified with products under this product-costing system?
3. Why would managers favor this multiple-overhead rate, ABC system instead of the older system?

13-70 Inventory Measures, Production Scheduling, and Evaluating Divisional Performance

The Calais Company stresses competition between the heads of its various divisions, and it rewards stellar performance with year-end bonuses that vary between 5% and 10% of division net operating income (before considering the bonus or income taxes). The divisional managers have great discretion in setting production schedules.

The Brittany division produces and sells a product for which there is a long-standing demand but which can have marked seasonal and year-to-year fluctuations. On November 30, 20X0, Veronique Giraud, the Brittany division manager, is preparing a production schedule for December. The following data are available for January 1 through November 30 (€ is the symbol for euro, the currency for most countries of the European Union):

Beginning inventory, January 1, in units	10,000
Sales price, per unit	€ 400
Total fixed costs incurred for manufacturing	€ 9,350,000
Total fixed costs: Other (not inventoriable)	€10,200,000
Total variable costs for manufacturing	€18,150,000
Total other variable costs (fluctuate with units sold)	€ 4,000,000
Units produced	110,000
Units sold	100,000
Variances	None

Production in October and November was 10,000 units each month. Practical capacity is 12,000 units per month. Maximum available storage space for inventory is 25,000 units. The sales outlook for December–February is 6,000 units monthly. To retain a core of key employees, monthly production cannot be scheduled at less than 4,000 units without special permission from the president. Inventory is never to be less than 10,000 units.

The denominator used for applying fixed factory overhead is regarded as 120,000 units annually. The company uses a standard absorption-costing system. All variances are disposed of at year-end as an adjustment to standard cost of goods sold.

1. Given the restrictions as stated, and assuming that Giraud wants to maximize the company's net income for 20X0, answer the following:
 - a. How many units should be scheduled for production in December?
 - b. What net operating income will be reported in 20X0 as a whole, assuming that the implied cost-behavior patterns will continue in December as they did throughout the year to date? Show your computations.
 - c. If December production is scheduled at 4,000 units, what would reported net income be?
2. Assume that standard variable costing is used rather than standard absorption costing.
 - a. What would net income for 20X0 be, assuming that the December production schedule is the one in part a of number 1?
 - b. What would net income for 20X0 be, assuming that December production was 4,000 units?
 - c. Reconcile the net incomes in this requirement with those in number 1.

- From the viewpoint of the long-run interests of the company as a whole, what production schedule should the division manager set? Explain fully. Include in your explanation a comparison of the motivating influence of absorption and variable costing in this situation.
- Assume standard absorption costing. Giraud wants to maximize her after-income tax performance over the long run. Given the data at the beginning of the problem, assume that income tax rates will be halved in 20X1. Assume also that year-end write-offs of variances are acceptable for income tax purposes. How many units should be scheduled for production in December? Why?

13-71 Performance Evaluation

A division of AgroTech Company produces high-yielding rice seeds for farmers throughout India. Bhavyesh Agarwal became CEO of the company in 2020. He is concerned with the ability of his division manager to control costs. To aid his evaluation, Bhavyesh set up a standard cost system.

Standard costs were based on 2019 costs in several categories. Each 2019 cost was divided by 1,520,000 quintal—the volume of 2019 production—to determine a standard for 2020 (one quintal means 100 kilograms):

	2019 Cost (thousands)	2020 Standard (per hundredweight)
Direct materials	₹291,840	₹192
Direct labor	₹133,760	₹ 88
Variable overhead	₹255,360	₹168
Fixed overhead	₹389,120	₹256

At the end of 2020, Bhavyesh compared actual results with the standards he established. Production was 1,360,000 quintals, and variances were as follows:

	Actual	Standard	Variance
Direct materials	₹ 288,320	₹261,120	₹27,200 U
Direct labor	₹ 117,600	₹119,680	₹ 2,080 F
Variable overhead	₹ 227,520	₹228,480	₹ 960 F
Fixed overhead	₹ 385,920	₹348,160	₹37,760 U
	<u>₹1,019,360</u>	<u>₹957,440</u>	<u>₹61,920 U</u>

Bhavyesh was not surprised by the unfavorable variance in direct materials. After all, rice prices in 2020 averaged 10% above those in 2019. But he was disturbed by the lack of control of fixed overhead. He called in the production manager and asked for an explanation.

- Prepare an explanation for the large unfavorable fixed-overhead variance.
- Discuss the appropriateness of using one year's costs as the next year's standards.

13-72 Converting an Income Statement from Absorption Costing to Variable Costing

Holden Corp. has the following income statement under standard absorption costing:

Sales	\$1,000,000
Cost of goods sold:	
Beginning inventory	\$ 0
Production	\$ 975,000
Ending inventory	\$ 225,000
Cost of goods sold:	\$ 750,000
Less adjustment for variances	\$ 95,000
Adjusted cost of goods sold	\$ 655,000
Gross profit	\$ 345,000
Selling and administrative expenses	
Variable selling and administrative	\$ 30,000
Fixed selling and administrative	\$ 170,000
Net income	\$ 145,000

During the period Holden produced 130,000 units and sold 100,000 units. There was no beginning or ending WIP inventory. Budgeted fixed factory overhead was \$150,000, actual fixed factory overhead was \$90,000, and denominator level was 100,000 units. Holden does not prorate variances.

Present a variable costing income statement. Be sure to list the amount of any variance in an adjustment for variances.

13-73 Converting an Income Statement from Variable Costing to Absorption Costing

Moseley Corp. currently uses variable costing in its accounting system, with the following selected results (assume there were no variances):

Contribution margin	\$300,000
Variable selling and administrative	\$100,000
Fixed selling and administrative	\$ 60,000
Net income	\$150,000

During the period Moseley produced 160,000 units and sold 80,000 units. Selling price is \$10/unit. There was no beginning or ending WIP inventory, and no beginning FG inventory. Moseley is considering a standard absorption costing system. It estimates that if it had used such a system this year, it would have budgeted fixed factory overhead at \$100,000, and would have selected a denominator level of 200,000 units. The company also estimates that there would have still been no variances related to direct materials, direct labor, and variable factory overhead.

Present a standard absorption costing income statement with proration. Be sure to present the adjustment for variances amount on the income statement.

NIKE 10-K PROBLEM

13-74 Overhead Costs at Umbro

Read [Nike's 10-K Item 1](#) description of its business. Although Nike does not manufacture the products it sells, its subsidiaries may do some manufacturing. For example, Nike's subsidiary, [Air Jordan](#), manufactures casual footwear, apparel, and accessories, and is predominantly focused on basketball using the Jumpman trademark.

1. What kinds of sports gear does Air Jordan make? Consider an Air Jordan plant that makes soccer clothing. List five variable-cost resources and five fixed-cost resources that are part of the plant's overhead.
2. Suppose that Air Jordan uses a dedicated production line to make only soccer shoes. What are some resources that are normally part of overhead that would be directly traceable to the soccer-shoe cost object?

EXCEL APPLICATION EXERCISE

13-75 Computing Budgeted Factory Overhead

Goal: Create an Excel spreadsheet to compute budgeted factory overhead rates and apply factory overhead to production. Use the results to answer questions about your findings.

Scenario: Kevin Aeronautics Company has asked you to determine its budgeted factory overhead rates. It would also like you to apply the appropriate factory overhead amounts to actual production and determine any variances. Additional background information for your spreadsheet appears in Fundamental Assignment Material 13-A1. (Ignore data in the Fundamental Assignment Material for product M89.)

When you have completed your spreadsheet, answer the following questions:

1. What was the budgeted factory overhead rate for department A? Department B?
2. What overhead amount was distributed to department A? Was the overhead over- or underapplied? By what amount?
3. What overhead amount was distributed to department B? Was the overhead over- or underapplied? By what amount?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
 Row 1: Chapter 13 Decision Guideline
 Row 2: Kevin Aeronautics Company
 Row 3: Overhead Applications Using Budgeted Rates
 Row 4: Today's Date

3. Merge and center the four heading rows across columns A–G.
 4. In row 7, create the following column headings:
 Column B: 20X0 Budget
 Column D: 20X0 Actual
 Column F: Variances
 5. Merge and center the 20X0 Budget heading across columns B–C.
 6. Merge and center the 20X0 Actual heading across columns D–E.
 7. Merge and center the Variances heading across columns F–G.
 8. In row 8, create the following center-justified column headings:
 Columns B, D, and F: Dept. A
 Columns C, E, and G: Dept. B
 9. In column A, create the following row headings:
 Row 9: Factory Overhead
 Row 10: Direct-Labor Hours
 Row 11: Machine Hours
 Skip a row.
 Row 13: Overhead Rate
 Row 14: Distributed Overhead
 Row 15: Over/(Under) Applied
- Note: Recommended column widths: column A = 18, columns B–G = 12.
10. Use data from Fundamental Assignment Material 13-A1 to enter the amounts for the department A and B 20X0 budget predictions and 20X0 actual results.
 11. Use the appropriate formulas to calculate the following amounts:

20X0 budgeted overhead rates for depts. A and B	Row 13, columns B and C
20X0 distributed overhead for depts. A and B	Row 14, columns D and E
20X0 over/under applied overhead	Row 15, columns D and E
Flexible budget variances for depts. A and B	Row 9, columns F and G
Activity budget variance for dept. B	Row 10, column G
Activity budget variance for dept. A	Row 11, column F
Total variances for depts. A and B	Row 15, columns F and G

12. Format amounts in rows 10 and 11 as follows:

Number tab:	Category:	Accounting
	Decimal:	0
	Symbol:	None

13. Format amounts in rows 9, 14, and 15 as follows:

Number tab:	Category:	Accounting
	Decimal:	0
	Symbol:	\$

14. Format amounts in row 13 as follows:

Number tab:	Category:	Accounting
	Decimal:	2
	Symbol:	\$

15. Modify the format of the total variances in row 15, columns F and G to display a top border using the default Line Style.

Border tab:	Icon:	Top Border

16. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

13-76 Accounting for Overhead

Form groups of four to six persons. Each group should identify a cost accountant at a local company to interview. The interviewee could be the top financial officer of a small company, but a division controller or cost analyst might be more appropriate for a large company. The essential factor is that the person chosen understands how overhead costs are allocated to products or services in the company.

Set up an interview with the cost accountant, and explore the following issues. Be prepared with follow-up questions if your question receives a superficial answer. Your goal should be to get as much operational detail as possible about the procedures used for allocating overhead costs at the company. If the company is large, you may want to focus on one department, one product line, or some other subdivision of the company.

The issues to explore are as follows:

1. What types of costs are included in overhead? How large is overhead compared with direct materials and labor costs?
2. What types of overhead cost pools exist? Are there different pools by department? By activity? By cost-allocation base? By fixed or variable cost? Be prepared to explain what you mean by these terms because terminology varies widely.
3. How is overhead applied to final products or services? What cost-allocation bases are used?

After the interview, draw a diagram of the cost application system in as much detail as possible. Be prepared to share this with the entire class, using it to explain the overhead cost application system at the company your group studied.

INTERNET EXERCISE

13-77 Dell

Published income statements use the absorption-costing basis. But the absorption-costing statement might not really provide the information that management needs to make future decisions because it does not separate fixed from variable costs. This exercise focuses on extracting contribution information from published absorption-costing financial statements of Dell Computer. As a manufacturer of computers, Dell has become a well-known, household name.

1. Go to the home page for Dell at www.dell.com. Take a look at one of the laptops being offered under the For Home section. Once you've arrived at the product page, what type of information do you find about the device? What information is available about prices? Is it possible that the model could have more than one price? Why or why not?
2. Look at the most recent 10-K report for Dell by following links to Investors, Financial Reporting Financials, and SEC Filings. Go to the section, "Management's Discussion and Analysis of Financial Condition and Results of Operations." What was the total revenue for Dell? What is the change in the average selling price for desktop PCs? Why do you think this change occurred?
3. Look at the most recent Consolidated Statement of Operations. What were the cost of goods sold and the selling, administrative, and engineering expenses for the current year? Refer to the cash flow statement for the current year. How much was the depreciation and amortization for the current year? Assume that \$3 billion of operating expense in addition to the depreciation and amortization are all the fixed expenses. Compute the average variable cost of goods sold percentage. Compute the average contribution margin percentage. What would be the break-even sales dollars under this scenario? Does this seem reasonable, given the current operating income reported by the firm?

Job-Order Costing and Process-Costing Systems

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Distinguish between job-order costing and process costing.
2. Prepare summary journal entries for the typical transactions of a job-order costing system.
3. Use an ABC system in a job-order environment.
4. Show how service organizations use job-order costing.
5. Explain the basic ideas underlying process costing and how they differ from job-order costing.
6. Compute output in terms of equivalent units.
7. Compute costs and prepare journal entries for the principal transactions in a process-costing system.
8. Demonstrate how the presence of beginning inventories affects the computation of unit costs under the weighted-average method.
9. Understand the concept of transferred-in costs in a process-costing system with sequential processes.
10. Use backflush costing with a JIT production system.

► JELLY BELLY

Here is a trivia question: Name the favorite candy of former American President Ronald Reagan, the candy featured in the hit Harry Potter series (with flavors like dirt, grass, and vomit), and the first candy to travel into outer space. The answer is jelly beans. And one of the most famous brands is **Jelly Belly Candy**. As noted by the authors of this text, this candy often shows up on the desks of students taking long, difficult management-accounting exams.

Jelly Belly is the world's number one gourmet jelly bean. The Jelly Belly Candy Company makes candy corn and more than 100 mouthwatering candies, including such delights as chocolates, gummies, sour candies, and confections for all the seasons. To make a Jelly Belly jelly bean in either of its two factories, several processes are required. A hot kettle of gooey mix is flavored and colored with ingredients such as real peanut butter, peach puree, or milk chocolate. Then, 1,260 tiny beans are placed in a tray, cooled, and coated with corn starch and sugar before a shell is added. The final processes include polishing, printing the Jelly Belly name on each piece, and packaging.

How do Jelly Belly's accountants, affectionately called bean counters, determine the cost of each of these processing steps? How is the cost of flavoring transferred to the sugar-coating process and then to the process that adds a shell? Finally, how are all these processing costs combined to determine the cost of the hundreds of products that are sold worldwide? The answers to these questions enable

management to determine the profit of each of the products sold and to set prices. To answer such questions, the accountants at Jelly Belly have developed a process-costing system with capabilities that are carefully tailored to meet the decision-making needs of management. ■

Distinction Between Job-Order Costing and Process Costing

The two most common systems of product costing are job-order costing and process costing. **Job-order costing** (or simply **job costing**) allocates costs to heterogeneous products that are readily identified by individual units or batches, each of which requires differential (sometimes custom) amounts of materials, labor, and overhead. Industries that commonly use job-order methods include construction, printing, aircraft, furniture, special-purpose machinery, and any manufacturer of tailor-made or unique goods.

Process costing averages costs over large numbers of homogeneous or nearly identical products. It is most often found in such industries as chemicals, oil, plastics, rubber, lumber, food processing, glass, mining, cement, and meatpacking. These industries mass produce homogeneous units that usually pass in continuous fashion through a series of uniform production steps called operations or processes.

The distinction between the job-cost and the process-cost methods centers largely on how they measure, aggregate, and apply product costs. Job costing applies costs to specific jobs, which may consist of either a single physical unit (such as a custom sofa) or a few like units (such as a dozen tables) in a distinct batch or job lot. In contrast, process costing deals with great masses of identical units and computes broad averages of unit costs.

The most important point is that product costing is an averaging process. The unit cost used for inventory purposes is the result of taking some accumulated cost of production (e.g., the sum of production-related activity costs) and dividing it by some measure of production. The basic distinction between job-order costing and process costing is the breadth of the denominator: In job-order costing, the denominator is small (e.g., 1 painting, 100 advertising circulars, 1 special packaging machine, or 1 highway bridge); however, in process costing, the denominator is large (e.g., thousands of pounds, gallons, or board feet).

Job costing and process costing are extremes along a continuum of potential costing systems. Each company designs its own accounting system to fit its underlying production activities. Some companies use **hybrid costing systems**, which are blends of ideas from both job costing and process costing.

Illustration of Job Costing

Job costing is best learned by example. But first we examine the basic records used in a job-cost system. The centerpiece of a job-costing system is the **job-cost record** (also called a **job-cost sheet** or **job order**), shown in Exhibit 14-1. The job-cost record contains all costs for a particular product, service, or batch of products. A file of job-cost records for partially completed jobs provides supporting details for the Work-in-Process Inventory account, often simply called Work in Process (WIP). A file of completed job-cost records comprises the Finished-Goods Inventory account.

As Exhibit 14-1 shows, the job-cost record summarizes information contained on source documents, such as materials requisitions and labor time tickets. **Materials requisitions** are records of materials used in particular jobs. **Labor time tickets** (or **time cards**) record the time a particular direct laborer spends on each job.

Today, job-cost records and other source documents are likely to be computer files, not paper records. With online data entry, bar coding, and optical scanning, much of the information needed for such records enters the computer without ever being written on paper. Nevertheless, whether records are on paper or in computer files, the accounting system must collect and maintain the same basic information.

As each job begins, we create its own job-cost record. As units are worked on, we make entries on the job-cost record. We accumulate three classes of costs on the job-cost record as units pass through the departments: Materials requisitions are the source of direct-materials



David Cardinez/Shutterstock

Jelly Belly produces a fun experience as well as candy, as is evident at this Jelly Belly Candy Store.

Objective 1

Distinguish between job-order costing and process costing.

job-order costing (job costing)

The method of allocating costs to heterogeneous products that are readily identified by individual units or batches, each of which requires differential (sometimes custom) amounts of materials, labor, and overhead.

process costing

The method of allocating costs to homogeneous products by averaging costs over large numbers of nearly identical products.

hybrid costing systems

An accounting system that is a blend of ideas from both job costing and process costing.

job-cost record (job-cost sheet, job order)

A document that shows all costs for a particular product, service, or batch of products.

materials requisitions

Records of materials used in particular jobs.

labor time tickets (time cards)

The record of the time a particular direct laborer spends on each job.

Exhibit 14-1**Completed Job-Cost Record and Sample Source Documents***

*Note that 7 of the 8 hours and \$105 of the \$120 in time ticket 7Z4 belong to job no. 963.

Job Cost Record: <u>Machining</u> Department					
Date Started	<u>1/7/20X1</u>		Job No.	<u>963</u>	
Date Completed	<u>1/14/20X1</u>		Units Completed	<u>12</u>	
Cost	Date	Ref.	Quantity	Amount	Summary
Direct Materials:					
6" Bars	1/7/20X1	N41	24	120.00	
Casings	1/9/20X1	K56	12	340.00	460.00
Direct Labor:					
Drill	1/8/20X1	7Z4	7.0	105.00*	
	1/9/20X1	7Z5	5.5	82.50	
Grind	1/13/20X1	9Z2	4.0	80.00	267.50
Factory Overhead:					
Applied	1/14/20X1		9.0 Mach. Hrs.	180.00	180.00
Total Cost					907.50
Unit Cost					75.625

Direct Materials Requisition: No. <u>N41</u>			
Job No. _____		Date <u>1/7/20X1</u>	
Department <u>Machining</u>			
Descript.	Quantity	Unit Cost	Amount
6" Bars	24	5.00	120.00
Authorization <u>J. Hays</u>			

Time Ticket: No. <u>7Z4</u>					
Employee No. <u>464-89-7265</u>					
Department <u>Machining</u>					
Date <u>1/8/20X1</u>					
Start	End	Hours	Rate	Amount	Job
8:00	11:30	3.5	15.00	52.50	963
12:30	4:00	3.5	15.00	52.50	963
4:00	5:00	1.0	15.00	15.00	571
Totals		8.0		120.00	
Supervisor <u>M. Butler</u>					

costs, time tickets provide direct-labor costs, and budgeted overhead rates (a separate rate for each overhead cost pool) are used to apply factory overhead to products. (The computation of these budgeted rates will be described later in this chapter.)

Basic Records of Enriquez Machine Parts Company

To illustrate the functioning of a job-order costing system, we will use the records and journal entries of the Enriquez Machine Parts Company. The following is a summary of pertinent transactions for the year 20X1:

	Machining	Assembly	Total
1. Direct materials purchased on account	—	—	\$1,900,000
2. Direct materials requisitioned for manufacturing	\$1,000,000	\$890,000	1,890,000
3. Direct-labor costs incurred	200,000	190,000	390,000
4a. Factory overhead incurred	290,000	102,000	392,000
4b. Factory overhead applied*	280,000	95,000	375,000
5. Cost of goods completed and transferred to finished-goods inventory	—	—	2,500,000
6a. Sales on account	—	—	4,000,000
6b. Cost of goods sold	—	—	2,480,000

*We explain the nature of factory overhead applied in Chapter 13, pp. 551–552.

On December 31, 20X0, the firm had the following inventories:

Direct materials (12 types)	\$110,000
Work in process	—
Finished goods (unsold units from two jobs)	12,000

Exhibit 14-2 is an overview of the general flow of costs through the Enriquez Machine Parts Company's job-order costing system.¹ The exhibit summarizes the effects of transactions on the key manufacturing accounts in the firm's books. As you proceed through the following transaction-by-transaction summary analysis, keep checking each explanation against the overview in Exhibit 14-2 (companies usually make entries as transactions occur but to obtain a sweeping overview, our illustration uses summary entries for the entire 20X1 year). Essentially, we bring into WIP the costs of direct material used, direct labor, and factory overhead applied. In turn, we transfer the costs of completed goods from WIP to Finished Goods. As the company sells goods, its costs become expense in the form of Cost of Goods Sold.

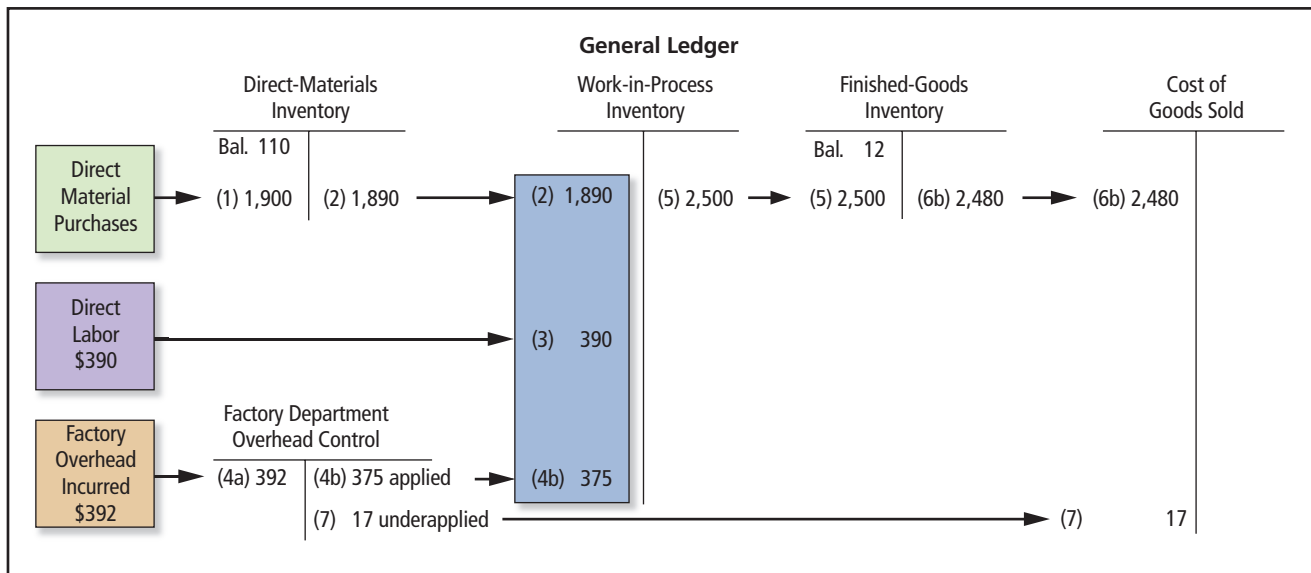


Exhibit 14-2

Job-Order Costing, General Flow of Costs (thousands)

¹Exhibit 14-2 and the following explanation of transactions assume knowledge of basic accounting procedures. We will use the T-account format for a company's accounts. Entries on the left of the T are debits and those on the right are credits. Asset T-accounts, such as the inventory accounts, show increases on the left (debit) side and decreases on the right (credit) side of the T:

Inventory	
Beginning Balance	Decreases
Increases	
Ending Balance	

We record transactions affecting the accounts as journal entries. We show debit (left-side) entries flush with the left margin, we indent credit (right-side) entries, and often we include an explanation. For example, we would show a \$10,000 transfer from Direct-Materials Inventory to WIP Inventory as follows:

```

WIP inventory .....10,000
  Direct-materials inventory ..... 10,000
To increase WIP inventory and decrease
  Direct-materials inventory by $10,000.
  
```


Using these rates, the applied overhead for 20X1 is \$375,000:

Machining: Actual machine hours of 70,000 × \$4	\$280,000
Assembly: Actual direct-labor cost of \$190,000 × 50%	<u>95,000</u>
Total factory overhead applied	<u>\$375,000</u>

The summary journal entry for this application follows:

- 4b. Transaction: Factory overhead applied, \$95,000 + \$280,000 = \$375,000
 Analysis: The asset WIP inventory is increased. The asset Factory department overhead control is decreased.
 Journal Entry: WIP inventory 375,000
 Factory department overhead control.....375,000

Finished Goods, Sales, and Cost of Goods Sold

Transactions 5, 6a, and 6b recognize the completion of production and the eventual sale of the goods. When Enriquez completes a particular job, it transfers the costs assigned to that job to Finished-Goods Inventory, and when it sells the job those same costs become expenses on the income statement in the form of Cost of Goods Sold.

5. Transaction: Cost of goods manufactured, \$2,500,000
 Analysis: The asset Finished-goods inventory is increased. The asset WIP inventory is decreased.
 Journal Entry: Finished-goods inventory 2,500,000
 WIP inventory 2,500,000
- 6a. Transaction: Sales on account, \$4,000,000
 Analysis: The asset Accounts receivable is increased. The revenue account Sales is increased.
 Journal Entry: Accounts receivable 4,000,000
 Sales 4,000,000
- 6b. Transaction: Cost of goods sold, \$2,480,000
 Analysis: The expense Cost of goods sold is increased. The asset Finished-goods inventory is decreased.
 Journal Entry: Cost of goods sold.....2,480,000
 Finished-goods inventory 2,480,000

Finally, transaction 7 in Exhibit 14-2 deals with differences between actual and applied overhead. In 20X1, Enriquez applied \$375,000 of overhead to its products but actually incurred \$392,000 of overhead costs. We call this difference underapplied overhead because the amount applied is less than the amount incurred. The opposite, overapplied overhead, occurs when the amount applied exceeds the amount incurred. As discussed more fully on pp. 554–556 of Chapter 13, the Enriquez Company disposes of under- or overapplied overhead by some method at year-end. We will assume it uses the immediate write-off method, so it adds the \$17,000 of underapplied overhead to cost of goods sold:

7. Transaction: Underapplied overhead, \$17,000
 Analysis: Cost of goods sold is increased and Factory department overhead control is decreased.
 Journal Entry: Cost of goods sold.....17,000
 Factory department overhead control.....17,000

These seven transactions have accounted for all direct materials, direct labor, and factory overhead costs incurred during 20X1. As shown in Exhibit 14-2, all these costs flowed through WIP and ended up in either Direct-Materials Inventory, WIP Inventory, Finished-Goods Inventory, or Cost of Goods Sold.

Making Managerial Decisions

Suppose you are a manager of a manufacturing department. Confirm your understanding of product costing in a job-order environment by indicating the transactions that occurred for each of the following journal entries. Which of these transactions records actual costs versus cost estimates?

1. WIP inventory.....XXX
Accrued payroll.....XXX
2. WIP inventory.....XXX
Factory department
overhead control XXX
3. Cost of goods sold.....XXX
Finished goods XXX

Answer

The first entry records the actual cost of direct labor that the accounting system traces to the specific job being costed. We make the second entry to record the application of factory overhead. This is an estimate of the costs of indirect resources used in producing the job. The last entry records the cost of goods sold when the company sells the job. The cost in this transfer from finished-goods inventory to cost of goods sold is a mix of actual costs (direct material and direct labor) and estimated costs (applied factory overhead).

Activity-Based Costing/Management in a Job-Costing Environment

Regardless of the nature of its production system, firms will inevitably have resources they share among different products. The costs of these resources are part of the overhead the company must account for in its system. In many cases, the magnitude of overhead is large enough to justify a significant investment in a costing system that provides accurate cost information. Whether companies use this cost information for planning and control or product costing, often the benefits of more accurate costs exceed the costs of installing and maintaining the cost system. As we have seen, ABC usually increases costing accuracy because it focuses on the cause-and-effect relationships between work performed (activities) and the consumption of resources (costs).

Illustration of ABC in a Job-Order Environment

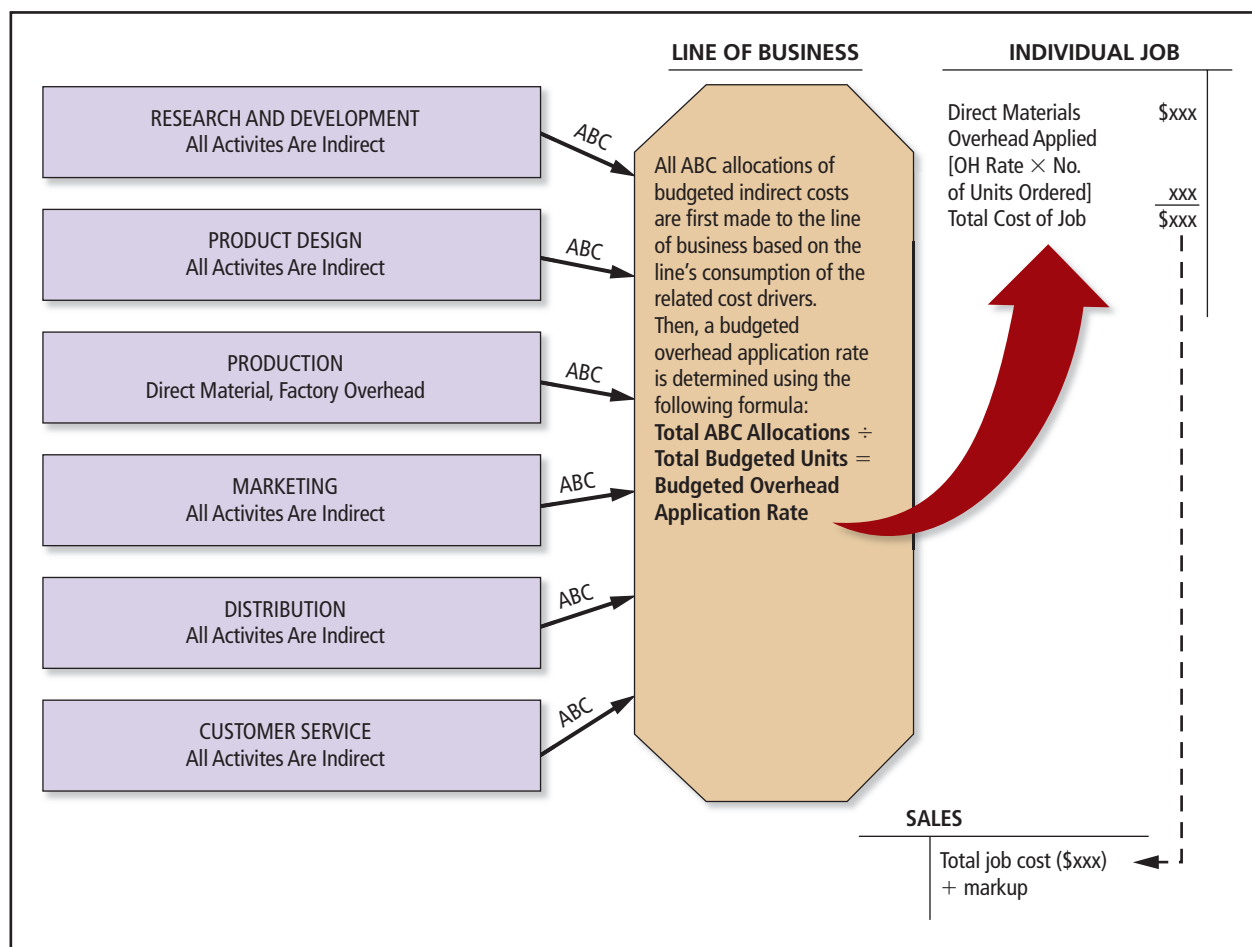
We illustrate an ABC system in a job-order environment by considering **Dell**. Recall that Dell was the subject of the introduction to Chapter 13, p. 550. Several years ago, Dell adopted an ABC job-order costing system. What motivated Dell to adopt ABC? Company managers cite two reasons: (1) the aggressive cost-reduction targets set by top management and (2) the need to understand product-line profitability. As is the case with any business, understanding profitability means understanding the cost structure of the entire business. One of the key advantages of an ABC system is its focus on understanding how work (activity) is related to the consumption of resources (costs). Therefore, an ABC system was a logical choice for Dell, and once managers improved their understanding of the company's cost structure, cost reduction through ABM (activity-based management) was much easier.

Like most companies that implement ABC, Dell began developing its ABC system by focusing on the most critical (core) processes across the value chain. These were the design and production processes. After it put the initial system in place, Dell added the remaining phases of the value chain. Exhibit 14-3 shows the functions (or core processes) that add value to the company's products and how Dell assigns the costs of these functions to an individual job under the current ABC system.

To understand product-line profitability, Dell managers identified key activities for the R&D, product design, production, marketing, distribution, and customer service phases. Then, they used appropriate cost drivers to allocate activity costs to the produced product lines. While each of the phases shown in Exhibit 14-3 is important, we will focus on the product design and production phases. Product design is one of Dell's most important value-adding functions, providing a defect-free computer product that is easy to manufacture and reliable to use. Engineering costs (primarily salaries and CAD equipment depreciation) account for most of the design costs. These costs are indirect and, thus, Dell must allocate them to product lines using a cost-allocation base.

Objective 3

Use an ABC system in a job-order environment.

**Exhibit 14-3****Dell Computer Corporation's Value Chain and ABC System**

The production costs include direct materials and factory overhead. Factory overhead consists of six activity centers and related cost pools (including a direct-labor cost pool where appropriate): receiving, preparation, assembly, testing, packaging, and shipping. Facility costs (plant depreciation, insurance, taxes) are considered part of the production function and are allocated to each activity center based on the square feet occupied by the center.

Dell divided the total annual budgeted indirect cost allocated to a product line by the total budgeted units produced to find a budgeted overhead rate. It then used this rate, which is adjusted periodically to reflect changes in the budget, to cost individual jobs.

Dell now breaks down each activity center into value added and non-value added activities, with the intent of targeting non-value added activities for cost reduction programs. An example of a non-value-added activity is the preparation activity in the production function.

Making Managerial Decisions

Refer to Exhibit 14-3. One of the primary purposes of an ABC system is to increase the accuracy of product costs so managers can make better cost-based decisions. Assume that you are a manager at **Dell** and that you have to determine prices for computers by adding a markup to the cost accumulated by the costing system. For example, if the accumulated total job cost is \$800, a markup sufficient to “cover” all unallocated costs

and provide a reasonable profit is added to the cost in determining the price. Using the table at the top of p. 602, determine whether the percentage markup under the ABC system is higher or lower than under the previous system. Which system gives you a higher degree of confidence that the price for a computer is adequate to cover all costs and provide a reasonable profit? Why?

Value-Chain Function	ABC or Unallocated	
	Previous Costing System	ABC Costing System
Research and development	Unallocated	ABC Allocations
Design	Unallocated	ABC Allocations
Production	Traditional Allocation	ABC Allocations
Marketing	Unallocated	ABC Allocations
Distribution	Unallocated	ABC Allocations
Customer service	Unallocated	ABC Allocations

Answer

Under the previous costing system, Dell determined prices by marking up only the cost of production. Thus, the markup was relatively high so that the company would cover all the unallocated costs and also achieve a reasonable profit, and managers

had a low level of confidence in this cost system. The ABC system provided estimates of all value-chain costs, so the size of the markup was low, and the confidence level in the costs provided was high.

Summary Problem for Your Review

PROBLEM

Review the Enriquez illustration, especially Exhibit 14-2 on p. 597. Prepare an income statement for 20X1 through the gross profit line. Use the immediate write-off method for overapplied or underapplied overhead.

SOLUTION

Exhibit 14-4 recapitulates the final impact of the Enriquez illustration on the financial statements. Note how the immediate write-off means that we add \$17,000 to cost of goods sold. As you study Exhibit 14-4, trace the three major elements of cost (direct materials, direct labor, and factory overhead) through the accounts.

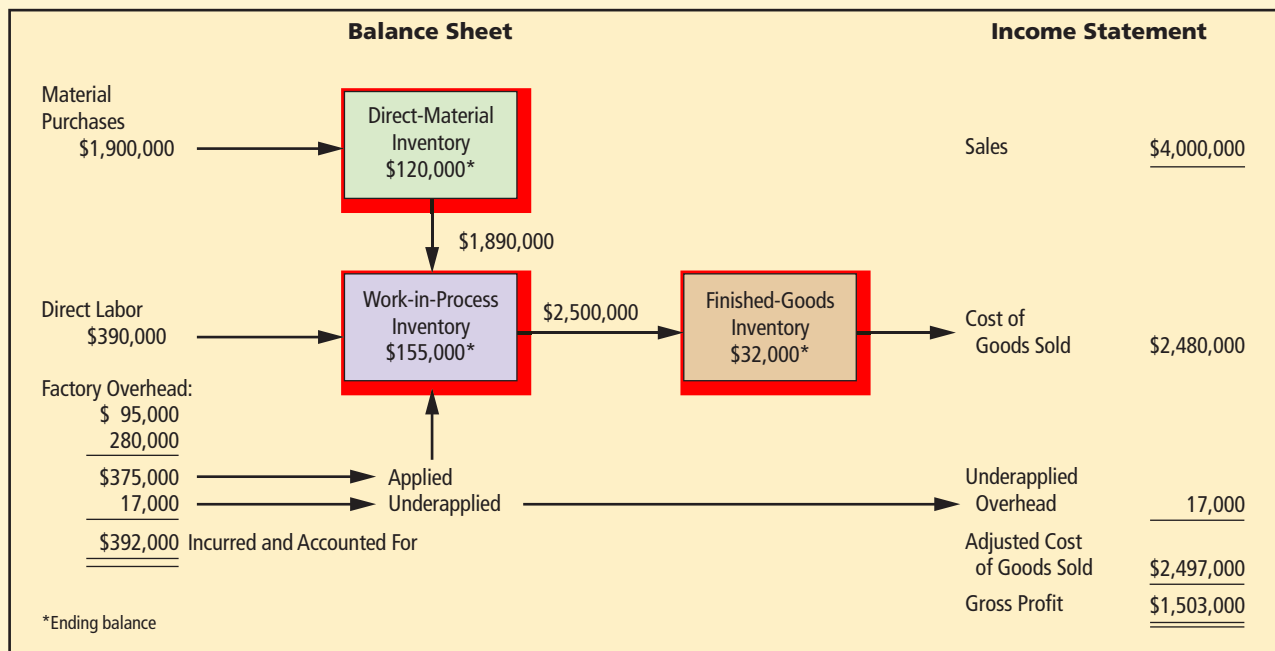


Exhibit 14-4

Relation of Costs to Financial Statements

Job Costing in Service and Nonprofit Organizations

This chapter has initially concentrated on applying costs to manufactured products. However, the job-costing approach is used in nonmanufacturing situations, too. For example, universities have research “projects,” airlines have repair and overhaul “jobs,” and public accountants have audit “engagements.” In such situations, the focus shifts from the costs of products to the costs of services, projects, or programs.

Service and nonprofit organizations do not usually call their “product” a “job order.” Instead, they may call it a program or a class of service. A “program” is an identifiable group of activities that frequently provides services rather than goods. Examples include a safety program, an education program, or a family counseling program. Accountants can trace costs or revenues to individual hospital patients, individual social welfare cases, and individual university research projects. However, internal departments in service organizations often work simultaneously on many programs, so the “job-order” costing challenge is to “apply” the diverse department costs to the various programs. Only then can managers best allocate limited resources among competing programs.

In service industries—such as repairing, consulting, legal, and accounting services—each customer order is a different job with a special account or order number. Accountants can trace just costs, just revenues, or both to jobs. For example, automobile repair shops typically have a repair order for each car worked on, with space for allocating materials and labor costs. Customers see only a copy showing the retail prices of the materials, parts, and labor billed to their orders. Meanwhile, accountants trace the actual parts and labor costs of each order to a duplicate copy of the repair order, providing a measure of profit for each job. To record these actual costs, auto mechanics enter their starting and stopping times on time tickets for each new order.

Budgets and Control of Engagements

In many service organizations and some manufacturing operations, job orders provide not only product/service costing, but also planning and control benefits. For example, a public accounting firm might have a condensed budget for 20X1 as follows:

Revenue	\$10,000,000	100%
Direct labor (for professional hours charged to engagements)	<u>2,500,000</u>	<u>25%</u>
Contribution to overhead and operating income	\$ 7,500,000	75%
Overhead (all other costs)	<u>6,500,000</u>	<u>65%</u>
Operating income	<u>\$ 1,000,000</u>	<u>10%</u>

In this illustration,

$$\begin{aligned}
 \text{budgeted overhead rate} &= \frac{\text{budgeted overhead}}{\text{budgeted direct labor}} \\
 &= \frac{\$6,500,000}{\$2,500,000} \\
 &= 260\%
 \end{aligned}$$

To prepare a budget for each engagement, the partner in charge of the audit predicts the expected number of direct-professional hours. Direct-professional hours are those that partners, managers, and staff auditors work to complete the engagement. The budgeted direct-labor cost is the pertinent hourly labor costs multiplied by the budgeted hours. Accounting firms charge partners’ time to the engagement at much higher rates than subordinates’ time.

How do such firms apply overhead? Accounting firms usually use either direct-labor cost or direct-labor hours as the cost driver for overhead application. In our example, the firm uses direct-labor cost. The budgeted total cost of an engagement is the direct-labor cost plus applied overhead, 260% of direct-labor cost in this illustration, plus any other direct costs.

This practice implies that partners require proportionately more overhead support for each of their hours charged. For example, 1 hour of partner work that has a direct-labor cost of \$200 would result in a projected overhead support cost of \$520. If this work can be done by a staff person whose charge rate is only \$50, the estimated overhead is only \$130.

Objective 4

Show how service organizations use job-order costing.

The engagement partner uses a budget for a specific audit job that includes detailed scope and procedures. For instance, the budget for auditing cash or receivables on the engagement would specify the exact work to be done, and the necessary hours of partner time, manager time, and staff time. The partner monitors progress by comparing the hours logged to date with the original budget, and with the estimated hours remaining on the engagement. If the firm quoted a fixed audit fee, the profitability of an engagement depends on whether it can accomplish the audit within the time allocated in the budget.

Accuracy of Costs of Engagements

Managers of service firms, such as auditing and consulting firms, frequently use budgeted costs of engagements as guides to pricing and for allocating effort to customized services or particular customers. Hence, the accuracy of projected costs of various engagements may affect pricing and operational decisions.

Suppose the accounting firm's policy for price quotes for engagements is 200% of total estimated professional costs, plus reimbursement of travel costs. The firm projects costs and sets the price on an auditing engagement as follows:

	Projected Cost	Price
Direct-professional labor	\$ 50,000	\$100,000
Applied overhead, 260% of direct-professional labor	<u>130,000</u>	<u>260,000</u>
Total professional costs excluding travel costs	\$180,000	360,000
Travel costs	<u>14,000</u>	<u>14,000</u>
Total projected costs of engagement	<u>\$194,000</u>	<u>\$374,000</u>

Note that costs reimbursed by the client—such as travel costs—do not add to overhead costs and so are not subject to any markups in the setting of fees. Once the client accepts the offer, the firm needs to monitor the assignment of work as well as the overhead incurred to insure control of costs.

Process Costing Basics

In this mine, owned and operated by **Nally & Gibson Georgetown**, limestone rock is mined from a quarry, and transported by a conveyor system to plant areas. Nally & Gibson uses a process-costing system to determine the costs of mining, crushing, transporting, processing, and storing limestone.



© JG Photography/Alamy

As indicated on p. 595, an alternative to job costing is process costing. Before we examine the procedures of process costing, let's examine a real application. **Nally & Gibson Georgetown** is a leading producer of limestone products used for industrial and commercial purposes. Limestone is used in highways, high school track beds, concrete sidewalks, buildings, soil enhancement products, residential homes, and about a million other places (yes, even in some toothpastes).

The making of limestone products is an excellent example of a process costing system. A single raw material—limestone rock—is subjected to several processes that result in finished limestone products. The basic production processes that convert limestone rock into usable limestone are easy to understand and are reasonably simple. Basically, the limestone rock is mined from Nally & Gibson's quarry and mine in Georgetown, Kentucky, and transported to the processing facility. There it passes through several stages of crushing and grinding, depending on how fine the limestone needs to be for the finished product. The ease and homogeneous nature of these processes might make you think the cost accounting system used to track product costs should also be fairly simple and unimportant to the success of the company. However, accurate and timely cost information is critical for both product costing and decision-making purposes at Nally & Gibson.

For example, the accurate allocation of the costs of mining and transporting limestone and subsequently crushing the limestone for various products is essential to the success of the company. The company's cost accounting system accumulates the costs of these processes and then calculates an average cost per ton of product using a process-costing system. According to company president Frank Hamilton Jr., "If Nally & Gibson did not keep a handle on costs, we would not be here."

One of Nally & Gibson's costs is transporting quarried rock from the mine to plants. Using trucks that have to travel up to a mile into the mine and then up a steep grade is expensive and hazardous. The solution to this transportation problem was provided by **Process Machinery, Inc.**, a full-service equipment dealer servicing Kentucky, Indiana, and Ohio. Process Machinery designed, constructed, and installed a 3,000-foot conveyor system used by Nally & Gibson. Interestingly, the accounting system used by Process Machinery to account for this job is an excellent example of a job-order system, as they produced a customer-specific product that required a unique combination of resources.

The result—Nally & Gibson increased its production by up to 50% with increased safety and at a reduced cost. We can see from this example that the cost accounting system a company uses depends on the nature of its products and services. The cost information needed by managers determines the type of cost accounting system. Process Machinery's managers need costs for specific products that have unique features. Nally & Gibson's managers, whose product is crushed limestone, have much different cost-information needs as dictated by their production process.

Companies like **Jelly Belly** and Nally & Gibson that produce large quantities of a generic or homogeneous product in a continuous process, do not use the job-costing techniques we discussed previously. Why? Because a method called process costing fits their production process better and so is a more efficient costing system for such companies.

Why doesn't Nally & Gibson use a job-cost system to assign costs to its products? The primary reason is that its manufacturing process does not produce discrete jobs. The company does not wait for a specific customer order before producing the product. The company makes a forecast of the demand for the product, and produces to meet this expected demand. Second, it is costly (and difficult) to trace costs to a specific truckload of limestone, while the benefit from improving accuracy is negligible. So the cost-benefit criterion clearly dictates that the company determines unit costs using much larger quantities—for example, a whole month's production.

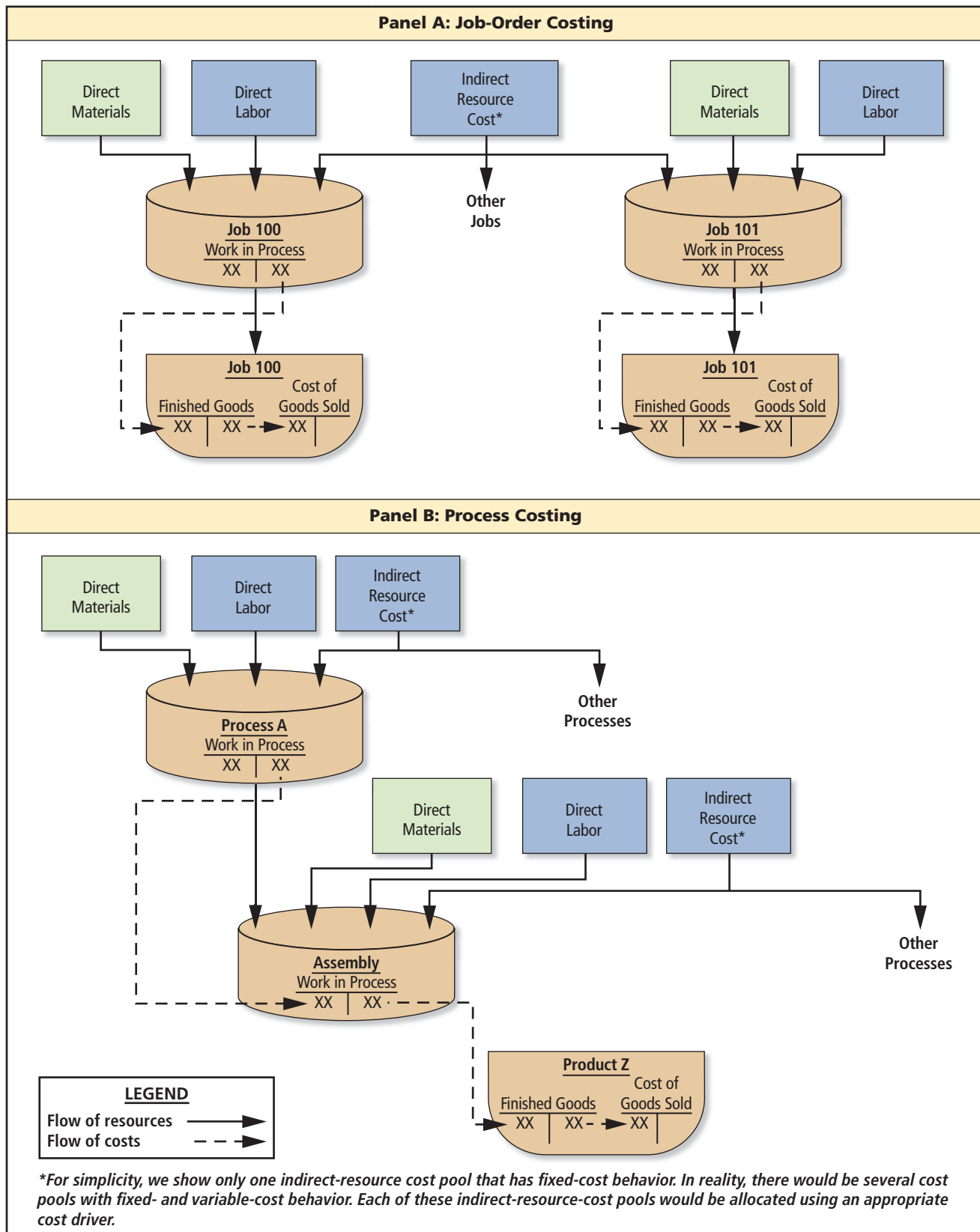
As we noted early in this chapter, all product costing uses averaging to determine costs per unit of production. Sometimes those averages apply to a relatively small number of units, such as a particular printing job produced in a job-order production system. Other times, the averages might be extremely broad, based on generic products from a continual-process production system, such as limestone road-fill. Process-costing systems apply costs to homogeneous products that a company mass produces in continuous fashion through a series of production processes. Examples include chemicals, flour, glass, toothpaste, paper, and potato chips as well as computer chips. These processes usually occur in separate departments, although a single department sometimes contains more than one process.

Process Costing Compared with Job Costing

It is easiest to understand process costing if you compare it with something you already know: job costing. Exhibit 14-5 shows the major differences between job-order costing and process costing. Job-order costing has one WIP for each job. In contrast, process costing requires one WIP account for each process. As goods move from process to process, accountants transfer their costs accordingly.

Objective 5

Explain the basic ideas underlying process costing and how they differ from job-order costing.

**Exhibit 14-5**

Comparison of Job-Order and Process Costing

Consider Nally & Gibson's process-costing system. The company's production system has four core processes as shown in Exhibit 14-6. The company first extracts limestone rock from surface quarries or from mines. It then transports the rock to the plant by rail or truck. At the plant, machines crush the rock and screen it to various sizes demanded by customers. The crushed limestone is then stocked in large piles of inventory for shipment. Each process requires resources. The direct-materials resource is the limestone rock itself. All four processes use direct labor and overhead resources.

The process-costing approach does not distinguish between individual units of product. Instead, it accumulates costs for a period and divides them by quantities produced during that period to get broad, average unit costs. We can apply process costing to nonmanufacturing activities as well as to manufacturing activities. For example, we can divide the costs of giving state automobile driver's license tests by the number of tests given, and we can divide the cost of a post office sorting department by the number of items sorted.

To get a rough feel for process costing, consider Perfect Taste Frozen Foods. This company quick-cooks tiny carrots, beans, and other vegetables before freezing them. It has only two processes: cooking and freezing. As the following T-accounts show, the costs of cooked vegetables (in millions of dollars) are transferred from the cooking department to the freezing department:

Work in Process—Cooking			
Direct materials	14	Transfer cost of goods completed to freezing department	23
Direct labor	4		
Factory overhead	<u>8</u>		
	26		
Ending inventory	3		

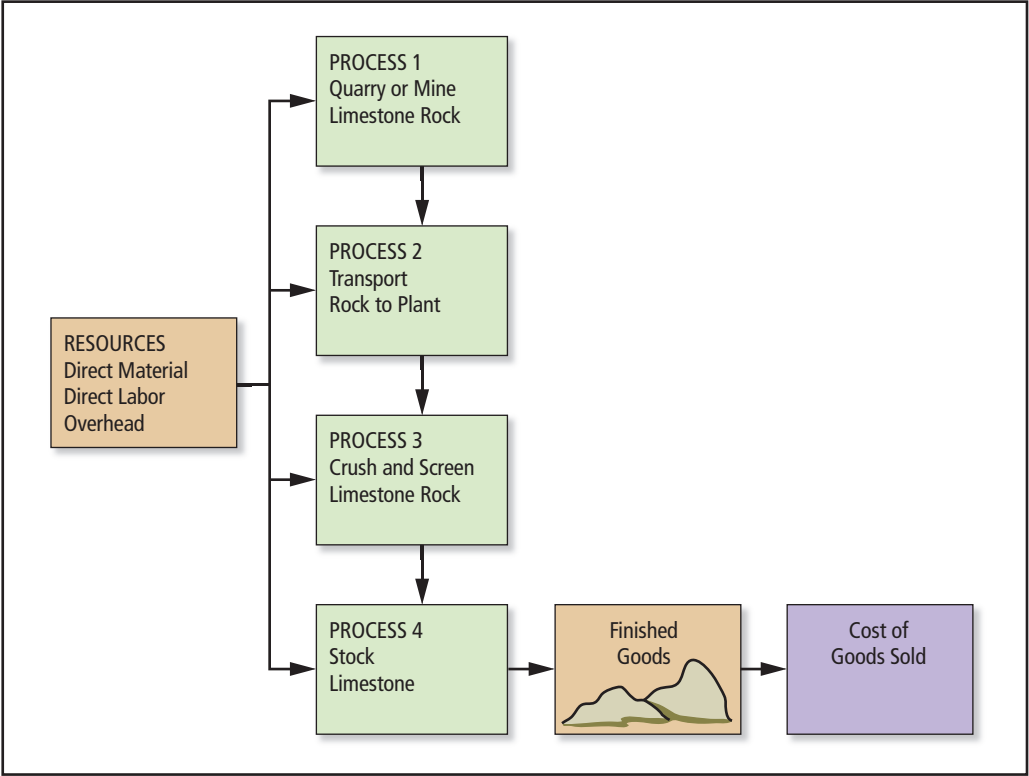
Work in Process—Freezing			
Cost transferred in from cooking	23	Transfer cost of goods completed to finished goods	21
Direct labor	1		
Factory overhead	<u>2</u>		
	26		
Ending inventory	5		

We determine the amount of cost to be transferred from cooking to freezing by dividing the accumulated costs in the cooking department by the pounds of vegetables processed. We then multiply the resulting cost per pound by the pounds of vegetables physically transferred to the freezing department.

The journal entries for process-costing systems are similar to those for the job-order costing system. That is, we account for direct materials, direct labor, and factory overhead as before. However, now there is more than a single WIP account for all units being manufactured. There is one WIP account for each processing department, WIP—Cooking and WIP—Freezing, in our example. The Perfect Taste data are recorded as follows:

1. Work in process—cooking..... 14
 Direct-materials inventory 14
 To record direct materials used.
2. Work in process—cooking..... 4
 Accrued payroll 4
 To record direct labor incurred in cooking.
3. Work in process—cooking..... 8
 Factory overhead 8
 To record factory overhead applied to product in cooking.

Exhibit 14-6
 Process Costing at Nally & Gibson



4.	Work in process—freezing.....	23
	Work in process—cooking.....	23
	To transfer goods from the cooking process to the freezing process; 3 million remains in cooking.	
5.	Work in process—freezing.....	1
	Accrued payroll.....	1
	To record direct labor incurred in freezing.	
6.	Work in process—freezing.....	2
	Factory overhead.....	2
	To record factory overhead applied to product in freezing.	
7.	Finished goods	21
	Work in process—freezing.....	21
	To transfer goods from the freezing process to finished goods; 5 million remains in freezing.	

Process manufacturing systems vary in design. The design shown in panel B of Exhibit 14-5 (as well as Exhibit 14-6) is sequential—units pass from process to process until the product is finished. You will find many other designs in practice—each tailored to meet specific production requirements. For example, a firm may operate two processes at the same time to produce different parts of a finished product. Whatever the specific layout, the basic principles of process costing are the same. The central product-costing problem is how each department should calculate unit cost, which is then used to compute the cost of goods transferred out and the cost of goods remaining in the department. If the same amount of work were done on each unit transferred out and on each unit in ending inventory, the cost allocation process would be easy. We could simply divide total costs by total units. Then, we would use this unit cost to calculate the total cost of units transferred out and the remaining cost of unfinished units. However, this is not possible because units in ending inventory cannot be complete, which makes them different from the completed units transferred out. Thus, the product-costing system must distinguish between the costs of fully completed units that a department transfers out and the costs of partially completed units that still remain in ending inventory. Let’s now see how process costing systems accomplish this.

Application of Process Costing

To help you better understand our discussion of process costing, we will use the example of Woodworld, Selangor, Malaysia. The company buys wood as a direct material for its forming department, which processes only one type of toy, puppets. It inserts all the wood into this department at the beginning of the process. After forming, the company transfers the puppets to the finishing department where workers hand shape them and add strings, paint, and clothing.

The forming department had no beginning inventory and completely manufactured 25,000 identical units during April, leaving no ending inventory. Its costs that month were as follows:

Direct materials		\$ 75,000
Conversion costs		
Direct labor	\$15,000	
Factory overhead	<u>40,000</u>	<u>55,000</u>
Costs to account for		<u>\$130,000</u>

Since there is no ending inventory, the unit cost of goods completed is simply $\$130,000 \div 25,000 = \$5.20$. An itemization would show the following:

Direct materials, $\$75,000 \div 25,000$	\$3.00
Conversion costs, $\$55,000 \div 25,000$	<u>2.20</u>
Unit cost of a whole completed puppet	<u>\$5.20</u>

But what if not all 25,000 puppets were completed during April? For example, assume that 5,000 were still in process at the end of April—only 20,000 were started and fully completed. All units—both those transferred out and those still in inventory—have obviously received all the necessary direct materials. However, only the units transferred out have received the full amount of conversion resources. Woodworld determined that the 5,000 puppets that remain in process have received, on average, only 40% of conversion resources. How should the forming department calculate the cost of goods transferred out and the cost of goods remaining in the ending WIP inventory? The answer lies in the following five key steps, which we describe in the next two sections:

- Step 1: Summarize the flow of physical units.
- Step 2: Calculate output in terms of equivalent units.
- Step 3: Summarize the total costs to account for, which are the costs applied to WIP.
- Step 4: Calculate cost per equivalent unit.
- Step 5: Apply costs to units completed and to units in the ending WIP.

As we work through each of these five steps, keep in mind that each step provides managers with data that are useful for product costing and operational control purposes.

Physical Units and Equivalent Units (Steps 1 and 2)

Step 1, as the first column in Exhibit 14-7 shows, tracks the physical units of production. How should we measure the output—the results of the department's work? This tracking tells us we have a total of 25,000 physical units to account for, but not all these units count the same in the forming department's output. Why not? Because only 20,000 units were fully completed and transferred out. The remaining 5,000 units are only partially complete, and we cannot assign partially completed units the same cost as the completed output. As a result, we have to state output not in terms of physical units but in terms of a different unit measure called an "equivalent unit."

Equivalent units are the number of completed (whole) units that the department could have produced from the resources required for the partially completed units. For example, four units that are each one-half completed represent two equivalent units. Similarly, if each unit had been one-fourth completed, the four together would represent one equivalent unit. So, we determine equivalent units of partially completed units by multiplying physical units by the percent of completion. This equivalent unit measure correctly equates the completed physical units that are transferred out with the partially completed physical units in ending inventory.

Objective 6

Compute output in terms of equivalent units.

equivalent units

The number of completed (whole) units that could have been produced from the resources required for the partially completed units.

Exhibit 14-7

Forming Department Output
in Equivalent Units
Month Ended April 30, 20X0

Flow of Production	(Step 1) Physical Units	(Step 2) Equivalent Units	
		Direct Materials	Conversion
Started and completed	20,000	20,000	20,000
Work in process, ending inventory	5,000	5,000	2,000*
Units accounted for	<u>25,000</u>		
Work done to date		<u>25,000</u>	<u>22,000*</u>

*5,000 physical units $\times$ 0.40 degree of completion of conversion costs.

In our example, as step 2 in Exhibit 14-7 shows, we measure the output as 25,000 equivalent units of direct-materials cost but only 22,000 equivalent units of conversion costs. Why? Because direct materials had been fully added to all 25,000 units. In contrast, only 40% of the conversion costs were applied to the 5,000 partially completed units, which would have been sufficient to complete only 2,000 equivalent units in addition to the 20,000 units that were actually completed.

To compute equivalent units, you need to estimate how much of a given resource was applied to units in process, which is not always an easy task. Some estimates are easier to make than others. For example, estimating the amount of direct materials used is fairly easy. However, how do you measure how much energy, maintenance labor, or supervision was incurred for a given unit? Conversion costs can involve a number of these hard-to-measure resources, which leaves you estimating both how much total effort it takes to complete a unit and how much of that effort has already been put into the units in process. Coming up with accurate estimates is further complicated in industries such as textiles, where there is a great deal of work in process at all times. To simplify estimation, some companies may decide that all unfinished work in process must be deemed either one-third, one-half, or two-thirds complete. In other cases where continuous processing leaves roughly the same amount in process at the end of every month, accountants ignore work in process altogether and assign all monthly production costs to units completed and transferred out.

Measures in equivalent units are not confined to manufacturing situations. Such measures are a popular way of expressing workloads in terms of a common denominator. For example, radiology departments measure their output in terms of weighted units. Various X-ray procedures are ranked in terms of the time, supplies, and related costs devoted to each procedure. A simple chest X-ray may receive a weight of one. But a skull X-ray may receive a weight of three because it uses three times more resources (for example, technicians' time) than a procedure with a weight of one.

Calculation of Product Costs (Steps 3 to 5)

Exhibit 14-8 is a production-cost report. It shows steps 3–5 of process costing. Step 3 summarizes the total costs to account for (that is, the total costs incurred and applied to WIP—Forming). Step 4 obtains unit costs by dividing the two categories of total costs by the appropriate measures of equivalent units. The unit cost of a completed unit—materials cost plus conversion costs per equivalent unit—is $\$3.00 + \$2.50 = \$5.50$. Why is the unit cost \$5.50 instead of the \$5.20 calculated on p. 609? Because the \$55,000 conversion cost is spread over 22,000 units instead of 25,000 units. Step 5 then uses these unit costs to apply costs to products. The 20,000 finished units are complete in terms of both direct materials and conversion costs. Thus, we can multiply the full unit cost times the number of completed units to determine their costs, which is 20,000 units times \$5.50, or \$110,000. The 5,000 physical units in ending work-in-process inventory are fully completed in terms of direct materials. Therefore, the direct materials applied to ending work in process are 5,000 equivalent units times \$3.00, or \$15,000. In contrast, the 5,000 physical units are 40% completed in terms of conversion costs. Therefore, the conversion costs applied to work in process are 2,000 equivalent units (40% of 5,000 physical units) times \$2.50, or \$5,000. Thus, the total cost of the ending inventory is \$20,000.

Objective 7

Compute costs and prepare journal entries for the principal transactions in a process-costing system.

		Details		
		Total Costs	Direct Materials	Conversion Costs
(Step 3)	Costs to account for	<u>\$130,000</u>	\$75,000	\$55,000
(Step 4)	Divide by equivalent units		÷ 25,000	÷ 22,000
	Unit costs	<u>\$ 5.50</u>	<u>\$ 3.00</u>	<u>\$ 2.50</u>
(Step 5)	Application of costs			
	To units completed and transferred to the finishing department, 20,000 units at \$5.50	<u>\$110,000</u>		
	To units not completed and still in process, April 30, 5,000 units			
	Direct materials	\$ 15,000	5,000 × \$3.00	
	Conversion costs	5,000		2,000 × \$2.50
	Work in process, April 30	<u>\$ 20,000</u>		
	Total costs accounted for	<u>\$130,000</u>		

Exhibit 14-8

Forming Department Production Cost Report
Month Ended April 30, 20X0

Journal entries for the data in our illustration would appear as follows:

- Work in process—forming.....75,000
 Direct-materials inventory 75,000
Materials added to production in forming for April.
- Work in process—forming.....15,000
 Accrued payroll.....15,000
Direct labor incurred in forming for April.
- Work in process—forming.....40,000
 Factory overhead.....40,000
Factory overhead applied in forming for April.
- Work in process—finishing..... 110,000
 Work in process—forming 110,000
Cost of goods completed and transferred from forming to assembly in April.

The \$130,000 added to the Work in Process—Forming account less the \$110,000 transferred out leaves an ending balance of \$20,000:

Work in Process—Forming			
1. Direct materials	\$75,000	4. Transferred	
2. Direct labor	15,000	out to	
3. Factory overhead	<u>40,000</u>	finishing	\$110,000
Costs to account for	130,000		
Bal. April 30	<u>\$20,000</u>		

Summary Problem for Your Review

PROBLEM

Consider **Nally & Gibson**'s plant operations in Georgetown. The plant processes limestone rock that is quarried in a nearby mine. Exhibit 14-6 (p. 608) shows the various processing steps. Process 3 is crushing and screening the rock. To produce the crushed limestone, the company starts with limestone rocks from its quarry in Georgetown, Kentucky, and puts the rocks through a crushing process. Suppose that during May, the company quarried and transported to its processing plant 288 tons of rock from its quarry, and at the end of the month 15 tons remained in process, on average 20% complete. The cost of rocks from the quarry for the last five months has been \$120 per ton, so the cost of the limestone rock put into Process 3 is \$120/ton times 288 tons, or \$34,560. Labor and overhead costs during May in the rock crushing process were \$35,880. Assume there was no work in process at the beginning of May.

1. Compute the cost of crushed rock processed and transferred out in May.
2. Compute the cost of the work-in-process inventory at the end of May.

SOLUTION

	(Step 1)	(Step 2) Equivalent Units in Tons	
Flow of Production	Physical Units (Tons)	Direct Materials	Conversion
Started and completed	273	273	273
Ending work in process	15	15*	3*
Units accounted for	288		
Work done to date		288	276

* $15 \times 100\% = 15$; $15 \times 20\% = 3$.

	Details		
	Total Costs	Limestone Rock	Conversion Costs
(Step 3) Costs to account for	\$70,440	\$34,560	\$35,880
(Step 4) Divide by equivalent units		÷ 288	÷ 276
Unit costs	\$250.00*	\$120.00	\$130.00
(Step 5) Application of costs			
To units completed and transferred, 273 tons at \$250.00	\$68,250		
To ending work in process, 15 tons			
Direct materials	\$ 1,800	15 × \$120.00	
Conversion costs	390		3 × \$130.00
Work in process, ending inventory	\$ 2,190		
Total costs accounted for	\$70,440		

*Cost per ton (\$250) = limestone rock costs (\$120) + conversion costs (\$130).

Effects of Beginning Inventories: Weighted-Average Method

Objective 8

Demonstrate how the presence of beginning inventories affects the computation of unit costs under the weighted-average method.

So far, our example has been very straightforward because all units were started during the period. In other words, there were no units in beginning inventory. The presence of units in beginning inventory actually complicates matters a great deal.

There are several ways to deal with beginning inventories, but we will describe only the most popular alternative, the weighted-average method. We will explore this method using the following data from our Woodworld example for the month of May. Recall that the ending WIP inventory for April in the forming department was 5,000 units. These units become the beginning inventory for May.

Units

Work in process, April 30: 5,000 units; 100% completed for materials,
but only 40% completed for conversion costs

Units started in May: 26,000

Units completed in May: 24,000

Work in process, May 31: 7,000 units; 100% completed for materials, but
only 60% completed for conversion costs

Costs

Work in process, April 30

Direct materials	\$15,000	
Conversion costs	<u>5,000</u>	\$ 20,000
Direct materials added during May		84,200
Conversion costs added during May		<u>62,680</u>
Total costs to account for		<u>\$166,880*</u>

*Note that the \$166,880 total costs to account for include the \$20,000 of beginning inventory in addition to the \$146,880 added during May.

The **weighted-average (WA) process-costing method** determines total costs by adding together the cost of (1) all work done in the current period and (2) the work done in the preceding period on the current period's beginning inventory of work in process. Then, you divide this total cost by the total equivalent units of work done to date, whether that work was done in the current or previous period.

Why do we use the term *weighted average* to describe this method? Primarily because the unit costs used for applying costs to products are based on the total cost incurred to date, regardless of whether the department incurred those costs in the current period or in the prior period. If costs of materials, labor, or overhead change across periods, essentially the weighted-average method reweights these comingled costs to determine a revised unit cost.

Exhibit 14-9 shows the first two steps in this process-costing method: computation of physical units and equivalent units. The computation of equivalent units ignores where the 31,000 units to account for came from: either beginning work in process or those started in May. Exhibit 14-10 presents a production-cost report, summarizing steps 3–5 regarding computations of unit product costs and the resulting cost allocations to inventory accounts.

weighted-average (WA) process-costing method

A process-costing method that determines total cost by adding together the cost of (1) all work done in the current period and (2) the work done in the preceding period on the current period's beginning inventory of work in process, and divides the total by the equivalent units of work done to date.

Transferred-In Costs

Many companies that use process costing have sequential production processes. For example, Woodworld, Selangor, Malaysia transfers the items completed in its forming department to the finishing department. The finishing department would label the costs of the items it receives from the

Objective 9

Understand the concept of transferred-in costs in a process-costing system with sequential processes.

Flow of Production	(Step 1) Physical Units	(Step 2) Equivalent Units	
		Direct Materials	Conversion
Work in process, April 30	5,000 (40%)*		
Started in May	<u>26,000</u>		
To account for	<u>31,000</u>		
Completed and transferred out			
during current period	24,000	24,000	24,000
Work in process, May 31	<u>7,000 (60%)*</u>	<u>7,000</u>	<u>4,200†</u>
Units accounted for	<u>31,000</u>		
Work done to date		<u>31,000</u>	<u>28,200</u>

*Degrees of completion for conversion costs at the dates of inventories.

†.60 × 7,000 = 4,200.

Exhibit 14-9

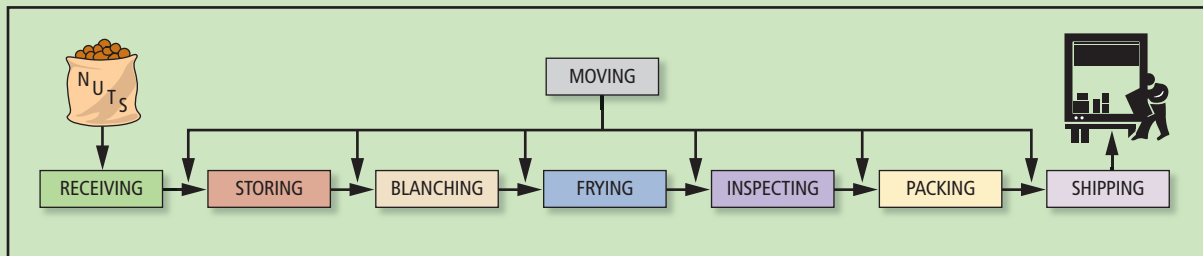
Forming Department Output in Equivalent Units, Weighted-Average Method
Month Ended May 31, 20X0

Business First

Process Costing at a Snack Peanut Company

Americans consume more than 300 million pounds of snack peanuts each year. The leading producer of snack peanuts is **Planters Specialty Products Company**, an operating unit of **Kraft Foods**. Planters markets regular-roast, dry-roast, salted, and unsalted peanuts in the United States. Processing a peanut snack food involves several activities. Most snack peanuts are blanched (removing the skins) before roasting. Peanuts can be oil-roasted or dry-roasted before being packaged and shipped.

The major activities in the processing of peanuts are shown below. This system not only tracks transferred-in costs between operating departments, such as the “blanching and frying department” and the “packing and shipping department,” it also tracks these costs for support (services) departments, such as receiving, moving, and storing activities within the overall process costing sequence. This is because Planters incorporates ABC concepts within its process costing environment, designing a system that focuses on tracking and reporting costs by key activities within the system, regardless of traditional operating versus support department classifications.



transferred-in costs

In process costing, costs incurred in a previous department for items that have been received by a subsequent department.

forming department as **transferred-in costs**—costs incurred in a previous department for items that have been received by a subsequent department. They are similar but not identical to additional direct-materials costs incurred in the finishing department. Because transferred-in costs are a combination of all types of costs (direct-materials and conversion costs) incurred in previous departments, they should not be called a direct-materials cost in the finishing department.

We account for transferred-in costs just as we would account for a direct material that is 100% added at the beginning of the finishing department, with one exception: We keep transferred-in costs separate from the direct materials added in the department as they truly are distinct categories of cost in a department. Therefore, Exhibit 14-10 would be modified to include

Exhibit 14-10

Forming Department
Production-Cost Report,
Weighted-Average Method
Month Ended May 31, 20X0

		Details		
		Totals	Direct Materials	Conversion Costs
(Step 3)	Work in process, April 30	\$ 20,000	\$15,000	\$ 5,000
	Costs added currently	146,880	84,200	62,680
	Total costs to account for	<u>\$166,880</u>	<u>\$99,200</u>	<u>\$67,680</u>
(Step 4)	Divisor, equivalent units for work done to date*		÷ 31,000	÷ 28,200
	Unit costs (weighted averages)	<u>\$ 5.60</u>	<u>\$ 3.20</u>	<u>\$ 2.40</u>
(Step 5)	Application of costs			
	Completed and transferred, 24,000 units × \$5.60	<u>\$134,400</u>		
	Work in process, May 31, 7,000 units			
	Direct materials	\$ 22,400	7,000 × \$3.20	
	Conversion costs	10,080		4,200* × \$2.40
	Total work in process	<u>\$ 32,480</u>		
	Total costs accounted for	<u>\$166,880</u>		

*Equivalent units of work done. For more details, see Exhibit 14-9.

three columns of costs instead of two: transferred-in costs, direct-materials costs, and conversion costs. The total unit cost will be the sum of all three types of unit costs. For an interesting look at how one major snack food company designed its costing system with numerous transferred-in costs, see the Business First box on p. 614.

Summary Problem for Your Review

PROBLEM

Consider the cooking department of **Middleton Foods**, a British food-processing company. Compute the cost of work completed and the cost of the ending inventory of work in process using the weighted-average method.

Units			
Beginning work in process: 5,000 units; 100% completed for materials, 40% completed for conversion costs			
Started during month: 28,000 units			
Completed during month: 31,000 units			
Ending work in process: 2,000 units; 100% completed for materials, 50% for conversion costs			
Costs			
Beginning work in process			
Direct materials		£8,060	
Conversion costs		<u>1,300</u>	£ 9,360
Direct materials added in current month			41,440
Conversion costs added in current month			<u>14,700</u>
Total costs to account for			<u>£65,500</u>

SOLUTION

Flow of Production	(Step 1) Physical Units	(Step 2) Equivalent Units	
		Material	Conversion
Completed and transferred out	31,000	31,000	31,000
Ending work in process	<u>2,000</u>	<u>2,000*</u>	<u>1,000*</u>
Equivalent units	<u>33,000</u>	<u>33,000</u>	<u>32,000</u>

* $2,000 \times 100\% = 2,000$; $2,000 \times 50\% = 1,000$.

Weighted-Average Method	Total Cost	Direct Materials	Conversion Costs
Beginning work in process	£ 9,360	£ 8,060	£ 1,300
Costs added currently	<u>56,140</u>	<u>41,440</u>	<u>14,700</u>
Total costs to account for	<u>£65,500</u>	£49,500	£16,000
Equivalent units, weighted-average		÷33,000	÷32,000
Unit costs, weighted-average	<u>£ 2.00</u>	<u>£ 1.50</u>	<u>£ 0.50</u>
Transferred out, $31,000 \times £2.00$	<u>£62,000</u>		
Ending work in process			
Direct materials	£ 3,000	$2,000 \times £1.50$	
Conversion cost	<u>500</u>		$1,000 \times £0.50$
Total work in process	<u>£ 3,500</u>		
Total costs accounted for	<u>£65,500</u>		

Objective 10

Use backflush costing with a JIT production system.

backflush costing

An accounting system that applies costs to products only when the production is complete.

Costing in a JIT System: Backflush Costing

Tracking costs through various stages of inventory—raw material, work-in-process inventory for each process (or department), and finished-goods inventory—makes accounting systems complex. If there were no inventories, we could charge all costs directly to cost of goods sold, and accounting systems would be much simpler. Organizations using JIT production systems usually have very small inventories, or no inventories at all. For them, a traditional accounting system that traces costs through several different types of inventories may be of limited value. One such company is **American Gypsum Company**. The company manufactures gypsum wallboard for commercial and residential use. Like many companies that use the JIT production system, American Gypsum has very low inventory levels and uses **backflush costing**, an accounting system that applies costs to products only when the production is complete. How does backflush costing work? As we shall see, it is a fairly simple costing system.

Principles of Backflush Costing

Backflush costing has only two categories of costs: materials and conversion costs. Its unique feature is an absence of a WIP account. Accountants enter actual material costs into a materials inventory account, and they enter actual labor and overhead costs into a conversion costs account. They then transfer costs from these two temporary accounts directly into finished-goods inventories. Some backflush systems even eliminate the finished-goods inventory accounts and transfer costs directly to cost of goods sold, especially if the company does not have a finished-goods inventory but rather sells products before producing them so that it can ship them immediately upon completion. Backflush systems assume that the company completes production so soon after the application of conversion activities that balances in the conversion costs accounts remain near zero because it transfers costs out almost immediately after initially recording them.

Example of Backflush Costing

Speaker Technology, Inc., (STI) produces speakers for automobile stereo systems. STI recently introduced a JIT production system and backflush costing. Consider the July production for speaker model AX27. The standard material cost per unit of AX27 is \$14, and the standard unit conversion cost is \$21. During July, STI purchased materials for \$5,600, incurred conversion costs of \$8,400 (which included all labor costs and manufacturing overhead), and produced and sold 400 units of AX27.

Backflush costing is accomplished in three steps:

- 1. Record actual materials and conversion costs. For simplicity, we initially assume that actual materials and conversion costs are identical to standard costs. As a company purchases materials, backflush systems add their cost to the Materials Inventory account:

Materials inventory	5,600
Accounts payable (or Cash)	5,600
To record actual material purchases.	

Similarly, we add direct labor and manufacturing overhead costs to the Conversion Costs account when the company incurs them:

Conversion costs	8,400
Accrued wages and other accounts	8,400
To record actual conversion costs incurred.	

- 2. Apply costs to completed units. When production is complete, we transfer the costs from Materials Inventory and Conversion Costs accounts to Finished-Goods Inventory, based on the number of units completed and the standard cost of each unit:

Finished-goods inventory(400 × \$35).....	14,000
Materials inventory	5,600
Conversion costs	8,400
To record costs of completed production.	

Because of short production cycle times, there is little lag between additions to the Conversion Costs account and transfers to Finished-Goods Inventory. The Conversion Costs account, therefore, remains near zero.

- Record cost of goods sold during the period. We transfer the standard cost of the items sold from Finished-Goods Inventory to Cost of Goods Sold:

Cost of goods sold..... 14,000
 Finished-goods inventory..... 14,000

To record cost of 400 units sold at \$35 per unit.

Suppose the company immediately delivers completed units to customers so that finished-goods inventories are negligible. We can combine steps 2 and 3 to eliminate the Finished-Goods Inventory account:

Cost of goods sold..... 14,000
 Material inventory 5,600
 Conversion costs 8,400

What if actual costs added to the Conversion Costs account do not equal the standard amounts that are transferred to Finished-Goods Inventory? We treat the variances like overapplied or underapplied overhead. Backflush systems assume that account balances for conversion costs are approximately zero at all times. Thus, we charge any remaining balance in the account at the end of an accounting period to Cost of Goods Sold. Suppose actual conversion costs for July are \$8,600 and the amount transferred to finished goods (that is, applied to the product) is \$8,400. We would write off the \$200 balance in the Conversion Costs account to Cost of Goods Sold at the end of the month:

Cost of goods sold..... 200
 Conversion costs 200

To recognize underapplied conversion costs.

Summary Problem for Your Review

PROBLEM

The most extreme (and simplest) version of backflush costing makes product costing entries at only one point, when the production of a unit is completed. Suppose STI had no Materials Inventory account (in addition to no WIP Inventory account). It purchases materials only when it needs them for production. Therefore, STI enters both materials and conversion costs directly into its Finished-Goods Inventory account.

Prepare journal entries (without explanations) and T-accounts for July's production of 400 units. As given earlier, materials purchases totaled \$5,600, and conversion costs were \$8,400. Why might a company use this extreme type of backflush costing?

SOLUTION

In one step, material and conversion costs are applied to finished-goods inventories:

Finished-Goods Inventories 14,000
 Accounts Payable 5,600
 Wages Payable and Other Accounts.....8,400

Finished-Goods Inventories		Accounts Payable, Wages Payable, and Other Accounts	
Materials	5,600		5,600
Conversion costs	8,400		8,400

This example shows that backflush costing is simple and inexpensive. Backflush costing provides reasonably accurate product costs if (1) materials inventories are low (most likely because of JIT delivery schedules), and (2) production cycle times are short, so that at any time a company has incurred only inconsequential amounts of materials costs and conversion costs for products that have yet to be completed.

Highlights to Remember

1. **Distinguish between job-order costing and process costing.** Product costing is an averaging process. Job-order costing involves narrow averages and unique units or a small batch of similar units. Process costing deals with broad averages and large volumes of homogeneous units.
2. **Prepare summary journal entries for the typical transactions of a job-costing system.** The focus of journal entries in a job-order costing system is on inventory accounts. The WIP Inventory account receives central attention. Direct materials used, direct labor, and factory overhead applied are accumulated in WIP. In turn, the cost of completed goods is transferred from WIP to Finished Goods.
3. **Use an ABC system in a job-order environment.** ABC can be used for any type of business that has significant levels of shared resources. In a job-order system, ABC helps managers understand the cost structure of the business on a job-by-job basis. Overhead costs are assigned to activity centers and then to jobs based on appropriate cost drivers. ABM uses ABC information and the increased understanding of the organization's cost structure to control and reduce overhead costs.
4. **Show how service organizations use job-order costing.** The job-costing approach is used in nonmanufacturing as well as manufacturing environments. Examples include costs of services such as auto repair, consulting, and auditing. For example, the job order is a key tool for planning and controlling an audit engagement by a public accounting firm.
5. **Explain the basic ideas underlying process costing and how they differ from job-order costing.** Process costing is used for inventory costing when there is continuous mass production of homogeneous units. Process-cost systems accumulate costs by department (or process); each department has its own WIP account. Job-order cost systems differ because costs are accumulated and tracked by the individual job order.
6. **Compute output in terms of equivalent units.** The key concept in process costing is that of equivalent units, the number of fully completed units that could have been produced from the resources required for the partially completed units.
7. **Compute costs and prepare journal entries for the principal transactions in a process-costing system.** There are five basic steps to process costing:
 1. Summarize the flow of physical units.
 2. Calculate output in terms of equivalent units.
 3. Summarize the total costs to account for.
 4. Calculate unit costs (step 3 ÷ step 2).
 5. Apply costs to units completed and to units in the ending work in process.

Steps 3 and 5 provide the data for journal entries. These entries all involve the WIP accounts for the various departments (processes) producing products.
8. **Demonstrate how the presence of beginning inventories affects the computation of unit costs under the weighted-average method.** Process costing is complicated by the presence of beginning inventories. The weighted-average method calculates a unit cost that includes the work done and costs incurred in previous periods on the current period's beginning inventory with work done and costs incurred in the current period.
9. **Understand the concept of transferred-in costs in a process-costing system with sequential processes.** Transferred-in costs are costs incurred in a previous department for items that have been received by a subsequent department. Although we consider transferred-in costs as a separate cost category, we treat them as if they were direct materials that are 100% added at the beginning of the subsequent department.
10. **Use backflush costing with a JIT production system.** Many companies with JIT production systems use backflush costing. Such systems have no WIP Inventory account and apply costs to products only after the production process is complete.

Accounting Vocabulary

backflush costing, p. 616	job-cost sheet, p. 595	process costing, p. 595
equivalent units, p. 609	job order, p. 595	time cards, p. 595
hybrid costing systems, p. 595	job-order costing, p. 595	transferred-in costs, p. 614
job costing, p. 595	labor time tickets, p. 595	weighted-average (WA) process-
job-cost record, p. 595	materials requisitions, p. 595	costing method, p. 613

Fundamental Assignment Material

MyLab Accounting

14-A1 Job-Order Costing, Basic Journal Entries

The following data (in thousands) summarize the factory operations of the Jonas Manufacturing Company for the year 20X1, its first year in business:

a.	Direct materials purchased for cash	\$350
b.	Direct materials issued and used	210
c.	Labor used directly on production	150
d1.	Indirect labor	130
d2.	Depreciation of plant and equipment	40
d3.	Miscellaneous factory overhead (ordinarily would be detailed)	70
e.	Overhead applied: 180% of direct labor cost	?
f.	Cost of production completed	575
g.	Cost of goods sold	415

1. Prepare summary journal entries. Omit explanations. For purposes of this problem, combine the items in part d as “overhead incurred.”
2. Show the T-accounts for all inventories, Cost of Goods Sold, and Factory Department Overhead Control. Compute the ending balances of the inventories. Do not adjust for underapplied or overapplied factory overhead.

14-A2 Basic Process Costing

iCell produces cellular phones in large quantities. For simplicity, assume that the company has two departments, assembly and testing. The manufacturing costs in the assembly department during February were as follows:

Direct materials added		\$ 73,600
Conversion costs		
Direct labor	\$59,000	
Factory overhead	<u>54,400</u>	<u>113,400</u>
Assembly costs to account for		<u><u>\$187,000</u></u>

There was no beginning inventory of work in process. Suppose work on 23,000 phones was begun in the assembly department during February, but only 20,000 phones were fully completed. All the parts had been made or placed in process, but only a third of the conversion costs had been completed for each of the phones still in process.

1. Compute the equivalent units and unit costs for February.
2. Compute the costs of units completed and transferred to the testing department. Also compute the cost of the ending work in process. (For journal entries, see problem 14-34.)

14-A3 Weighted-Average Process-Costing Method

The Magnatto Company manufactures electric drills. Material is introduced at the beginning of the process in the assembly department. Conversion costs are applied uniformly throughout the process. As the process is completed, goods are immediately transferred to the finishing department.

Data for the assembly department for the month of July 20X1 follow:

Work in process, June 30: \$175,500 (consisting of \$138,000 materials and \$37,500 conversion costs); 100% completed for direct materials, but only 25% completed for conversion costs	10,000 units
Units started during July	80,000 units
Units completed during July	70,000 units
Work in process, July 31: 100% completed for direct materials, but only 50% completed for conversion costs	20,000 units
Direct materials added during July	\$852,000
Conversion costs added during July	\$634,500

1. Compute the total cost of goods transferred out of the assembly department during July.
2. Compute the total costs of the ending work in process. Prepare a production-cost report or a similar orderly tabulation of your work. Assume weighted-average product costing. (For journal entries, see Exercise 14-38.)

14-A4 Backflush Costing

The Temp makes electronic thermostats for homes and offices. The Orlando division makes one product, Autotherm, which has a standard cost of \$33, consisting of \$22 of materials and \$11 of conversion costs. In January, actual purchases of materials totaled \$235,000, labor payroll costs were \$24,000, and manufacturing overhead was \$76,000. Completed output was 10,000 units.

The Orlando division uses a backflush-costing system that records costs in materials inventory and conversion costs accounts and applies costs to products at the time production is completed. There were no finished-goods inventories on January 1 and 30 units on January 31.

1. Prepare journal entries (without explanations) to record January's costs for the Orlando division. Include the purchase of materials, incurrence of labor and manufacturing overhead costs, application of product costs, and recognition of cost of goods sold.
2. Prepare the journal entry to recognize overapplied or underapplied conversion costs at the end of January.

14-B1 Job-Order Costing, Basic Journal Entries

Consider the following data for Birmingham Printing Company (in thousands):

Inventories, December 31, 2011	
Direct materials	£ 12
Work in process	20
Finished goods	130

Summarized transactions for 2012 are as follows:

a. Purchases of direct materials	£ 74
b. Direct materials used	52
c. Direct labor	200
d. Factory overhead incurred	156
e. Factory overhead applied, 80% of direct labor cost	?
f. Cost of goods completed and transferred to finished goods	417
g. Cost of goods sold	532
h. Sales on account	742

1. Prepare summary journal entries for 2012 transactions. Omit explanations.
2. Show the T-accounts for all inventories, Cost of Goods Sold, and Factory Department Overhead Control. Compute the ending balances of the inventories. Do not adjust for underapplied or overapplied factory overhead.

14-B2 Basic Process Costing

Parenzo Company produces digital watches in large quantities. The manufacturing costs of the assembly department were as follows:

Direct materials added		\$2,394,000
Conversion costs		
Direct labor	\$561,000	
Factory overhead	<u>870,000</u>	<u>1,431,000</u>
Assembly costs to account for		<u><u>\$3,825,000</u></u>

For simplicity, assume that this is a two-department company: assembly and finishing. There was no beginning work in process.

Suppose 570,000 units were started in the assembly department. There were 287,000 units completed and transferred to the finishing department. The 283,000 units in ending work in process were fully completed regarding direct materials but one-quarter completed regarding conversion costs.

1. Compute the equivalent units and unit costs in the assembly department.
2. Compute the costs of units completed and transferred to the finishing department. Also compute the cost of the ending work in process in the assembly department. (For journal entries, see Exercise 14-35.)

14-B3 Weighted-Average Process-Costing Method

The Shamrock Paint Company uses a process-costing system. Materials are added at the beginning of a particular process, and conversion costs are incurred uniformly. Work in process at the beginning of the month is 30% complete, while at the end it is 25% complete. One gallon of material makes one gallon of product. Data follow:

Beginning inventory	900 gal
Direct materials added	9,200 gal
Ending inventory	2,400 gal
Conversion costs incurred	\$39,800
Cost of direct materials added	\$82,950
Conversion costs, beginning inventory	\$ 1,700
Cost of direct materials, beginning inventory	\$ 2,900

Use the weighted-average method. Prepare a schedule of output in equivalent units and a schedule of application of costs to products. Show the cost of goods completed and cost of ending work in process. (For journal entries, see Exercise 14-37.)

14-B4 Backflush Costing

Remote Components recently installed a backflush-costing system. One department makes 4-inch speakers with a standard cost as follows:

Materials	\$ 9.40
Conversion costs	<u>4.70</u>
Total	<u><u>\$14.10</u></u>

Speakers are scheduled for production only after orders are received, and products are shipped to customers immediately on completion. Therefore, no finished-goods inventories are kept, and product costs are applied directly to cost of goods sold.

In October, 2,200 speakers were produced and shipped to customers. Materials were purchased at a cost of \$23,980, and actual conversion costs (labor plus manufacturing overhead) of \$10,490 were recorded.

1. Prepare journal entries to record October's costs for the production of 4-inch speakers.
2. Prepare a journal entry to recognize underapplied or overapplied conversion costs.

Additional Assignment Material

QUESTIONS

14-1 "There are different product costs for different purposes." Name at least two purposes.

14-2 Distinguish between job costing and process costing.

14-3 Describe the supporting details for work in process in a job-cost system.

14-4 What types of source documents provide information for job-cost records?

14-5 What is the journal entry for applying factory overhead costs to job orders?

14-6 "Law firms use job-costing to cost engagements. Thus, the markup required to cover overhead costs is not as great as in companies that use a process-costing system." Do you agree? Explain.

14-7 What is the use of "equivalent units" in process costing?

14-8 Give three examples of nonprofit organizations where process-costing systems are probably used.

14-9 "There are five key steps in process-cost accounting." What are they?

14-10 Identify the major distinction between the first two and the final three steps of the five major steps in accounting for process costs.

14-11 Suppose a refrigerator manufacturing firm has 12,000 fully completed units and 6,000 units that are 60% complete. Using the concept of equivalent units, compute the number of equivalent units.

14-12 Present an equation that describes the physical flow in process costing when there are beginning inventories in work in process.

14-13 How are transferred-in costs treated in process costing?

14-14 Explain what happens in a backflush-costing system when the amount of actual conversion cost in a period exceeds the amount applied to the products completed during that period.

CRITICAL THINKING EXERCISES

14-15 Purposes of Accumulating Job Costs

"Job costs are accumulated for purposes of inventory valuation and income determination." State two other purposes.

14-16 Job-Order Compared to Process Costing

"The basic distinction between job-order costing and process costing is the breadth of the denominator." Explain.

14-17 Cost Allocation in Service Firms

Suppose you are the managing partner of an audit firm. In a recent meeting on the annual budget and cost allocation policy of your firm, one of the senior managers has advocated that while making quotations for a client-order, the firm should trace only the professional hours and allocate all other costs (materials and supplies as well as overhead costs) as a percentage of the professional compensation cost. Do you agree with him?

14-18 Purpose of Product Costing in a Process Production Environment

All product costing uses averages to determine costs per unit of product produced. In job-order production systems, the averages are based on a relatively small number of units. In a process production environment, the number of units is much larger. Once the average unit cost is determined, what is the central product-costing problem in process costing?

14-19 Process Costing in a JIT Environment

Companies using JIT production systems usually have very small inventories or no inventories at all. As a result, a traditional accounting system may be inappropriate. Many of these companies have adopted backflush-costing systems. Do backflush-costing systems work only for companies using a JIT production system? Explain.

EXERCISES

14-20 Job Costing in Business Sectors

Job costing system is applied in all business sectors. For each example listed, indicate whether the company is in the manufacturing, merchandising, or service sector:

1. Consultancy by Tata Consultancy Services
2. Sales promotion by Amazon
3. Assembly of auto parts by Jaguar
4. Data analytics by Sigma XL

14-21 Direct Materials

For each of the following independent cases, fill in the blanks (in millions of dollars):

	1	2	3	4
Direct-materials inventory, December 31, 20X0	7	15	6	—
Purchased	10	7	—	7
Used	10	—	10	6
Direct-materials inventory, December 31, 20X1	—	13	11	4

14-22 Use of WIP Inventory Account

The July production resulted in the following activity in a key account of Liverpool Iron Works Company (in thousands of pounds):

WIP Inventory	
July 1 balance	£ 27
Direct materials used	141
Direct labor charged to jobs	90
Factory overhead applied to jobs	81

Job orders X16 and X39, with total costs of £105,000 and £120,000, respectively, were completed in July.

1. Journalize the completed production for July.
2. Compute the balance in WIP Inventory, July 31, after recording the completed production.
3. Journalize the credit sale of Job X16 for £147,000.

14-23 Job-Cost Records

The Indian Institute of Science uses job-cost records for various research projects. A major purpose for such records is to satisfy the internal auditor with the costs incurred for a project and obtain the utilization certificate to be submitted to the sponsoring authorities, mostly the central and state governments.

Consider the following summarized data regarding a COVID-19 research project at the biotechnology department:

- April 5 Direct materials, various medical supplies, ₹540,000
- April 7 Direct materials, various chemicals, ₹1,220,000
- April 5–12 Direct labor, research associates, 125 hours
- April 7–12 Direct labor, research associates, 205 hours

Research associates receive ₹3,360 per hour, while assistants receive ₹1,440. The overhead rate is 60% of the direct-labor cost.

Sketch a job-cost (project-cost) record. Post all the data to the project-cost record. Compute the total cost of the project through April 12.

I4-24 Analysis of Job-Cost Data

Job-cost records for Peter Construction contained the following data:

Job No.	Dates			Total Cost of Job at May 31
	Started	Finished	Sold	
1	April 19	June 14	June 15	\$8,400
2	April 26	June 22	June 25	4,800
3	May 2	May 6	June 8	9,200
4	May 9	May 29	June 5	8,600
5	May 14	May 14	May 16	6,700

Compute Peter's (1) WIP Inventory at May 31, (2) Finished-Goods Inventory at May 31, and (3) Cost of Goods Sold for May.

I4-25 Analysis of Job-Cost Data

The Cabrillo Construction Company constructs houses on speculation. That is, the houses are started before any buyer is known. Even if the buyer agrees to purchase a house under construction, no sales are recorded until the house is completed and accepted for delivery. The job-cost records contained the following (in thousands):

Job No.	Dates			Total Cost of Job at September 30	Total Construction Cost Added in October
	Started	Finished	Sold		
43	4/26	9/7	9/8	\$180	
51	5/17	9/14	9/17	170	
52	5/20	9/30	10/4	150	
53	5/28	10/14	10/18	200	\$50
61	6/3	10/20	11/24	115	20
62	6/9	10/21	10/27	180	25
71	7/7	11/6	11/22	118	36
81	8/7	11/24	12/24	106	48

1. Compute Cabrillo's cost of (a) construction-in-process inventory at September 30 and October 31, (b) finished-houses inventory at September 30 and October 31, and (c) cost of houses sold for September and October.
2. Prepare summary journal entries for the transfer of completed houses from construction in process to finished houses for September and October.
3. Record the cash sale (price = \$345,000) and the cost of the house sold for Job 53.

I4-26 Discovery of Unknowns

Elixir Pharmaceuticals has the following balances (in millions) in December 2020:

Factory overhead applied	€1,920
Cost of goods sold	1,950
Factory overhead incurred	1,900
Direct-materials inventory	110
Finished-goods inventory	190
WIP inventory	1,976

The cost of goods completed was €1,940. The cost of direct materials requisitioned for production during 2020 was €656. The cost of direct materials purchased was €450. Factory overhead was applied to production at a rate of 160% of direct-labor cost.

Compute the beginning inventory balances of direct materials, WIP, and finished goods. Make these computations before considering any possible adjustments for overapplied or underapplied overhead.

14-27 Discovery of Unknowns

The Detroit Manufacturing Company has the following balances (in millions) as of December 2020:

WIP inventory	\$ 54
Finished-goods inventory	540
Direct-materials inventory	222
Factory overhead incurred	576
Factory overhead applied at 150% of direct-labor cost	522
Cost of goods sold	1,776

The cost of direct materials purchased during 2020 was \$897. The cost of direct materials requisitioned for production during 2020 was \$726. The cost of goods completed was \$1,890 in millions.

Before considering any year-end adjustments for overapplied or underapplied overhead, compute the beginning inventory balances of direct materials, WIP, and finished goods.

14-28 Relationships Among Overhead Items

Fill in the unknowns:

	Case A	Case B	Case C
Budgeted factory overhead	\$3,600,000	\$?	\$1,500,000
Budgeted cost drivers			
Direct-labor cost	\$2,000,000		
Direct-labor hours		450,000	
Machine hours			250,000
Overhead application rate	?	\$ 5	?

14-29 Process Costing in Business Sectors

Process-costing systems are used in almost all business sectors. For each of the examples listed, indicate whether the company is in the manufacturing or service sector.

1. Soft drink bottling at PepsiCo.
2. Courier service by Blue Dart Express Limited
3. Petroleum refining at Reliance
4. Processing a car insurance application at HDFC ERGO

14-30 Process Map and Process Costing

Refer to Exhibit 14-5, panel B, on p. 606. Identify an example of (1) a transferred-in cost, (2) a variable-cost resource, (3) a direct fixed-cost resource, and (4) an indirect resource cost for the process-costing system.

14-31 Equivalent Units

Confirm your understanding of the equivalent units concept by computing the equivalent units for material, direct labor, and overhead for the following hypothetical case at Nally & Gibson (refer to Exhibit 14-6, p. 608).

In Process 3—crush and screen limestone rock—400 tons of limestone rock were transported to the plant during March. There was no beginning inventory of rock. During March, 320 tons were crushed, screened, and stocked. At the end of March, 80 tons of rock were 40% crushed and screened. Direct labor and overhead are incurred evenly during the crushing and screening process.

14-32 Basic Process Costing

A department of Imperial Chemical Company produces a special type of chemical for industrial use. All direct materials are introduced at the start of the process. Conversion costs are incurred uniformly throughout the process.

In June 2020, there was no beginning inventory. Units started, completed, and transferred were 1,350,000 liters. Units in process on June 30, 2020, were 498,000 liters. The ending work in process was 35% converted. Costs incurred during June were direct materials at £8,316,000 and conversion costs at £3,810,750.

1. Compute the total work done in equivalent units and the unit cost for June 2020.
2. Compute the cost of units completed and transferred. Also, compute the cost of units in ending work in process.

14-33 Uneven Flow

One department of Xiaomi produces tablets under the brand name of Mi Pad. Several materials are added at various stages of the process. The outer front shell and the carrying case, which represent 10% of the total materials cost, are added at the final step of the assembly process. All other materials are considered to be “in process” by the time the tablet reaches a 50% stage of completion.

During 2020, 37,000 tablets were started in production. At year-end, 3,000 tablets were in various stages of completion, but all of them were beyond the 50% stage and, on the average, they were regarded as being 70% completed.

The following costs were incurred during the year: direct materials, ¥16,441,600; conversion costs, ¥31,768,000. There was no beginning WIP inventory.

1. Prepare a schedule of physical units and equivalent units.
2. Tabulate the unit costs, cost of goods completed, and cost of ending work in process.

14-34 Journal Entries

Refer to the data in problem 14-A2. Prepare summary journal entries for the use of direct materials, direct labor, and factory overhead applied. Also prepare a journal entry for the transfer of goods completed and transferred. Show the postings to the WIP account.

14-35 Journal Entries

Refer to the data in problem 14-B2. Prepare summary journal entries for the use of direct materials, direct labor, and factory overhead applied. Also prepare a journal entry for the transfer of goods completed and transferred. Show the posting to the WIP—Assembly Department account.

14-36 Compute Equivalent Units

Consider the following data for 2020:

	Physical Units
Started in 2020	35,000
Completed in 2020	57,500
Ending inventory, work in process	17,500
Beginning inventory, work in process	40,000

The beginning inventory was 95% complete regarding direct materials and 90% complete regarding conversion costs. The ending inventory was 25% complete regarding direct materials and 15% complete regarding conversion costs.

Prepare a schedule of equivalent units for the work done to date.

14-37 Journal Entries

Refer to the data in problem 14-B3. Prepare summary journal entries for the use of direct materials and conversion costs. Also, prepare a journal entry for the transfer of goods completed, assuming that the goods are transferred to another department.

14-38 Journal Entries

Refer to the data in problem 14-A3. Prepare summary journal entries for the use of direct materials and conversion costs. Also, prepare a journal entry for the transfer of the goods completed and transferred from the assembly department to the finishing department.

PROBLEMS**14-39 Job Costing at Dell Computer**

Dell's manufacturing process at its Austin, Texas, facility consists of assembly, functional testing, and quality control of the company's computer systems. The company's build-to-order manufacturing

process is designed to allow the company to quickly produce customized computer systems. For example, the company contracts with various suppliers to manufacture unconfigured base Latitude notebook computers, and then Dell customizes these systems for shipment to customers. Quality control is maintained through the testing of components, parts, and subassemblies at various stages in the manufacturing process.

Describe how Dell might set up a job-costing system to determine the costs of its computers. What is a “job” to Dell? How might the costs of components, assembly, testing, and quality control be allocated to each “job”?

14-40 Relationships of Manufacturing Costs

Selected data concerning the past fiscal year’s operations of the Woodson Manufacturing Company are as follows (in thousands):

	Inventories	
	Beginning	Ending
Raw materials	\$ 70	\$ 90
WIP	75	35
Finished goods	100	120
Other data:		
Raw materials used		\$468
Total manufacturing costs charged to production during the year (includes raw materials, direct labor, and factory overhead applied at a rate of 80% of direct-labor cost)		864
Selling and general expenses		50

Answer each of the following items:

1. Compute the cost of raw materials purchased during the year.
2. Compute the direct-labor costs charged to production during the year.
3. Compute the cost of goods available for sale during the year.
4. Compute the cost of goods sold during the year.

14-41 Relationship of Subsidiary and General Ledgers Journal Entries

Omega Manufacturing Company produces customized jewelry boxes. The following summarized data relate to the operations of the company during the months of May and June 2020.

	Job 515		Job 516		Job 517
	May	June	May	June	June
Direct materials	€18,000	€5,000	€24,000	—	€26,000
Direct labor	8,000	3,000	10,000	5,000	4,000
Factory overhead applied	16,000	?	20,000	?	?

The company’s fiscal year ends on June 30. Factory overhead is applied as a percentage of direct labor costs. The balances in selected accounts on May 31 were as follows: direct-materials inventory, €38,000; finished-goods inventory, €36,000.

Job 515 was completed during June and transferred to finished goods. Job 516 was still in process at the end of June, as was Job 517, which had started June 25. These were the only jobs worked on during May and June.

Job 515 was sold, along with other finished goods, by June 29. The total cost of goods sold during June was €66,000. The balance in Cost of Goods Sold for sales through May 31 was €900,000.

1. Prepare a schedule showing the balance of the WIP Inventory for May 31. This schedule should show the total costs of each job record. Taken together, the job-cost records are the subsidiary ledger supporting the general ledger balance of work in process.
2. What is the overhead application rate?
3. Prepare summary general journal entries for all costs added to WIP during June. Also prepare entries for all costs transferred from WIP to Finished Goods and from Finished Goods to Cost of Goods Sold. Post to the appropriate T-accounts.
4. Prepare a schedule showing the balance of WIP Inventory, June 30.

14-42 Job Costing in an Accounting Service Provider Firm

Xcel Accounting Solutions is a firm of professional accountants. It mostly does bookkeeping jobs of companies in various industries. The firm obtains its jobs by placing fixed-price quotations depending on the expected volume of transactions of the business.

A client may be served by various professional staff members who hold positions in the hierarchy from junior account assistant to senior account assistant to managers to partners. In addition, there are secretaries and other employees.

Xcel Accounting Solutions has the following budget for 2021:

Compensation of professional staff	\$6,000,000
Other costs	<u>1,875,000</u>
Total budgeted costs	<u>\$7,875,000</u>

Each professional staff member must submit a weekly report, which is used for charging hours to a client job-order record. The time report has seven columns, one for each day of the week. Its rows are as follows:

- Chargeable hours
 - Client Job #212
 - Client Job #389
 - etc.
- Nonchargeable hours
 - Attending seminar on new accounting standards
 - Unassigned time
 - etc.

In turn, these time reports are used for charging hours and costs to the client job-order records. The managing partner regards these job records as absolutely essential for measuring the profitability of various jobs.

1. This firm applies overhead to jobs at a budgeted percentage of the professional compensation charged directly to the job (“direct labor”). For all categories of professional personnel, chargeable hours average 75% of available hours. Nonchargeable hours are regarded as additional overhead. What is the overhead rate as a percentage of “direct labor,” the chargeable professional compensation cost?
2. A senior account assistant works 48 weeks per year, 40 hours per week. His compensation is \$199,680. He has worked on two jobs during the past week, devoting 24 hours to Job 212 and 16 hours to Job 389. How much cost should be charged to Job 212 because of his work there?

14-43 Weighted-Average Process Costing at Nally & Gibson

Nally & Gibson produces crushed limestone, among other products, used in highway construction. To produce the crushed limestone, the company starts with limestone rocks from its quarry in Georgetown, Kentucky, and puts the rocks through a crushing process. Suppose that on May 1, Nally & Gibson has 24 tons of rock (75% complete) in the crushing process. The cost of that beginning WIP inventory was \$6,000. During May, the company added 288 tons of rock from its quarry, and at the end of the month 15 tons remained in process, on average one-third complete. The cost of rocks from the quarry for the last five months has been \$120 per ton. Labor and overhead cost during May in the rock-crushing process were \$40,670. Nally & Gibson uses weighted-average process costing.

1. Compute the cost per ton of crushed rock for production in May.
2. Compute the cost of the WIP inventory at the end of May.
3. Suppose the flexible budget for labor and overhead was \$16,000 plus \$80 per ton. Evaluate the control of overhead and labor costs during May.

14-44 Process and ABC

Consider the biscuit manufacturing process at a company such as Britannia Industries Ltd. Britannia uses a continuous flow technology that is suited for high volumes of product. At their facility in Ahmedabad, Gujarat, between 5,000 and 5,250 kilograms of biscuits are produced each hour. The plant operates 24 hours a day.

It takes 30 minutes to completely produce a packet of biscuits from the raw materials to the packed end product.

1. What product and process characteristics of biscuits dictate the cost accounting system used? Describe the costing system best suited to Britannia.
2. What product and process characteristics dictate the use of an ABC system? What implications does this have for Britannia?
3. When beginning inventories are present, product costing becomes more complicated. Estimate the relative magnitude of beginning inventories at Britannia compared to total production. What implication does this have for the costing system?

14-45 Nonprofit Basic Process Costing

The Central Board of Indirect Taxes and Customs, India, must process millions of Goods and Services Tax (GST) returns monthly. When the taxpayer submits a tax return online, detailed scrutiny of the data is conducted to ensure appropriateness of tax deposited and to process the refunds. Some returns are more complicated than others so the expected time allowed to process a return is geared to an “average” return.

Some work-measurement experts have been closely monitoring the processing. They are seeking ways to improve productivity.

Suppose 16 million returns were received on June 15. On June 22, the work measurement teams discovered that 20% of the returns still had to undergo a final inspection. The other returns were fully completed.

1. Suppose the final inspection represents 5% of the overall processing time in this process. Compute the total work done in terms of equivalent units.
2. The materials and supplies consumed were ₹64,000,000. For these calculations, materials and supplies are regarded just like direct materials. The conversion costs were ₹785,664,000. Compute the unit costs of materials and supplies and of conversion.
3. Compute the cost of the tax returns not yet completely processed.

14-46 Two Materials, Basic Process Costing

The following data pertain to the galvanized steel department of Ontario Iron and Steel Works Inc. for January 2020:

Units:		
	Work in process, December 31	0
	Units started	25,000
	Completed and transferred to finishing department	20,000
Costs:		
Materials:		
	Metallic component	\$225,000
	Zinc and other chemical compounds	\$ 30,000
	Conversion costs	\$110,000

The metallic component is introduced at the start of the process, while the zinc and other chemical compounds are added when the product reaches an 80% stage of completion. Conversion costs are incurred uniformly throughout the process.

The ending work in process is 40% completed for conversion costs. None of the units in process reached the 80% stage of completion.

1. Compute the equivalent units and unit costs for January.
2. Compute the total cost of units completed and transferred to finished goods. Also compute the cost of the ending work in process.

14-47 Materials and Cartons in Basic Process Costing

A British company manufactures and sells small portable digital voice recorders. Business is booming. Several materials are added at various stages in the assembly department. Costs are accounted for on a process-cost basis. The end of the process involves conducting a final inspection and adding a cardboard carton.

The final inspection requires 5% of the total processing time. All units inspected during the period successfully passed inspection. All materials, besides the carton, are added by the time the recorders reach an 80% stage of completion of conversion.

There were no beginning inventories. During 20X1, 150,000 recorders were started in production. At the end of the year, which was not a busy time, 5,000 recorders were in various stages of completion. All the ending units in work in process were at the 95% stage. They awaited final inspection before being placed in cartons.

Total direct materials consumed in production, except for cartons, cost £2,250,000. Cartons used cost £319,000. Total conversion costs were £1,198,000.

1. Present a schedule of physical units, equivalent units, and unit costs of direct materials, cartons, and conversion costs.
2. Present a summary of the cost of goods completed and the cost of ending work in process.

I4-48 Weighted-Average Process Costing with Transferred-in-Costs

Given the second process in a two-process manufacturer for January, 20X1:

Inventory in process, January 1, 50% completed	10,000 units
Completed and transferred out of process in January	40,000 units
Started into process in January	50,000 units
Inventory in process, January 31, 30% completed	???
Direct-material costs, January 1 inventory	\$ 40,000
Direct-material costs, current costs	\$120,000
Conversion costs, January 1 inventory	\$ 30,000
Conversion costs, current costs	\$246,000
Transferred-in costs, January 1 inventory	\$ 50,000
Transferred-in costs, current costs	\$250,000

Conversion costs are incurred uniformly during the process, while direct material is added when units are 40% complete.

1. Assuming Weighted average, what is the dollar valuation of the units transferred out for the month?

I4-49 Backflush Costing

Sawtooth Meter manufactures a variety of measuring instruments. One product is an altimeter used by hikers and mountain climbers. Sawtooth adopted a JIT viewpoint with an automated, computer-controlled, robotic production system. The company schedules production only after an order is received, materials and parts arrive just as they are needed, the production cycle time for altimeters is less than one day, and completed units are packaged and shipped as part of the production cycle.

Sawtooth's backflush-costing system has only three accounts related to production of altimeters: materials and parts inventory, conversion costs, and finished-goods inventory. At the beginning of April (as at the beginning of every month), each of the three accounts had a balance of zero. Following are the April transactions related to the production of altimeters:

Materials and parts purchased	\$273,800
Conversion costs incurred	\$ 89,600
Altimeters produced	12,800 units

The budgeted (or standard) cost for one altimeter is \$21 for materials and parts and \$7 for conversion costs.

1. Prepare summary journal entries for the production of altimeters in April.
2. Compute the cost of goods sold for April. Explain any assumptions you make.
3. Suppose the actual conversion costs incurred during April were \$90,600 instead of \$89,600, and all other facts were as given. Prepare the additional journal entry that would be required at the end of April. Explain why the entry was necessary.

14-50 Review of Chapters 13 and 14

Pasadena Co. uses normal absorption costing. Factory overhead is applied to production at a budgeted rate based on direct labor cost. At the end of the period, there are two unfinished jobs. Additional information is available as follows:

Direct materials used = \$90,000
 Direct labor = \$130,000
 Beginning balance of work in process = \$120,000
 Cost of goods manufactured = \$220,000
 Finished goods beginning inventory = \$70,000
 Finished goods ending inventory = \$130,000
 Factory overhead is overapplied by \$80,000
 Actual factory overhead = \$141,000

Determine the following:

1. The cost of goods sold before disposition of overapplied overhead
2. Ending balance in WIP
3. Budgeted rate for applying factory overhead
4. Assuming the overapplied factory overhead is not prorated, what is adjusted cost of goods sold?

14-51 Review of Chapters 13 and 14

Clark Co. uses normal absorption job-order costing. Factory overhead is applied to production at a budgeted rate of 300% of prime costs (direct materials plus direct labor). Clark Co.'s policy is to not prorate any over- or underapplied overhead amounts. All inventory amounts listed next are after disposition of any over- or under applied overhead:

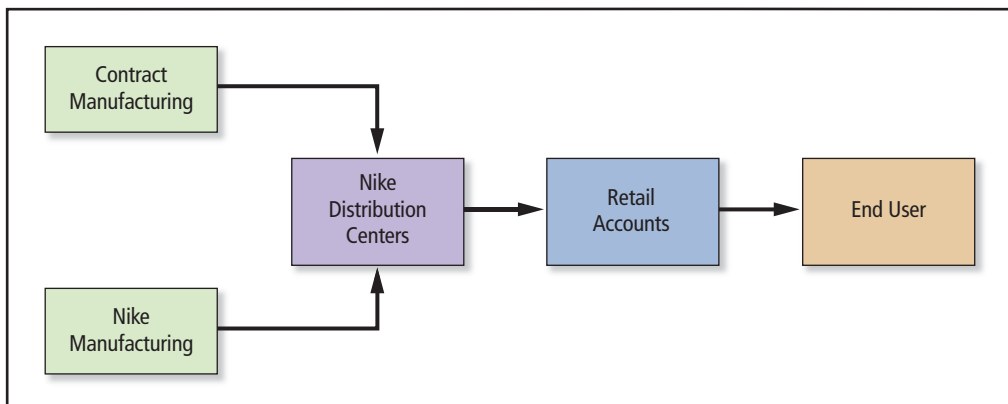
Direct labor = \$100,000
 Beginning balance of stores (direct materials) = \$20,000
 Ending balance of stores = \$20,000
 Purchased \$50,000 of direct materials during period
 Beginning balance of work in process = \$300,000
 Ending balance of work in process = \$300,000
 Cost of goods sold = \$350,000
 Finished goods beg. inventory = \$100,000
 Finished goods ending inventory = \$200,000

Determine the following:

1. Direct materials used
2. Factory overhead applied
3. Cost of goods manufactured
4. Actual factory overhead for the period

NIKE 10-K PROBLEM**14-52 ABC and Distribution Centers**

Read **Nike's** 10-K in Appendix C. Item 1 describes its business, especially in the United States. A simplified description of Nike's supply chain follows:



1. What kind of production system and associated costing system would you expect at the contract manufacturers? Nike distribution centers? How many distribution centers does Nike operate in the United States? Where are they located?
2. Suppose Nike is implementing an ABC system to improve its accounting for overhead costs at its Memphis facility. Some of the activities performed at a Nike distribution center are listed below, along with a resource used by each activity. Because each of the resources is also used by more than one activity, its cost must be allocated. For each of the activities-resource pairs, suggest a plausible cost-allocation base that could be used to allocate the resource cost to the activities.

Activities	Resource Used
Receiving, putting away apparel, picking products to fill an order, loading pallets onto trucks for shipment	Forklift
Receiving, putting away apparel, repacking in boxes, repacking in cartons, shipping	Occupancy costs
Supplies ordering, customer order processing, invoicing and payment for parcel deliveries	Variable computer costs

EXCEL APPLICATION EXERCISE

14-53 Value of Units Produced

Goal: Create an Excel spreadsheet to compute the value of units produced using the weighted-average process-costing method. Use the results to answer questions about your findings.

Scenario: The Magnatto Company has asked you to compute costs for the electric drills produced in its assembly department during the month of July. You will need to use the weighted-average process-costing method to determine costs for beginning work in process, completed units, and ending work in process. Additional background information for your spreadsheet appears in Fundamental Assignment Material 14-A3.

When you have completed your spreadsheet, answer the following questions:

1. At the end of July, what is the value of the 20,000 units remaining in the WIP ending inventory?
2. What were the materials, conversion, and total cost of goods amounts for the units transferred to the finishing department during the month of July?
3. What are the materials and conversion cost per unit amounts for the accumulated units and costs in July?

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
 Row 1: Chapter 14 Decision Guideline
 Row 2: Magnatto Company
 Row 3: Weighted-Average Process Costing for July, 20X1
 Row 4: Today's Date
3. Merge and center the four heading rows across columns A–K.
4. In row 7, create the following column headings justified as indicated:
 Column B: Number Center-justify
 Column C: Percent Complete Merge and center across columns C and D
 Column E: Equivalent Units Merge and center across columns E and F
 Column G: Cost of Goods Merge and center across columns G–I
 Column J: Cost per Unit Merge and center across columns J and K
5. In row 8, create the following center-justified column headings:
 Column B: of Units
 Columns C, E, G, and J: Materials
 Columns D, F, H, and K: Conversion
 Column I: Total
6. In column A, create the following row headings:
 Row 9: Beginning WIP
 Skip a row.
 Row 11: Units started
 Row 12: Less: Ending units
 Row 13: Units started and completed in July

Row 14: Beginning units completed
 Skip a row.
 Row 16: Accumulated units and costs in July
 Skip a row.
 Row 18: Value of transferred units

Note: Recommended column widths:

Column A = 28
 Column B = 7
 Columns C, E, and J = 8
 Columns D, F, G, H, and K = 9
 Column I = 11

7. Format columns C and D as follows:

Number tab:	Category:	Percentage
	Decimal places:	0

8. Use data from Fundamental Assignment Material 14-A3 to enter the following amounts:

Beginning WIP:	units, percent complete, cost of goods
Units started:	units
Less: Ending units:	units, percent complete
Accumulated units and costs in July:	cost of goods for materials and conversion
Value of transferred units:	units

9. Calculate the following amounts:

Units started and completed in July:	units, percent complete
Beginning units completed:	units, percent complete

10. In the sequence listed, use formulas to calculate the following amounts:

Equivalent units for:	Beginning WIP
	Less: Ending units
	Units started and completed in July
	Beginning units completed
	Accumulated units and costs in July
Cost per unit for:	Beginning WIP
	Accumulated units and costs in July
Materials cost of goods for:	Less: Ending units
	Units started and completed in July
	Beginning units completed
	Value of transferred units
Conversion cost of goods for:	Less: Ending units
	Units started and completed in July
	Beginning units completed
	Value of transferred units
Total cost of goods for:	Less: Ending units
	Units started and completed in July
	Beginning units completed
	Accumulated units and costs in July
	Value of transferred units
Cost per unit for:	Value of transferred units

11. Format columns B, E, F, G, H, and I as follows:

Number tab:	Category:	Number
	Decimal places:	0
	Use 1000 Separator (,):	Checked
	Negative numbers:	Red with parentheses

12. Format columns J and K as follows:

Number tab:	Category:	Currency
	Decimal places:	2
	Symbol:	\$
	Negative numbers:	Red with parentheses

13. Format the cost of goods rows 9, 12, 16, and 18 as follows:

Number tab:	Category:	Accounting
	Decimal places:	0
	Symbol:	\$

14. Modify the format of column B, rows 13 and 18; and row 16, columns E–I to display a top border using the default Line Style.

Border tab:	Icon:	Top Border

15. Modify the format of row 7, columns C, D, G, H, and I; and row 8, columns E, F, J, and K to display with a light gray fill.

Patterns tab:	Color:	Lightest Grey (above white)

16. Save your work, and print a copy for your files.

Note: Print your spreadsheet using landscape in order to ensure that all columns appear on one page.

COLLABORATIVE LEARNING EXERCISE

I4-54 Job and Process Costing

Form into groups of three to six students. For each of the following production processes, assess whether a job-cost or process-cost system is most likely to be used to determine the cost of the product or service. Also, explain why you think that system is most logical. (This can be done by individuals, but it is a much richer experience when done as a group, because the knowledge and judgment of several students interact to produce a much better analysis than a single student can produce.)

- Producing Cheerios by **General Mills**
- Processing an application for life insurance by **Prudential**
- Producing a couch by **Ethan Allen**
- Building a bridge by **Kiewit Construction Co.**
- Producing gasoline by **Chevron**
- Printing 200 copies of a 140-page course packet by **FedEx Office**
- Producing a superferry by **Vigor Industrial**

INTERNET EXERCISE

I4-55 Process Costing at a Variety of Companies

Process costing assigns costs by measuring overall production costs and averaging them based on total production in units over a period of time, usually a month. The resulting average unit costs are then used to determine inventory cost and the cost of goods sold. Let's look at some companies and see if any of them might be candidates for using a process-costing system.

1. Log on to the **Lands' End** Web site at www.landsend.com. Click on “About Us” on the bottom of the page. What type of firm is Lands' End? What is its main activity? Do you think that the firm would be a good candidate for using a process-costing system? Why or why not?
2. Log on to **La-Z-Boy**'s Web site at www.lazboy.com. Click on “About La-Z-Boy.” What type of firm is La-Z-Boy? What is its main activity? Do you think that the firm would be a good candidate for using a process-costing system? Why or why not?
3. Log on to **Tastykake's** Web site at www.tastykake.com. What type of firm is Tastykake? What is its main activity? Do you think that the firm would be a good candidate for using a process-costing system? Why or why not?

Basic Accounting: Concepts, Techniques, and Conventions

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Read and interpret basic financial statements.
2. Analyze typical business transactions using the balance sheet equation.
3. Distinguish between the accrual basis of accounting and the cash basis of accounting.
4. Make adjustments to the accounts under accrual accounting.
5. Explain the nature of dividends and retained earnings.
6. Select relevant items from a set of data and assemble them into a balance sheet and an income statement.
7. Distinguish between the reporting of corporate owners' equity and the reporting of owners' equity for partnerships and sole proprietorships.
8. Explain the role of auditors in financial reporting and how accounting standards are set.
9. Identify how the measurement principles of recognition, matching and cost recovery, and stable monetary unit affect financial reporting.
10. Define continuity, relevance, faithful representation, materiality, conservatism, and cost-benefit (Appendix 15A).
11. Use T-accounts, debits, and credits to record transactions (Appendix 15B).

► INTEL CORPORATION

The company “integrated electronics” (Intel) was founded in 1968 and its technology is integrated into our lives in various ways. We might know Intel’s products from their central processing units (CPUs), which are included in our laptops and computers. However, the company is also active in the fields of Autonomous Driving, 5G Networks, Client and Cloud Computing, as well as Artificial Intelligence (AI) and Analytics, the Internet of Things (IoT) and Client Connectivity. As you can see later in this chapter, Intel not only excels in technological considerations but is also praised for its efforts relating to Corporate Social Responsibility. How can the company’s managers see how much profit Intel is making? The same way you can—by reading the company’s financial statements.

Financial statements are generated by a company’s financial accounting system. Intel, like all well-managed companies, has a financial accounting system that not only generates company-wide financial statements but also provides detailed information about the financial results of each product. In his 2020 message to stakeholders, Omar Ishrak, chairman of Intel’s Board, indicated that with \$77.9 billion, Intel had achieved the highest revenue in company history. He also stressed that due to the focus and diligence of Intel’s employees, the company had entered 2021 with a renewed sense of purpose as well as a position of financial and strategic strength.

Suppose you want to buy shares of Intel instead of its products. Then you too would be interested in the company’s financial performance. You would want to know the company’s financial position and its prospects

to judge whether it is wise to invest in Intel's shares. The company's financial statements can be a great help in making this judgment, but only if you know a bit about accounting. Accounting is the language of business. Its special vocabulary conveys the financial story of an organization. To understand corporate annual reports, you must learn this language—the words and ideas used by accountants and other managers when discussing financial matters.

This chapter explores the essence of profit-making activities and how accountants portray them in financial statements. We leave the more technical topics for the chapter appendices. As you examine what accountants do, you will also learn many of the relevant concepts and principles of accounting. Although the focus will be on profit-seeking organizations, the main ideas also apply to nonprofit organizations. ■

The Need for Accounting

Accountants record the financial history of a company. You can use accounting information to assess the past financial performance of a company and to help predict its future performance. In addition to businesses, all kinds of organizations—government agencies, nonprofit organizations, and others—rely on accounting to gauge their progress.

The accounting process begins by recording an organization's transactions. A **transaction** is any event that affects the financial position of an organization and requires recording. Selling goods or services is one of many examples of such transactions. Many concepts, conventions, and rules determine what events a company records as accounting transactions and how accountants measure the financial impact of each transaction. As you learn about these concepts, conventions, and rules, you will also learn about **financial statements**, which are summaries of recorded accounting transactions.

Managers, investors, and other interest groups often want the answers to two important questions about an organization: How well did the organization perform for a given period? Where does the organization stand financially at a given point? Accountants answer these questions with three major financial statements: The income statement (also called profit and loss account) and statement of cash flows summarize two different aspects of performance over a period of time, and the balance sheet shows the financial position at a point in time. This chapter discusses the income statement and balance sheet. Consequently, the balance sheet is also referred to as statement of financial position. Chapter 16 introduces the statement of cash flows.

Financial Statements—Balance Sheet and Income Statement

An efficient way to learn about accounting is to study a specific illustration. Suppose Stora Exor Hardware began business as a **corporation**—a business organized as a separate legal entity and owned by its stockholders. The company's first transaction occurred on February 28, 20X2, when its stockholders invested a total of \$100,000 cash. The following additional transactions occurred during March:

Transaction 2: Acquisition of inventory for \$75,000 cash.

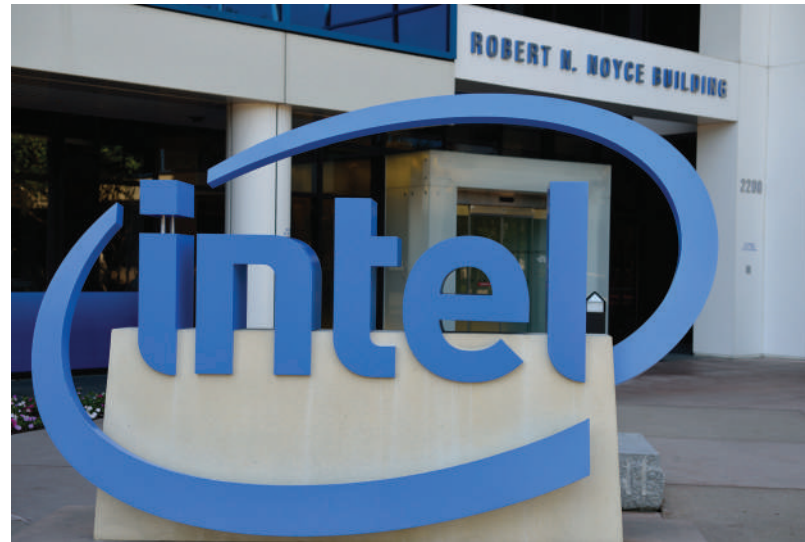
Transaction 3: Acquisition of inventory for \$35,000 on open account. A purchase on open account allows the buyer to pay cash after the date of purchase, often in 30 days. Amounts owed to vendors for purchases on open accounts, or on credit, are **trade (or accounts) payable**.

Transaction 4: Merchandise carried in inventory at a cost of \$100,000 was sold for \$130,000. Stora Exor received \$10,000 in cash and recorded accounts receivable of \$120,000. **Trade (or accounts) receivable** are amounts due from customers for sales on credit, or charged to an account, instead of being paid for in cash.

Transaction 5: From these \$120,000 in trade receivables (see Transaction 4), a further \$15,000 is now collected in cash.

Transaction 6: From the total of \$35,000 in trade payables (see Transaction 3), a further \$20,000 is now paid in cash.

Transaction 7: On March 1, Stora Exor paid \$3,000 cash for store rent for March, April, and May. Rent is \$1,000 per month, payable quarterly in advance, beginning March 1.



Stars and Stripes/Alamy Stock Photo

Intel Corporation is a global leader when it comes to integrated electronics.

transaction

Any event that affects the financial position of an organization and requires recording.

financial statements

Summarized reports of accounting transactions.

Objective 1

Read and interpret basic financial statements.

corporation

A business organized as a separate legal entity and owned by its stockholders or shareholders.

trade (or accounts) payable

Amounts owed to vendors for purchases on open accounts.

trade (or accounts) receivable

Amounts due from customers for sales charged to an account instead of being paid for in cash.

balance sheet (statement of financial position)

A snapshot of the financial status of an organization at a specific point in time.

The Balance Sheet

Stora Exor’s **balance sheet** (also called a **statement of financial position**)—a snapshot of the financial status of an organization at a specific point in time—looks as follows after the initial investment by stockholders:

Stora Exor Balance Sheet (Statement of Financial Position) as of February 28, 20X2			
Assets		Liabilities and Stockholders' Equity	
Cash	\$100,000	Paid-in capital	\$100,000

The balance sheet has two sections—(1) assets and (2) liabilities plus owners’ (stockholders’) equity. **Assets** are economic resources that a company owns and expects to provide future benefits. **Liabilities** are the entity’s economic obligations to nonowners. **Owners’ equity** is the excess of the assets over the liabilities.

You can think of the two sections of the balance sheet as the two sides of an equation:

Assets = Liabilities + Owners’ Equity

Liabilities and owners’ equity are essentially claims on the assets by creditors and owners, respectively. A company typically has multiple assets, liabilities, and owners’ equity items—a large company may have thousands, or even millions, of individual assets and liabilities. The accounting process aggregates and summarizes results reported on the balance sheet. Each separate asset, liability, or owners’ equity item shown on a balance sheet is an **account**—the term used for any item in a financial statement. In the subsequent chapter, a more detailed differentiation of assets and liabilities is shown, by subdividing them into current and noncurrent items.

Because the stockholders own a corporation, we call the owners’ equity of a corporation **stockholders’ equity**. In turn, the stockholders’ equity has two major components, (1) **paid-in capital**, the ownership claim arising from funds paid in by the owners, and (2) **retained earnings** (or **retained income**), the ownership claim arising from reinvestment of previous profits of the company:

assets = liabilities + stockholders’ equity
= liabilities + (paid-in capital + retained earnings)

Now let’s examine how Stora Exor’s March transactions affect the balance sheet. The balance sheet equation, shown in Exhibit 15-1, summarizes the cumulative effect of all these transactions (including the initial investment) as of March 31st. Note that most of the transactions are summaries of a larger set of underlying transactions. For example, the sales did not all occur in a single sales transaction. Similarly, there were multiple purchases of inventory, collections from customers, or disbursements to suppliers. Consider sales of Intel’s processors. It sells countless processors and other products during a year in thousands of transactions. Accountants record each transaction in the accounting system and then add together all the sales amounts to find the total sales to report in the financial statements.

You can see in Exhibit 15-1 that Stora Exor’s transaction 1, the initial investment by owners, increases assets and increases stockholders’ equity. That is, cash increases and so does paid-in capital—the claim arising from the owners’ total initial investment in the corporation. The balance sheet after this first transaction, shown at the top of this page, contains only two accounts.

Transaction 2, the purchase of inventory for cash, is an exchange of one asset for another. This transaction changes the balances in individual assets, increasing one asset (inventory) and decreasing another asset (cash), but does not change total assets or claims on those assets. Transaction 3, the purchase of inventory on account, adds an asset (inventory) and a liability (accounts payable), increasing total assets and total liabilities and stockholders’ equity to \$135,000. After the first three transactions, the balance sheet now includes four accounts, namely cash, inventory, accounts payable, and paid-in capital:

Stora Exor Balance Sheet After Transactions 1, 2, and 3			
Assets		Liabilities and Stockholders' Equity	
Cash	\$ 25,000	Account payable	\$ 35,000
Inventory	110,000	Paid-in capital	100,000
Total assets	\$135,000	Total liabilities and stockholders' equity	\$135,000

assets

Economic resources that a company owns and expects to provide future benefits.

liabilities

The entity’s economic obligations to nonowners.

owners’ equity

The excess of the assets over the liabilities.

account

Each item in a financial statement.

stockholders’ equity

The owners’ equity of a corporation.

paid-in capital

The ownership claim arising from funds paid in by the owners.

Objective 2

Analyze typical business transactions using the balance sheet equation.

retained earnings (or retained income)

The ownership claim arising from the reinvestment of previous profits of the company.

	Assets				=	Liabilities	Stockholders' Equity					
	Cash	+	Accounts Receivable	+	Inventory	+	Prepaid Rent	Accounts Payable	+	Paid-in Capital	+	Retained Earnings
Transactions												
1. initial investment	+ 100,000									+ 100,000		
2. Acquire inventory for cash	− 75,000				+ 75,000							
3. Acquire inventory for credit					+ 35,000			+ 35,000				
4a. Sales on credit and for cash	+ 10,000		+ 120,000									+ 130,000
4b. Cost of inventory sold					− 100,000							− 100,000
5. Collect from customers	+ 15,000		− 15,000									
6. Pay accounts of suppliers	− 20,000							− 20,000				
7a. Pay rent in advance	− 3,000						+ 3,000					
7b. Recognize expiration of rental services												

Exhibit 15-1

Stora Exor Hardware

Analysis of Transactions (in dollars) for March 20X2

Transaction 4 is the sale of \$100,000 of inventory for \$130,000. This is our first example of a transaction that reflects the fundamental purpose of providing a good or service that has a value to the purchaser (\$130,000) greater than the cost of providing the good or service (\$100,000). In this transaction, two things happen simultaneously—the company acquires new assets, Cash and Accounts Receivable (4a), in exchange for Inventory (4b). The assets Cash and Accounts Receivable increase by the selling price of \$130,000, as does the Retained Earnings portion of Stockholders' Equity. (Notice that the \$10,000 increase in Cash plus the \$120,000 increase in Accounts Receivable equals the \$130,000 increase in stockholders' equity.) The asset Inventory and the Retained Earnings portion of Stockholders' Equity decrease by the cost of the items sold, \$100,000. The \$30,000 net increase in Retained Earnings represents stockholders' claims arising from the profitable sale. Transaction 4a is also our first example of a **compound entry**, a transaction that affects more than two accounts.

compound entry

A transaction that affects more than two accounts.

Transaction 5, cash collection of accounts receivable, is another example of an event that affects individual asset accounts but has no impact on liabilities or stockholders' equity. Collections are merely the transformation of one asset (Accounts Receivable) into another (Cash). Transaction 6, cash payment of accounts payable, affects assets and liabilities only. Cash (asset) is used to settle parts of the trade payables (liability). In general, collections from customers and payments to suppliers have no direct impact on stockholders' equity.

In transaction 7, the company pays cash for rent to acquire the right to use store facilities for the next three months. On March 1, we create the asset Prepaid Rent (7a), a measure of the future benefit from the right to use these facilities. Assets include legal rights to receive goods and services such as the future use of facilities as well as items you can see or touch such as cash or inventory. Transaction 7b recognizes that Stora Exor received one-third of the three months of rental services during March. Because the company has "used up" \$1,000 of the asset Prepaid Rent during March, we reduce both the asset and stockholders' equity by \$1,000 (note: This example will be explained in more details later in this chapter when the Income Statement is introduced).

The Balance Sheet for Stora Exor at the end of March follows:

Stora Exor Hardware
Balance Sheet as of March 31, 20X2

Assets		Liabilities and Stockholders' Equity	
Cash	\$ 27,000	Liabilities: Accounts payable	\$ 15,000
Accounts receivable	105,000	Stockholders' equity	
Inventory	10,000	Paid-in capital	\$100,000
Prepaid rent	2,000	Retained earnings	29,000
Total	<u>\$144,000</u>	Total	<u>\$144,000</u>

Revenues, Expenses, and the Income Statement

Let's review transaction 4 in more detail. Recall that this transaction has two phases, (a) and (b). Transaction 4a illustrates the recognition of revenue. **Revenues** are increases in ownership claims (or owner's equity) arising from the delivery of goods or services. We **recognize** revenue by formally recording it in the accounting records during the current period. We do this only after it meets two tests. First, the company must earn the revenues. That is, it must deliver the goods or render the services to customers. Second, the revenue must be realized or realizable. If the company collects payment, it has realized the revenue. If it has not collected payment but is reasonably sure that it will collect the receivable, the revenue is realizable.

Transaction 4b illustrates the incurrence of an expense. **Expenses** are decreases in ownership claims (or owner's equity) arising from delivering goods or services or using up assets. The expense in this case is cost of goods sold, the amount paid for the items sold to the customer.

Transactions 4a and 4b also illustrate the fundamental meaning of **income** (also called **net income**, **profits**, or **earnings**), which is the excess of revenues over expenses. As the Retained Earnings column in Exhibit 15-1 shows, increases in revenues increase stockholders' equity. In contrast, increases in expenses decrease stockholders' equity.

A company's **income statement** summarizes its revenues and expenses. It measures the performance of an organization by matching its accomplishments (revenue from customers, often called **sales revenue** or simply **sales**) and its efforts (cost of goods sold and other expenses) for a span of time, often a month, a quarter, or a year.

revenue

Increases in ownership claims arising from the delivery of goods or services.

recognize

To formally record in the accounting records during the current period.

expenses

Decreases in ownership claims arising from delivering goods or services or using up assets.

income (net income, profits, earnings)

The excess of revenues over expenses.

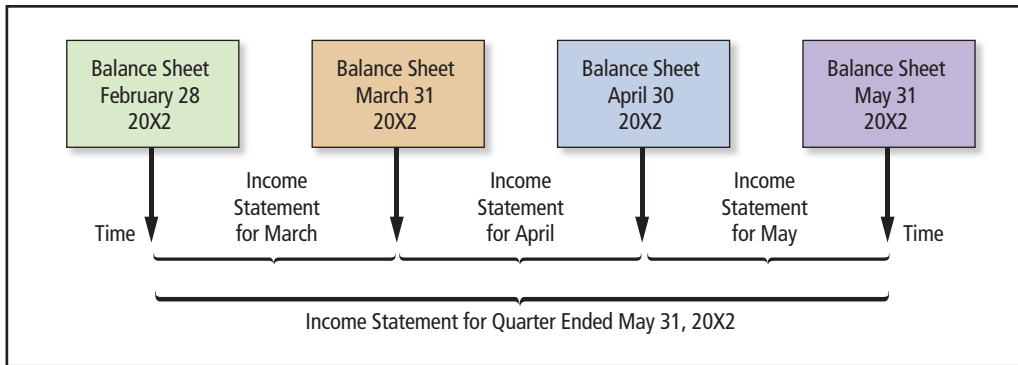
income statement

A statement that summarizes a company's revenues and expenses. It measures the performance of an organization by matching its accomplishments (revenue from customers) and its efforts (cost of goods sold and other expenses).

sales revenue (sales)

Revenue from customers.

The income statement is the major link between balance sheets:



Notice that each balance sheet is a snapshot at a point in time. In contrast, each income statement summarizes events during a period that cause changes in the stockholders' equity (specifically retained earnings) section of the balance sheet. Examine the changes in retained earnings in Exhibit 15-1. The revenues and expenses during March explain why retained earnings changed from \$0 at the beginning of the month to \$29,000 at the end of the month. The revenues increase stockholders' equity, and expenses decrease stockholders' equity.

The following Stora Exor income statement summarizes the company's revenues and expenses for the month of March:

Stora Exor Hardware Income Statement for the Month Ended March 31, 20X2			
Revenues (sales)			\$130,000
Expenses			
Cost of goods sold	\$100,000		
Rent	<u>1,000</u>		
Total expenses			<u>101,000</u>
Net income			<u>\$ 29,000</u>

Real income statements and balance sheets use the same formats as those for Stora Exor, though they usually contain more details. Consider Intel Corporation. Simplified versions of its balance sheet and income statement follow (in millions):

Intel Corporation

Balance Sheet December 26, 2020

Assets	(in millions of dollars)	Liabilities and Stockholders' Equity	(in millions of dollars)
Cash and cash equivalents	5,865	Liabilities	72,053
Accounts receivable	6,782	Stockholders' equity	81,038
Other assets	<u>140,444</u>		
Total assets	<u>153,091</u>	Total liabilities and stockholders' equity	<u>153,091</u>

Source: Intel Annual Report 2020, https://www.intc.com/filings-reports/annual-reports?form_type=&year=2020

Intel Corporation

Income Statement for the Year Ended December 26, 2020

Net revenue	\$ 77,867 million
Expenses	<u>\$ 56,968 million</u>
Net income	<u>\$ 20,899 million</u>

Source: Intel Annual Report 2020, https://www.intc.com/filings-reports/annual-reports?form_type=&year=2020

The income statement shows that Intel's stockholders' equity (in particular the retained earnings) increased by \$20,899 million because of profitable operations in the year ended December 26, 2020. This \$20,899 million is included in the \$81,038 million of stockholders' equity on the December 26, 2020, balance sheet. However, please note that other transactions, like paying dividends, reduced the stockholders' equity of Intel.

The Analytical Power of the Balance Sheet Equation

The balance sheet equation highlights the link between the income statement and balance sheet. Indeed, the entire accounting system is based on the simple balance sheet equation,

$$\text{Assets (A)} = \text{liabilities (L)} + \text{stockholders' equity (SE)} \quad (1)$$

SE equals the original ownership claims plus the increase in ownership claims from profitable operations. That is, SE equals the claim arising from paid-in capital plus the claim arising from retained earnings. Therefore,

$$A = L + \text{paid-in capital} + \text{retained earnings} \quad (2)$$

For most companies, the major changes in retained earnings come from revenues and expenses—revenues increase retained earnings and expenses decrease them. Revenue and expense accounts are nothing more than current period changes in retained earnings. They are temporary retained earnings accounts that are reset to zero at the start of each new period. They summarize the revenues and expenses that occurred during the current period, summarizing the reasons for the changes in retained earnings. After a company adds the revenues less expenses for the current period to the balance in retained earnings, it resets revenue and expense accounts to zero so that it can use them to accumulate the revenues and expenses for the next period.

Notice in Exhibit 15-1 that, for each transaction, the equation is always in balance. How do we keep it in balance? If a transaction affects items on only one side of the equation, the total amount added equals the total amount subtracted on that side. If the transaction affects items on both sides, then we add or subtract equal amounts on each side.

The striking feature of the balance sheet equation is its universal applicability. Every transaction, no matter how simple or complex, can be analyzed via the equation. The top technical partners in the world's largest professional accounting firms, when confronted with the most intricate transactions of multinational companies, inevitably discuss and analyze transactions in terms of the balance sheet equation.

Accrual Basis and Cash Basis

Objective 3

Distinguish between the accrual basis of accounting and the cash basis of accounting.

accrual basis

A process of accounting that recognizes the impact of transactions on the financial statements in the time periods when revenues and expenses occur instead of when the company pays or receives cash.

cash basis

A process of accounting where revenue and expense recognition occur when the company receives and pays out cash.

There are two approaches to accounting: the cash basis and the accrual basis. You may not realize it, but you are probably already familiar with the cash basis. Many of us use money management apps or Excel lists to record receipts and payments of cash. This is the cash basis. Many small nonprofit organizations use the cash basis of accounting.

In contrast, corporations and many other large organizations measure income and financial position using the accrual basis of accounting. The **accrual basis** recognizes the impact of transactions on the financial statements in the periods when revenues and expenses occur instead of when the company receives or pays cash. That is, a company records revenue when it meets the criteria for recognition, and it records expenses when it uses resources to generate revenue—not necessarily when cash changes hands.

Transaction 4a in Exhibit 15-1, on p. 639, shows an example of the accrual basis. Stora Exor recognizes revenue when it makes sales on credit, not when it receives cash. Similarly, transactions 4b and 7b (for cost of goods sold and rent) show that Stora Exor records expenses as it expends efforts or uses services to obtain the revenue, regardless of when it pays out the cash. Most users of financial statements believe that the accrual basis provides the best framework for relating accomplishments (revenues) with efforts (expenses). That is, they believe that revenue less expenses is a better measure of a company's performance during a period than is cash receipts less cash payments. Why do they believe this? Companies conduct more than 95% of all business on a credit basis, so cash receipts and payments are not the critical transactions for recognizing accomplishments and efforts. The accrual basis evolved to provide a more complete and timely, and therefore more accurate, report of the financial impact of various events.

If Stora Exor used the **cash basis** of accounting instead of the accrual basis, revenue and expense recognition would occur when the company receives and pays out cash. In March, Stora Exor would show \$25,000 of revenue, the amount of cash collected from customers. Similarly, cost of goods sold would be the \$20,000 cash payment for the purchase of inventory, and rent expense would be the \$3,000 cash payment for rent rather than the \$1,000 rent applicable to March. Consider the rent example for Stora Exor. Under the cash basis, March must bear expenses for the entire quarter's rent of \$3,000, merely because the cash outflow occurs then. Most accountants maintain that it is nonsense to say that March's rent expense was \$3,000 while rent expense for April and May was zero. In contrast, the accrual basis better measures

performance by assigning one-third of the total three-month rental expenses to each of the three months that benefits from the use of the facilities. This method makes the economic performance of each month comparable to that of other months.

The major deficiency of the cash basis of accounting is that it fails to properly match efforts and accomplishments (expenses and revenues) to measure performance. Moreover, it omits key assets (such as accounts receivable and prepaid rent) and key liabilities (such as accounts payable) from balance sheets that measure financial position.

Nonprofit Organizations

The examples in this chapter focus on profit-seeking organizations (for-profit), but nonprofit organizations, such as government agencies and charitable organizations, also use balance sheets and income statements. For many years, most nonprofit organizations used cash-basis rather than accrual accounting. However, that is changing quickly. As these organizations face more pressure to develop accurate measures of performance, they are increasingly using accrual accounting.

The basic concepts of assets, liabilities, revenues, and expenses apply to all organizations, whatever their goals and wherever they are located. Further, because they have no owners, there is no owners' equity. Nevertheless, they have parallels to income statements and balance sheets. For example, balance sheets of nonprofit organizations show a category of "net assets" instead of "owners' equity" to measure the difference between assets and liabilities. Instead of an income statement, nonprofit organizations have a "statement of activities" that reports changes in net assets.

Adjustments to the Accounts

Earlier, we defined a transaction as any economic event that an accountant should record. Under accrual accounting, accountants record both **explicit transactions**—day-to-day routine events, such as credit sales, credit purchases, cash received on account, and cash payments on account—and **implicit transactions**—events that day-to-day recording procedures temporarily ignore, such as expiration of prepaid rent or accrual of interest due to the passage of time. Explicit transactions are easy to identify because they record market transactions, exchanges of goods and services between the entity and another party. They are generally supported by **source documents**, clear evidence of transactions, such as sales slips and purchase invoices.

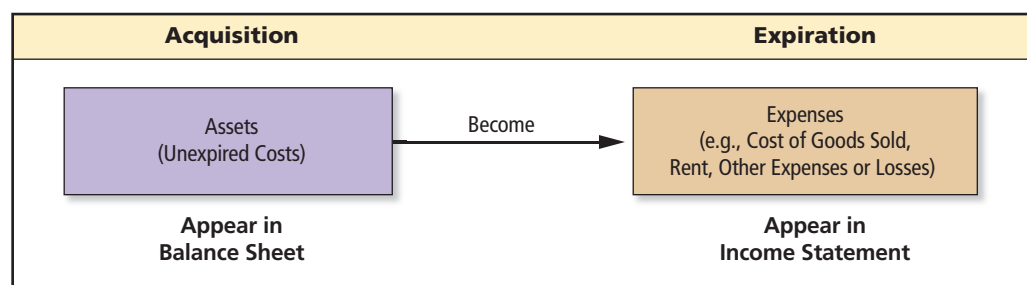
In contrast, accountants need a way to ensure that they record all implicit transactions. At the end of each accounting period accountants systematically make **adjustments (or adjusting entries)** to account for implicit transactions such as unpaid wages, prepaid rent, interest owed, and the like. We classify the principal adjustments into four types, each of which we will discuss in detail:

1. Expiration of Unexpired Costs
2. Recognition (Earning) of Unearned Revenues
3. Accrual of Unrecorded Expenses
4. Accrual of Unrecorded Revenues

These adjustments are an essential part of accrual accounting. They provide a more complete and timely measure of efforts, accomplishments, and financial position.

Adjustment Type I: Expiration of Unexpired Costs

You can view assets other than cash and receivables as bundles of economic services awaiting future use—prepaid or stored costs that the accounting system carries forward to future periods. The values of assets frequently decline (and eventually disappear) because of the passage of time. We illustrated this first type of adjustment in Exhibit 15-1 by recognizing the rent expense in transaction 7b. Rather than immediately charging these costs as expenses, we charge them as expenses in future periods when the company uses the services:



explicit transactions

Transactions that record day-to-day routine events—such as credit sales, credit purchases, cash received on account, and cash disbursed on account—that are supported by source documents.

implicit transactions

Transactions that record events that day-to-day recording procedures temporarily ignore, such as expiration of prepaid rent or accrual of interest due to the passage of time.

source documents

Clear evidence of transactions, such as sales slips and purchase invoices.

adjustments (or adjusting entries)

Entries that record implicit transactions such as unpaid wages, prepaid rent, interest owed, and the like.

Objective 4

Make adjustments to the accounts under accrual accounting.

unexpired cost

Any asset that managers expect to become an expense in future periods, for example, inventory and prepaid rent.

When a company uses the services represented by a particular cost, we say the cost expires. Therefore, an **unexpired cost** is any asset that managers expect to become an expense in future periods. Examples in our Stora Exor illustration are inventory and prepaid rent. Other examples are equipment and various prepaid expenses, such as prepaid insurance and prepaid property taxes. When accountants say they are “writing off” an asset, they mean they are recording the decline in asset value as an expense.

The analysis of the inventory and rent transactions in Exhibit 15-1 maintains this distinction between acquisition and expiration. The unexpired costs of inventory and prepaid rent are assets until the company uses them up, at which time they become expenses.

Timing of Asset Expiration

Sometimes companies acquire and use resources almost simultaneously. Examples are advertising services and sales salaries and commissions. Conceptually, we can view these costs, at least momentarily, as assets on acquisition before we write them off as expenses. For example, suppose an eighth transaction in Exhibit 15-1 was online advertising acquired for \$1,000 cash. We can analyze the transaction in two phases:

Transaction	Asset		=	Liabilities	+	Stockholders' Equity	
	Cash	Other Assets + Unexpired Advertising				Paid-in Capital	Retained Earnings
8a. Acquire advertising services	-1,000	+1,000	=				
8b. Use advertising services		-1,000	=				-1,000 (expense)

In concept, the benefit of the newspaper ad is to increase sales, and this benefit expires over a period of days or weeks after the ad runs. However, when the benefit expires quickly, accountants often do not bother to take two steps to record an asset, Unexpired Advertising, and then write it off. Instead, they take a shortcut and record the expense immediately:

Transaction	Cash + Other Assets	=	Liabilities + Paid – in Capital + Retained Earnings
8. Acquire and use advertising services	-1,000	=	-1,000 (expense)

Making the entry in two steps instead of one is cumbersome from a practical bookkeeping viewpoint. But it is useful to think about how accounting entries relate to what managers actually do. Managers acquire goods and services, not expenses per se. These goods and services become expenses as managers use them to obtain revenue.

When does an asset expire and become an expense? Sometimes this question is hard to answer. For example, some accountants prefer to record as assets the amounts spent for research and development (R&D) and write them off (charge as an expense) in some systematic manner over a period of years. Why? Because they maintain that money spent for R&D creates future benefits and, thus, qualifies as an asset. But the regulators of financial accounting in the United States have ruled that all such costs have vague future benefits that are difficult to measure reliably. Thus, financial reporting rules in the United States require companies to write off R&D costs as expenses immediately. You will not find R&D costs listed as assets in U.S. balance sheets. Outside the United States, international financial accounting standards allow companies to differentiate between research costs—which they immediately expense—and development costs—which they are allowed to record as assets and write off to expense in future periods if the development costs meet some specific criteria.

Depreciation

To keep the expense-adjustment illustration simple, until now we have deliberately ignored the accounting for **long-lived assets**—also referred to as **fixed or noncurrent assets**, these are assets that will provide services for more than a year. As outlined earlier, a more detailed explanation of the different types of assets is provided in Chapter 16 of this book. Equipment is an example of a long-lived asset that is essentially a bundle of future services that a company will use over a series of years. The cost of equipment becomes an expense on the income statement via depreciation, which is the cost of equipment that a company spreads over the future periods in which the company will be able to use the equipment.

long-lived assets (fixed assets, noncurrent assets)

Assets that will provide services for more than a year.

To account for long-lived assets, accountants (1) predict the length of the asset's **useful life** (that is, the number of years the company expects to use the asset), (2) predict the ultimate **residual value** (that is, the predicted value of the asset at the end of its useful life), and (3) spread the cost of the asset less the residual value to the years of its useful life in some systematic way. This process of systematically spreading the equipment cost across the years of its useful life is called depreciation for physical (long-lived) assets—such as buildings, equipment, furniture, and fixtures—that the entity owns. (Land is not subject to depreciation. Why? Because we do not use up land.) The same process is called depletion when it is applied to natural resources and amortization when it is applied to intangible (non-physical) assets.

The most popular depreciation method for financial reporting is the **straight-line method**, which depreciates an asset by the same amount each year. Suppose Stora Exor had acquired some store equipment for \$14,000 on March 1. The predicted life of the equipment is 10 years, and the estimated residual value is \$2,000:

$$\begin{aligned}\text{straight-line depreciation per year} &= \frac{\text{original cost} - \text{estimated residual value}}{\text{years of useful life}} \\ &= \frac{\$14,000 - \$2,000}{10} \\ &= \$1,200 \text{ per year, or } \$100 \text{ per month}\end{aligned}$$

Depreciation illustrates the essence of the general concept of expense. The purchase and use of a resource (that is, a good or service, such as inventories, rent, or equipment) ordinarily consists of two basic steps: (1) the acquisition of the asset (transactions 2, 3, and 7a) and (2) the expiration of the asset as an expense (transactions 4b and 7b). When we use an asset, whether immediately or in some future period, we say part of the asset expires, and we decrease the value of the asset and decrease owners' equity by the same amount.

useful life

The number of years the company expects to use an asset.

residual value

The predicted sales value of a long-lived asset at the end of its useful life.

straight-line method

A method that depreciates an asset by the same amount each year.

Summary Problem for Your Review

PROBLEM

We analyzed the Stora Exor transactions for March in Exhibit 15-1 on p. 639. The balance sheet showed the following balances as of March 31, 20X2:

	Assets	Liabilities and Stockholders' Equity
Cash	\$ 27,000	
Accounts receivable	105,000	
Inventory	10,000	
Prepaid rent	2,000	
Accounts payable		\$ 15,000
Paid-in capital		100,000
Retained earnings		29,000
	<u>\$144,000</u>	<u>\$144,000</u>

Here is a summary of the transactions that occurred during the next month, April:

1. Cash collections of accounts receivable, \$88,000.
2. Cash payments of accounts payable, \$24,000.
3. Acquisitions of inventory on open account, \$80,000.
4. Merchandise carried in inventory at a cost of \$70,000 was sold on open account for \$85,000.
5. Adjustment for recognition of rent expense for April.

Using the accrual basis of accounting, prepare an analysis of transactions, employing the equation approach demonstrated in Exhibit 15-1.

SOLUTION

The answer is in the top half of Exhibit 15-2 ending with transaction 5. We will explain transactions 6–9 in the following sections.

Transaction	Assets				Liabilities		Stockholders' Equity			
	Cash	+ Accounts Receivable	+ Inventory	+ Prepaid Rent	=	Accounts Payable	+ Accrued Wages	+ Unearned Revenue	+ Paid-in Capital	+ Retained Earnings
Bal. 3/31/X2	+ 27,000	+ 105,000	+ 10,000	+ 2,000	=	+ 15,000			+ 100,000	+ 29,000
1.	+ 88,000	- 88,000			=					
2.	- 24,000				=	- 24,000				
3.			+ 80,000		=	+ 80,000				
4a.		+ 85,000			=					+ 85,000
4b.			- 70,000		=					- 70,000
5.				- 1,000	=					- 1,000
6.	+ 3,000				=			+ 3,000*		- 6,000
7.	- 6,000				=		+ 600			- 600
8.					=					- 18,000
9.	- 18,000				=					+ 18,400
4/30/X2	+ 70,000	+ 102,000	+ 20,000	+ 1,000	=	+ 71,000	+ 600	+ 3,000	+ 100,000	
	<u>193,000</u>					<u>193,000</u>		<u>193,000</u>		

*Some accountants would call this account "Customer Deposits," "Advances from Customers," "Deferred Sales Revenue," or "Unrealized Sales Revenue."

Exhibit 15-2
Stora Exor Hardware
Analysis of Transactions (in dollars) for April 20X2

Adjustment Type II: Recognition (Earning) of Unearned Revenues

Now let's examine a second type of adjustment. Consider the following transaction for Stora Exor Hardware in April:

6. Some customers paid \$3,000 cash in advance for merchandise that they ordered but that Stora Exor did not expect to deliver until mid-May.

See transaction 6 in Exhibit 15-2. We call this \$3,000 **unearned revenue** or **deferred revenue**. Why? Because Stora Exor collected cash from customers and recorded the amount received before the company earned it by delivering the merchandise. Unearned revenue is a liability because Stora Exor is obligated to deliver the merchandise ordered or to refund the money if it does not deliver the merchandise. Some companies call this account *advances from customers* or *customer deposits*. Advance collections of rent and magazine subscriptions are other examples.

Sometimes it is easier to see how accountants analyze transactions by visualizing the financial positions of both parties to a contract. For instance, consider the rent transaction of March 1. You are already familiar with the Stora Exor analysis. The \$1,000 monthly entries for Stora Exor are examples of the first type of adjustments, the expiration of unexpired costs. Compare this financial impact on Stora Exor with the impact on the landlord who receives the rental payment:

	Owner of Property (Landlord, Lessor)					Stora Exor (Tenant, Lessee)				
	A	=	L	+	SE	A	=	L	+	SE
	Cash		Unearned Rent Revenue		Rent Revenue	Cash		Prepaid Rent		Rent Expense
a. Explicit transaction (advanced payment of 3 months' rent)	+3,000	=	+3,000			−3,000		+3,000	=	
b. March adjustment (for 1 month's rent)		=	−1,000		+1,000		=	−1,000		−1,000
c. April adjustment (for 1 month's rent)		=	−1,000		+1,000		=	−1,000		−1,000
d. May adjustment (for 1 month's rent)		=	−1,000		+1,000		=	−1,000		−1,000

From the viewpoint of the owner of the rental property, the first transaction recognizes unearned revenue. This is a liability because the owner is obligated to deliver the rental services (or to refund the money if s(he) does not deliver the services).

As you can see from the preceding table, adjustments for the expiration of unexpired costs (Type I) and adjustments for the recognition of unearned revenues (Type II) are mirror images of each other. If one party to a contract has a prepaid expense, the other has unearned revenue. We can make a similar analysis for a 3-year magazine subscription. The buyer recognizes a prepaid expense (asset) and uses adjustments of Type I to spread the initial cost to expense over the 3-year life of the services. In turn, the magazine publisher must initially recognize its liability, unearned subscription revenue. It then changes the unearned revenue to earned revenue (i.e., increases magazine revenue and decreases unearned revenue) when the company delivers magazines throughout the life of the subscription—adjustment Type II.

Adjustment Type III: Accrual of Unrecorded Expenses

Let's proceed now to the third type of adjustment: accrual of unrecorded expenses. To **accrue** something means to accumulate and record a receivable or payable during a given period even though no explicit transaction occurs. Examples of **accrued expenses**—expenses reported on the income statement before a company pays for them with cash—are the wages of employees for partial payroll periods and the interest that accumulates on borrowed money before the interest payment is made. The liability corresponding to such expenses, such as wages payable or interest payable, grows as time passes—it is accruing (or accumulating). Computerized accounting systems

unearned revenue (deferred revenue)

Collections from customers that companies receive and record before they earn the revenue.

accrue

To accumulate a receivable or payable during a given period, even though no explicit transaction occurs.

accrued expenses

Expenses reported on the income statement before a company pays for them with cash.

can make daily or even “real-time” recordings in the accounts for many accruals. However, such frequent entries are often costly and unnecessary. Instead, accountants usually make adjustments to bring each expense and corresponding liability account up to date only periodically, such as at the end of a period for which they are preparing formal financial statements.

Accounting for Payment of Wages

Consider the following two transactions relating to wages paid by Stora Exor to its employees:

7. Stora Exor paid employees \$1,500 each Friday in April, for total wages of \$6,000. (For simplicity, we ignored wages in March.) Stora Exor recognizes these payments for employee services by increasing Wages Expense and decreasing Cash.
8. Stora Exor incurred two days of wages totaling \$600 near the end of April, but it did not pay the employees until after April 30. Accordingly, the accountant increased Wages Expense and increased a liability, Accrued Wages Payable.

Most companies pay their employees at predetermined times. The German civil code, for example, prescribes that remuneration is to be paid after performance of the services and most companies choose for a monthly remuneration period in this geographical area. In contrast, UK-based companies are more likely to utilize a weekly pay scheme. Stora Exor pays its employees each Friday for services rendered during that week. Here is a sample calendar for April:

April						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

The cumulative total wages paid on the Fridays during April were \$6,000. Stora Exor accounts for wages expense using the shortcut procedure described earlier for goods and services that a company routinely consumes in the period of their purchase. Transaction 7 in Exhibit 15-2 (and summarized next) shows Stora Exor’s entry for April’s wages through April 26:

	Assets (A)	=	Liabilities (L)	+	Stockholders’ Equity (SE)
	Cash	=			Wages Expense
7. Routine entry for capital transactions	−6,000	=			−6,000

Accounting for Accrual of Wages

Stora Exor’s wages of \$1,500 per week are \$300 per day for a 5-day work week. At the end of April, in addition to the \$6,000 already paid and recorded, Stora Exor owes \$600 for the time employees worked during the last two days of April but will not pay the employees for these services until the next regular weekly payday, May 3. Thus, to bring the financial statements up to date through April 30, an accrual is necessary to record wages owed but not yet recorded. Periodic adjustments ensure that the financial statements apply accrual accounting to measure revenues, expenses, assets, and liabilities on a timely basis. Stora Exor accounts for this implicit transaction with entry 8:

	A	=	L	+	SE
			Accrued Wages Payable		Wages Expense
8. Adjustment for the accrual of unrecorded wages		=	+600		−600

	Expense	Revenue
Payment precedes recognition of expense or revenue	I Expiration of unexpired costs. Illustration: The write-off of prepaid rent as rent expense (Exhibit 15-2, entry 5)	II Recognition (earning) of unearned revenues. Illustration: The mirror image of Type I, whereby the landlord recognizes rent revenue and decreases unearned rent revenue (rent collected in advance)
Recognition of expense or revenue precedes payments	III Accrual of unrecorded expenses. Illustration: Wage expense for wages earned by employees but not yet paid (Exhibit 15-2, entry 8)	IV Accrual of unrecorded revenues. Illustration: Interest revenue earned but not yet collected by a financial institution

Exhibit 15-3**Four Major Types of Accounting Adjustments Before Preparation of Financial Statements**

Accrued expenses, such as accrued wages payable, arise when payment follows the rendering of services. Other examples of accrued expenses include sales commissions, property taxes, income taxes, and interest on borrowed money. In all of these, the payment generally comes after the company recognizes the expense. Consider interest expense, which is an amount paid for the use of money. It is similar to the rent you pay for the use of buildings or automobiles. The interest accumulates (accrues) as time unfolds, regardless of when the company actually pays the interest in cash. So when Intel Corporation showed interest expenses of \$629 million in note 6 to its 2020 financial statements, it means that the company accrued \$629 million of interest that year, not necessarily that it paid this amount in cash.

Adjustment Type IV: Accrual of Unrecorded Revenues

The final type of adjustment, the recognition of **accrued revenues**—revenues that a company has earned but has not yet received in cash—does not appear in Exhibit 15-2. It is the mirror image of the accrual of unrecorded expenses. Suppose Security State Bank lends \$50,000 in cash to Stora Exor on a three-month promissory note with interest at 1% per month payable at the end of the three months. The following tabulation shows the effect of the adjustment for interest at the end of the first month ($0.01 \times \$50,000 = \$500$) on both Stora Exor (the accrual of unrecorded expenses, adjustment Type III covered in the previous section) and Security State Bank (the accrual of unrecorded revenues, the subject of this section):

No cash changes hands at the end of the first month, but Stora Exor records interest expense and Security State Bank records interest revenue.

This completes our discussion of the four types of adjustments to account for implicit transactions. We summarize these in Exhibit 15-3, which shows accruals of expenses or revenues in the columns and the timing of the accrual compared to the cash flows in the rows.

accrued revenues

Revenues that a company has earned but has not yet received in cash.

Making Managerial Decisions

The manager of the video games division of a large electronics firm complained, “I don’t understand all this accrual stuff. Why can’t you just measure my performance based on cash in and cash out?” Provide a brief answer to this question.

Answer

Accrual accounting more accurately matches accomplishment with effort. When you buy a machine that will last five years, do you think the entire cost of the machine should be

charged against your performance at the time of purchase? Or when you sell a carton of video game consoles on credit to a longstanding customer who is virtually certain to pay, should your credit for the sale await eventual collection of the cash? Accrual accounting gives you credit for accomplishments when you achieve them and charges for the expenses associated with those accomplishments. Thus, it provides a much better measure of performance than does “cash in and cash out.”

Objective 5

Explain the nature of dividends and retained earnings.

cash dividends (dividends)
 Distributions of cash to stockholders that reduce retained earnings.

Dividends and Retained Earnings

We have now covered all the entries in Exhibit 15-2 that show how revenues increase and expenses decrease the retained earnings portion of stockholders' equity. Now, let's look at transaction 9, which shows another type of transaction that decreases retained earnings—payment of dividends:

9. Cash dividends of \$18,000 were declared by the board of directors and disbursed to stockholders on April 29.

Dividends Are Not Expenses

Cash dividends (often called simply **dividends**) are distributions of cash to stockholders. Dividends reduce retained earnings, but they are not expenses like rent and wages. Companies do not deduct them from revenues when measuring income because dividends do not help to generate sales or conduct operations. Cash dividends simply distribute assets (cash) to the owners of those assets (stockholders). They reduce both assets (cash) and owners' claims on those assets (retained earnings).

A company's board of directors decides when to pay dividends and how much to pay. The amount of cash dividends declared by the board of directors of a company depends on many factors. A company's cash position and future needs for cash to pay debts or to purchase additional assets are usually more important than the balance in retained earnings. A company with a large retained earnings balance but little cash will find it difficult to pay dividends. Many companies try to maintain a stable dividend policy, paying dividends consistently even if they encounter a few years of little or no net income. For example, **General Mills** has paid shareholder dividends, uninterrupted and without reduction, for 112 consecutive years.

Nature of Retained Earnings

Let's examine the retained earnings account in more detail. On p. 638 we explained that you can think of the entire right-hand side of the balance sheet equation as claims against the total assets. The liabilities are the claims of creditors. The stockholders' equity represents the claims of owners arising out of their initial investment (paid-in capital) and subsequent profitable operations (retained earnings). On December 26, 2020, Intel Corporation had retained earnings of \$56,233 million, around 2.2 times its paid-in capital of \$25,556 million. As a company grows, the retained earnings account can soar if the company does not pay large dividends. Retained earnings is frequently the largest stockholders' equity account, especially for older companies. For example, General Electric had retained earnings of \$87,732 million on December 31, 2019, compared to paid-in capital of less than \$1 billion. In contrast, Amgen, a biotech company that had huge investments before it began generating any profits, had paid-in capital of \$31.5 billion and a retained deficit (negative retained earnings) of \$21.3 billion. Note that the company's retained deficit is caused by payments of dividends and repurchases of common stock and not by net losses.

Some users of financial statements have the mistaken impression that retained earnings represents a pot of cash awaiting distribution to stockholders. Rather, retained earnings (and also paid-in capital) is a general claim against, or undivided interest in, total assets, not a specific claim against cash or against any other particular asset. Do not confuse the assets themselves with the claims of stockholders against the assets.

We can illustrate this for Stora Exor by looking at cash and retained earnings at three points in time (from the top line and bottom line of Exhibit 15-1 on p. 639, and the bottom line of Exhibit 15-2 on p. 646):

	Cash	Retained Earnings
February 28, 20X2	\$100,000	\$ 0
March 31, 20X2	27,000	29,000
April 30, 20X2	70,000	18,400

On February 28, Stora Exor had \$100,000 in cash (all from investments by stockholders) and no retained earnings because Stora Exor had not yet begun operations and, thus, had generated no profits or losses. By March 31, cash had fallen by \$73,000 to \$27,000, primarily because the company had used cash to buy inventories. Meanwhile, retained earnings increased by \$29,000 because of profitable operations. Finally, during April, cash increased by \$43,000

(mainly because Stora Exor began to collect its accounts receivable), while retained earnings fell by \$10,600, mainly because Stora Exor paid more dividends than it earned in net income. You can see that cash can increase while retained earnings decreases, and vice versa. It is clear that there is no direct relationship between retained earnings and available cash.

Preparing Financial Statements

We will use the data from the balance sheet equation in Exhibit 15-2 to prepare Stora Exor's April financial statements. The balance sheet and income statement, shown in Exhibits 15-4 and 15-5, are similar to those illustrated earlier. The balance sheet uses the totals at the bottom of Exhibit 15-2, and the income statement uses the revenue and expense entries in the retained earnings column.

Exhibit 15-6 shows the linkage between the balance sheet and income statement. It lists the items affecting retained earnings during April. It starts with the beginning balance, adds net income for the period, and deducts cash dividends, to arrive at the ending balance. This explanation of changes in retained earnings is often included as part of a **statement of stockholders' equity**, which shows the changes in each individual stockholders' equity account (including retained earnings) during the period. Accountants call the income statement in Exhibit 15-5 a "multiple-step" statement because it includes a subtotal for gross profit. As described in Chapter 2 on p. 76, gross profit (sometimes called gross margin) is the excess of sales over the cost of the inventory that was sold. A "single-step" statement would merely list all the expenses, including cost of goods sold, and deduct the total from sales. More complex multiple-step income statements may have additional subtotals.

Objective 6

Select relevant items from a set of data and assemble them into a balance sheet and an income statement.

statement of stockholders' equity

A statement that shows the changes in each stockholders' equity account during the period.

Assets		Liabilities and Stockholders' Equity		
Cash	\$ 70,000	Liabilities		
Accounts receivable	102,000	Accounts payable	\$ 71,000	
Inventory	20,000	Accruable wages payable	600	
Prepaid rent	1,000	Unearned revenue	3,000	\$ 74,600
		Stockholders' equity		
		Paid-in capital	\$100,000	
		Retained earnings	18,400	118,400
Total assets	<u>\$193,000</u>	Total liabilities and stockholders' equity		<u>\$193,000</u>

Exhibit 15-4

Stora Exor Hardware

Balance Sheet as of April 30, 20X2

Sales	\$85,000	
Cost of goods sold	<u>70,000</u>	
Gross profit	\$15,000	
Operating expenses		
Rent	\$1,000	
Wages	<u>6,600</u>	<u>7,600</u>
Net income		<u>\$7,400</u>

Exhibit 15-5

Stora Exor Hardware

Income Statement for the Month Ended April 30, 20X2

Retained earnings, March 31, 20X2	\$29,000
Net income for April	<u>7,400</u>
Total	\$36,400
Dividends	<u>18,000</u>
Retained earnings, April 30, 20X2	<u>\$18,400</u>

Exhibit 15-6

Stora Exor Hardware

Changes in Retained Earnings for the Month Ended April 30, 20X2

Sole Proprietorships and Partnerships

Objective 7

Distinguish between the reporting of corporate owners' equity and the reporting of owners' equity for partnerships and sole proprietorships.

sole proprietorship

A business entity with a single owner.

partnership

An organization that joins two or more individuals together as co-owners.

To this point, the discussion has focused on the accounting for a corporation. However, the basic accounting concepts also apply to a **sole proprietorship**—a business entity with a single owner—or a **partnership**—an organization that joins two or more individuals together as co-owners. Accounting for assets, liabilities, revenues, and expenses is identical for all forms of businesses. The basic concepts relating to owners' equity are also identical, except that financial statements for proprietorships and partnerships rarely make distinctions between paid-in capital and retained earnings. Let's compare the owners' equity section of Stora Exor as of April 30 to similar presentations for a sole proprietorship owned by Alice Walsh or a partnership owned equally by Susan Zingler and John Martin:

Owners' Equity for a Corporation	
Stockholders' equity	
Capital stock (paid-in capital)	\$100,000
Retained earnings	18,400
Total stockholders' equity	<u>\$118,400</u>
Owners' Equity for a Sole Proprietorship	
Alice Walsh, capital	<u>\$118,400</u>
Owners' Equity for a Partnership	
Susan Zingler, capital	\$ 59,200
John Martin, capital	<u>59,200</u>
Total partners' equity	<u>\$118,400</u>

This example shows that, unlike corporations, sole proprietorships and partnerships do not distinguish between paid-in capital (i.e., amounts invested by owners) and retained earnings. Instead, they typically accumulate a single amount for each owner's original investment, subsequent investments, share of net income, and withdrawals.

net worth

A synonym for owners' equity.

Some accountants call owners' equity **net worth**. This is unfortunate because naïve users of financial statements might interpret this as meaning that owners' equity is a measure of the market value of the business to an outside buyer. It is not. The market value of a business depends on future profit projections that may have little relationship to the existing assets, liabilities, or stockholders' equity of the entity as measured by its accounting records. For example, General Mills' shareholders' equity (or net worth) in June 2011, was just over \$6.6 billion, while its market value was approximately \$37 billion.

Making Managerial Decisions

When entrepreneurs start a company, they must decide whether the company will be a sole proprietorship, a partnership, or a corporation. As the accountant for such a start-up company, explain how the accounting system would differ for each of the three types of organizational structures.

Answer

Most important aspects of the accounting system are the same for all three types of organizational structures. The only difference

will be in the owners' equity section. For a sole proprietorship, there is only one owners' equity account. A partnership has one owners' equity account for each partner. This requires the accountant to attribute all increases or decreases in owners' equity to a particular partner. For example, income will be split among the partners according to a predetermined formula. Finally, a corporation divides owners' equity into paid-in capital and retained earnings to distinguish resources contributed by the owners from those generated by profitable operations.

Generally Accepted Accounting Principles

Accounting is commonly misunderstood as being a precise discipline that produces exact measurements of a company's financial position and performance. As a result, many individuals regard accountants as little more than mechanical tabulators who grind out financial reports after processing an imposing amount of detail in accordance with stringent predetermined rules. Although accountants take methodical steps with masses of data, their rules of measurement allow much room for judgment—accounting is more an art than a science. These judgments are guided by a set of principles on which there is general agreement, not on rules that can be “proved.” These principles and procedures that together make up accepted accounting practice at any given time—generally accepted accounting principles (GAAP)—were introduced in Chapter 1 on p. 22.

Auditor's Independent Opinion

To ensure that companies abide by GAAP, the financial statements of publicly held corporations are subject to an independent audit. An **audit** is an examination or in-depth inspection of financial statements and companies' records made by an independent registered public accounting firm in accordance with auditing standards approved by the Public Company Accounting Oversight Board (PCAOB) in the United States. The PCAOB is a part of the **Securities and Exchange Commission (SEC)**, a government agency that regulates U.S. financial markets, including financial reporting. After auditing a company's financial statements, an accounting firm issues an **independent opinion**—the accountant's assurance that management's financial statements are in conformity with GAAP. The audit opinion typically includes the following key phrasing found in General Mills' 2020 annual report:

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the company as of May 31, 2020 and May 26, 2019, and the results of its operations and its cash flows for each of the fiscal years in the three-year period ended May 31, 2020, in conformity with U.S. generally accepted accounting principles.

Audit opinions are not infallible guarantees of financial truth. Why? Financial statements may seem precise because their numbers all add up. However, they are the result of a complex measurement process that rests on a large number of assumptions and conventions. Further, it is impossible for auditors to examine every bit of data that goes into the financial statements.

Although audits are not perfect, financial statement users rely on them as being honest and impartial assessments of the financial statements. However, in the last decade the shareholders of several companies, including **Enron**, **WorldCom**, **Washington Mutual**, **Fannie Mae**, and **Tyco**, accused auditors of being either negligent or deceitful (and sometimes both). These companies experienced financial troubles after receiving a “clean bill of health” from their auditors. In response to the scandals in the early 2000s, the U.S. Congress passed the Sarbanes-Oxley Act (SOX). SOX required independent audits of companies' internal control systems—the policies that protect and ensure efficient use of a company's assets. One function of internal controls is to make sure that a company's financial records and reports are accurate. Management must file a statement attesting to the quality of its internal control system, and auditors examine both the system and management's statement about it. Then they issue an opinion, such as the following one about General Mills:

We also have audited the company's internal control over financial reporting as of May 31, 2020, based on criteria established in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission... We conducted our audits in accordance with the standards of the PCAOB... [I]n our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of May 31, 2020.

Accounting Standard Setters

Auditors and the investing public rely on GAAP determined by the **Financial Accounting Standards Board (FASB)** in the United States and the **International Accounting Standards Board (IASB)** in much of the rest of the world. The FASB is an independent creation of the

Objective 8

Explain the role of auditors in financial reporting and how accounting standards are set.

audit

An “examination” or in-depth inspection of financial statements and companies' records made in accordance with auditing standards.

Securities and Exchange Commission (SEC)

A government agency that regulates the financial markets in the United States, including financial reporting.

independent opinion

The accountant's assurance that management's financial statements are in conformity with GAAP.

Financial Accounting Standards Board (FASB)

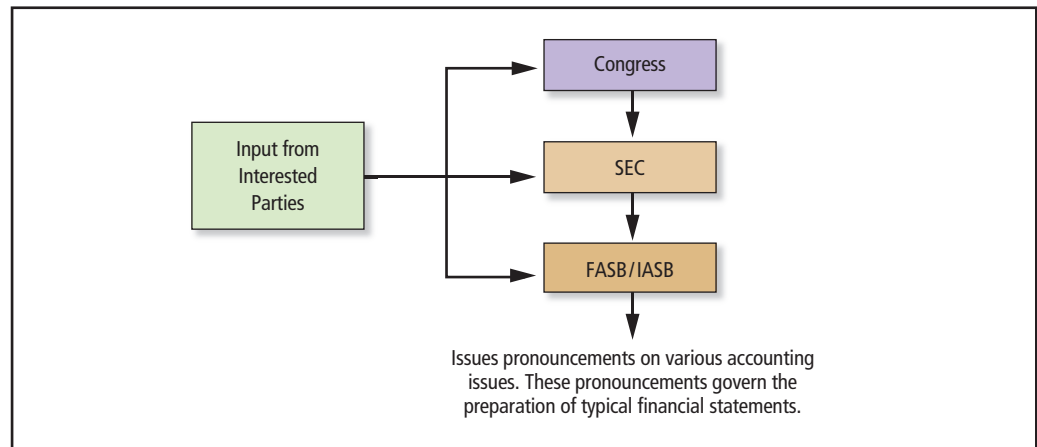
The body that sets GAAP in the United States.

International Accounting Standards Board (IASB)

The group that establishes international GAAP.

private sector. “The collective mission of the FASB, the GASB, and the FAF is to establish and improve financial accounting and reporting standards to provide useful information to investors and other users of financial reports and educate stakeholders on how to most effectively understand and implement those standards.” The IASB is a similar independent organization whose pronouncements, called International Financial Reporting Standards (IFRS) as discussed in Chapter 1 on p. 22, define GAAP in the European Union and more than 100 other countries. In 2008 the SEC started accepting financial statements based on IFRS for non-U.S. companies whose stock is traded in U.S. capital markets. It also defined a “road-map” for eventual adoption of international standards by U.S. companies as well. The FASB and IASB continue to work together to improve comparability and consistency in global financial reporting.

The SEC has the ultimate responsibility for specifying GAAP for U.S. companies with publicly traded stock. However, the SEC has informally delegated much rule-making power to the FASB. If and when the pending move to international standards occurs, such power will also be delegated to the IASB. This public sector–private sector relationship may be sketched as follows:



The FASB and IASB issue pronouncements on accounting issues that govern the preparation of financial statements. However, both Congress and the SEC can overrule the standard setters if they disagree with a particular accounting standard. Such disagreements are rare because setting accounting standards usually involves a long due process that includes many discussions among the affected parties: public regulators (Congress and SEC in the United States, the European Commission and others abroad), private regulators (FASB and IASB), companies, the public accounting profession, representatives of investors, and other interested groups. In the United States, Congress and the SEC generally make their opinions known long before the FASB or IASB approves standards.

Ethics

Regardless of what the accounting standards say, they do no good if accountants fail to follow them. A hallmark of the accounting profession has been its ethics and integrity. Most accountants and auditors are highly ethical and truthfully report their financial results in accordance with GAAP. The media have feasted on a few allegations of untruthful reporting in companies such as **Washington Mutual**, **AIG**, and **Freddie Mac**, but these are the exceptions. The Business First box above highlights some of the companies that have outstanding records for corporate citizenship. Confidence in financial information is important to the smooth functioning of the world’s capital markets, and confidence in financial statements depends on the competence and integrity of accountants and auditors. There are many professional organizations of accountants across the world:

- The Chinese Institute of Certified Public Accountants established a China Ethics Standards Board for CPAs (CESB) to issue ethical requirements for its members.
- The Institute of Chartered Accountants of India (ICAI) established ethical requirements in its Code of Ethics, developed in 2009.
- In Australia, the Accounting Professional and Ethical Standard Board (APESB) sets the ethical requirements for all professional accountants in the country.

Business First

Corporate Citizenship Awards

The media have criticized many businesses in the past for their greed and lack of ethics. While some companies deserve such criticism, many more go out of their way to prove their integrity and good citizenship through their dealings with customers, suppliers, employees, and the community. To recognize some of these activities a corporate citizen ranking was established in 1999 (back then by the *Business Ethics Magazine*). This ranking evaluates the “1,000 largest publicly traded U.S. companies” and names the 100 best corporate citizens each year. **Intel Corp.**, for example, has made the list in all 22 years and has been listed in the top 10 consecutively since the 2012 ranking. In 2021, the top 10 companies were (listed from rank one to ten) **Owens Corning, General Mills, HP, Cisco Systems, Intel Corporation, Newmont Corporation, Accenture, Ecolab, AT&T, and Citigroup**. What these companies have in common with those included on past lists is a commitment to social responsibility, including an assessment of concern for stakeholders in eight areas: climate change, employees, environment, ESG performance, financial, governance, human rights, stakeholders and society.

CRO also maintains that good corporate social policies can lead to improved financial performance. According to an analysis of the 2009 “100 Best,” companies on the list outperformed the companies not on the list by 26% in the last 3 years. Especially in the recession of 2008–2009, which was caused

partly by falling trust in businesses and their leaders, companies found it important to make transparent their commitment to social responsibility. This was made clear by Richard Clark, CEO of Merck: “We’ve really stepped back and made sure that we are more transparent about our business. I think we have always done good things, but I don’t know we have always communicated them internally or externally the best way we should. It’s even more important today because we are operating in a very difficult environment, and our reputation is being challenged. We need to go the extra mile now so our stakeholders can see what we do and regain their trust.” Sandra Leung, senior vice president of Bristol Myers-Squibb explained why corporate social responsibility can lead to a more productive workforce: “People like working at a place that has a vision and has respect for the environment as well as sustainability. They have respect for a company where they know their concerns will be not only heard but addressed.”

Corporate social responsibility cannot rescue a failing company. But it can be an important competitive advantage, as Dan Henkle, senior vice president of social responsibility of Gap, said: “Making our company a good corporate citizen and increasingly transparent is a competitive imperative. It’s that simple.”

Sources: LaMotta, Lisa, “The 100 Best Corporate Citizens,” *Forbes.com* (March 6, 2009); and *3BL Media* Web site (<https://100best.3blmedia.com/>).

- Members of the South African Institute of Chartered Accountants (SAICA) follow the International Ethics Standards Board for Accountants (IESBA) Code of Ethics.
- In the United States, the American Institute of CPAs (AICPA), has a code of professional conduct that specifies the ethical obligations of accountants.

Source: The International Federation of Accountants, <https://www.ifac.org/what-we-do/global-impact-map> (date of access February 9, 2022)

The accounting problems in past years have just highlighted the importance of accurate financial information and, therefore, the importance of recognizing and adhering to these ethical standards.

Three Measurement Principles

GAAP in the United States is based on a conceptual framework that the FASB first established in the 1970s and is currently revising in a joint effort with the IASB. Among the most important concepts are three broad measurement or valuation principles that underlie accrual accounting: recognition (when to record revenue), matching and cost recovery (when to record expense), and the stable monetary unit (what unit of measure to use).

Recognition

The first principle, **recognition**, introduced on p. 640, specifies when a company should record revenue in the accounting records. We indicated that companies recognize revenue when it is both earned and realized or realizable. Consequently, most companies recognize revenue when they deliver goods or services to customers. However, in some industries revenue recognition is not so straightforward. Suppose **Oracle** sells some software to a client and promises to

Objective 9

Identify how the measurement principles of recognition, matching and cost recovery, and stable monetary unit affect financial reporting.

recognition

The principle that specifies when a company should record revenue in the accounting records.

help until the installation is complete. When has Oracle earned the revenue? At the point of sale? At the time the installation is complete? Or sometime between? This might be further complicated if the customer is a small start-up company that may run out of cash before it is able to pay for the software. How certain must Oracle be that it will receive payment before it can recognize the revenue? These are judgment issues, and Oracle's accountants together with its auditor will decide when earning and realization are sufficiently complete to recognize the revenue.

Matching and Cost Recovery

matching

The linking of revenues (as measured by the selling prices of goods and services delivered) with the expenses incurred to generate them (as measured by the cost of goods and services used).

The timing of revenue recognition is important because it leads to the recording of expenses through the concept of **matching**—the linking of revenues (as measured by the selling prices of goods and services delivered) with the expenses incurred to generate them (as measured by the cost of goods and services used). Accountants apply matching as follows:

1. Identify the revenue recognized during the period.
2. Record expenses that relate directly to the recognized revenue, such as sales commissions or costs of goods sold.
3. Record expenses that are costs of operations during a specific time period that have no measurable benefit for a future period and, thus, must be linked to the current period's revenues. Examples are administrative salaries, wages of janitors, and costs of supplies used.

cost recovery

A concept in which companies carry forward as assets such items as inventories, prepayments, and equipment because they expect to recover the costs of these assets in the form of cash inflows (or reduced cash outflows) in future periods.

The heart of recognizing expense is the **cost recovery** concept. That is, companies carry forward as assets such items as inventories, prepayments, and equipment. Why? Because companies expect to recover the costs of these assets in the form of cash inflows (or reduced cash outflows) in future periods. At the end of each period, accountants examine evidence to assure themselves that they should not write off these assets—these unexpired costs—as an expense of the current period. For instance, in our chapter example, Stora Exor carried forward the asset Prepaid Rent of \$2,000 on March 31 because the accountant is virtually certain that it represents a future benefit. Why? Because Stora Exor is planning to use the rented facilities in April and May and without the prepayment, Stora Exor would have to pay \$2,000 for rent in April and May. So the presence of the prepayment is a benefit in the sense that it reduces future cash outflows by \$2,000.

Stable Monetary Unit

The monetary unit (for example, the dollar in the United States, the yen in Japan, or the euro in the European Union) is the principal means for measuring assets, liabilities, and stockholders' equity. It is the common denominator for quantifying the effects of a wide variety of transactions.

Such measurement assumes that the monetary unit—the dollar, for example—is an unchanging yardstick. Yet, we all know that a 2020 dollar does not have the same purchasing power as a 2000 or 1990 dollar. Therefore, users of accounting statements that include dollars from different years must recognize the limitations of the basic measurement unit.

Some accountants have criticized the FASB and IASB for not making explicit and formal adjustments to remedy the defects of the measuring unit. Supporters of the status quo maintain that price-level adjustments would lessen objectivity and would be confusing to users. They claim that critics have exaggerated the price-level problem and that the adjustments would not significantly affect the vast bulk of corporate statements. Why? Because many accounts, such as cash, receivables, and payables, are already in current or nearly current dollars, and inflation rates have been low in recent years.

On the other hand, although inflation rates in developed countries have recently run only -0.1% – 3.3% , those in some developing countries have been significantly higher and therefore have a large effect, especially on long-lived assets. In addition, companies in countries with hyperinflation have felt the need to inflation-adjust their accounting numbers for them to make any sense at all. However, even low inflation rates can create large changes in value when the inflation persists over a long period. The most troublesome aspect of adjusting accounting numbers for inflation, however, is how to interpret the results after we measure them. Investors and managers in the United States are accustomed to the conventional statements. The intelligent interpretation of statements adjusted for changes in the price level would require extensive changes in the habits of users, and, therefore, price-level adjustment faces widespread opposition. Rather than explicitly adjusting values for inflation, most users prefer to live with an “elastic” measuring stick.

The body of GAAP contains more than the measurement conventions just discussed. We introduce some other major concepts, including going concern, objectivity, materiality, and cost benefit, in Appendix 15A. In Chapter 16, we will look in more detail at the income statement and balance sheet and introduce the third major financial statement, the statement of cash flows.

Summary Problem for Your Review

PROBLEM

Suppose a friend approaches you after learning that you have taken an accounting course. They make the following remarks regarding financial statements. Do you agree or disagree? Explain fully.

1. “If I purchase 100 shares of the outstanding common stock of **Intel**, I invest my money directly in that corporation. Intel must record that transaction.”
2. “Sales revenue is the cash coming in from customers and the various expenses show the cash going out for goods and services. The difference is net income.”
3. Consider the following 2019 accounts of Nike (in millions):

Paid-in capital	\$7,166
Retained earnings	\$1,643
Other	\$ 231
Total stockholders' equity	<u>\$9,040</u>

A shareholder might comment, “Why can’t Nike pay higher wages and dividends? It can use its \$1.6 billion of retained earnings to do so.”

4. “If Nike were sold to another company, the Nike shareholders would receive \$9,040 billion, the total shareholders’ equity.”

SOLUTION

1. Money is invested directly in a corporation only upon original issuance of the stock by the corporation. For example, a corporation might issue 100,000 shares of stock at \$80 per share, bringing in \$8 million to the corporation. This is a transaction between the corporation and the stockholders. It affects the corporate financial position:

Cash	\$8,000,000	Stockholders' equity	\$8,000,000

In turn, an original stockholder (A) may later sell 100 shares of that stock to another individual (B) for \$92 per share. This is a private transaction; no cash comes to the corporation. The corporation records the fact that B now owns the 100 shares originally owned by A, but the corporate financial position is unchanged. Accounting focuses on the business entity; the private dealings of the owners have no direct effect on the financial position of the entity and hence are unrecorded (except for detailed records of the owners’ identities).

2. Cash receipts and disbursements are not the fundamental basis for the accounting recognition of revenues and expenses. If a company delivers goods or renders services to a customer, a receivable is generally sufficient justification for recognizing revenue. Similarly, if a company uses up goods or services, an obligation in the form of a payable is justification for recognizing expense. This approach to the measurement of net income is the accrual basis. Companies recognize revenue as they earn and realize it. They recognize expenses or losses when they use goods or services in obtaining revenue (or when they can no longer justify carrying forward such goods or services as an asset because they have no potential future benefit). Companies deduct the expenses and losses from the revenue, and the result of this matching process is net income, the net increase in stockholders’ equity from the conduct of operations.
3. Retained earnings is not cash. It is a stockholders’ equity account that represents the accumulated increase in ownership claims because of profitable operations less the decrease from payment of cash dividends. The erroneous linking of retained earnings and cash is a common misinterpretation. As a general rule, there is no direct relationship between the

individual items on the two sides of the balance sheet. For example, Nike had \$4,466 million of cash and equivalents when its retained earnings were nearly \$1,643 million. IBM has an even larger difference between cash and retained earnings, \$8,172 million in cash in cash and cash equivalents, \$162,954 million in retained earnings.

4. **Stockholders' equity is not a market value.** It is the difference between assets and liabilities measured at historical cost expressed in an unchanging monetary unit. Intervening changes in markets and general price levels in inflationary times may mean that financial statements list assets at amounts far below their market values. Market values for publicly traded companies are determined by daily trading conducted in the financial marketplaces, such as the New York Stock Exchange. Numerous factors affect these values, including the expectations of (a) price appreciation and (b) cash flows in the form of dividends. The focus is on the future; investors examine the present and the past only as clues to what may be forthcoming. Therefore, the present stockholders' equity is usually of only incidental concern. For example, stockholders' equity for Nike in 2020 was slightly more than \$10 per share, while the company's market price per common share was more than \$100.

Highlights to Remember

1. **Read and interpret basic financial statements.** This chapter introduces two basic financial statements: the balance sheet (or statement of financial position) and income statement. Their main elements are assets, liabilities, owners' equity, revenues, and expenses. Income statement and balance sheets are linked because the revenues and expenses appearing on an income statements are components of stockholders' equity on the balance sheet. Revenues increase stockholders' equity, and expenses decrease stockholders' equity.
2. **Analyze typical business transactions using the balance sheet equation.** The balance sheet equation provides a framework for recording accounting transactions: $\text{assets} = \text{liabilities} + \text{owners' equity}$.
3. **Distinguish between the accrual basis of accounting and the cash basis of accounting.** The accrual basis is the heart of accounting. Under accrual accounting, companies recognize revenues as they earn and realize them, and they record expenses as they use resources, not necessarily when they receive or pay cash. Do not confuse expense with the term *cash payment*, or revenue with the term *cash receipt*.
4. **Make adjustments to the accounts under accrual accounting.** At the end of each accounting period, companies make adjustments so that they can present financial statements on an accrual basis. The major adjustments are for (a) expiration of unexpired costs, (b) recognition (earning) of unearned revenues, (c) accrual of unrecorded expenses, and (d) accrual of unrecorded revenues.
5. **Explain the nature of dividends and retained earnings.** Dividends are not expenses; they are distributions of assets that reduce ownership claims. Similarly, retained earnings is not cash; it is a claim against total assets.
6. **Select relevant items from a set of data and assemble them into a balance sheet and an income statement.** After a company records transactions and makes adjustments, it can compile the data into financial statements. The balances in the accounts comprise the balance sheet. The changes in the retained earnings account form the basis for the income statement. Therefore, the changes in retained earnings link the income statement with the balance sheet.
7. **Distinguish between the reporting of corporate owners' equity and the reporting of owners' equity for partnerships and sole proprietorships.** Entities can be organized as corporations, partnerships, or sole proprietorships. The type of organization does not affect most accounting entries. Only the owners' equity section will differ among organizational types.

8. **Explain the role of auditors in financial reporting and how accounting standards are set.** Auditors examine companies' records and financial statements to ensure they comply with GAAP. Accounting standards are set in the United States by the Financial Accounting Standards Board (FASB) and in most other countries by the International Accounting Standards Board (IASB).
9. **Identify how the measurement principles of recognition, matching and cost recovery, and stable monetary unit affect financial reporting.** Three major conventions that affect accounting are recognition, matching and cost recovery, and stable monetary unit. Recognition determines when companies record revenues in the income statement, matching and cost recovery specify when to record expenses, and stable monetary units justify use of a unit of currency (the dollar in the United States) to measure accounting transactions.

Appendix 15A: Additional Accounting Concepts

This appendix describes several concepts that are prominent parts of the body of GAAP: continuity or going concern, relevance and faithful representation, materiality, conservatism, and cost-benefit.

The Continuity or Going Concern Convention

The **continuity** or **going concern convention** is the assumption that an organization will continue to exist and operate. This notion implies that a company will use existing resources, such as plant assets, to fulfill the general purposes of a continuing entity rather than sell them in tomorrow's real estate or equipment markets. It also implies that the company will pay existing liabilities at maturity in an orderly manner.

Suppose some old specialized equipment has a net book value (defined on p. 258 as original cost less accumulated depreciation) of \$10,000, a replacement cost of \$12,000, and a realizable value of \$7,000 on the used-equipment market. Accountants often cite the continuity convention as the justification for adhering to net book value, \$10,000 in this example, as the primary basis for valuing assets such as inventories, land, buildings, and equipment. Some critics of these accounting practices believe that such valuations are not as informative as their replacement cost (\$12,000) or their realizable values on sale (\$7,000). Defenders of using \$10,000 as an appropriate asset valuation argue that a going concern will generally use the asset as originally intended. Therefore, the net book value (the acquisition cost less depreciation) is the preferable basis for accountability and evaluation of performance. Hence, other values are not germane because the company is using, not replacing or disposing of, the asset.

The opposite view to this going concern or continuity convention is an immediate-liquidation assumption, whereby a company values all items on a balance sheet at the amounts appropriate if it were to sell its assets and pay off its liabilities in piecemeal fashion within a few days or months. A company would use this liquidation approach to valuation only when it is in severe financial trouble.

Relevance and Faithful Representation

Relevance and faithful representation are the two main qualities that make accounting information useful for decision making. **Relevance** refers to whether the information makes a difference to a decision maker. If information has no impact on a decision, it is not relevant to that decision. The two things that can make information relevant are predictive value and confirmatory value. Information has **predictive value** if users of financial statements can use the information to help them form their expectations about the future. Information has **confirmatory value** if it can either confirm or change existing expectations.

Users of financial statements want assurance that management has accurately and truthfully reported its financial results. Consequently, in addition to relevance, accountants want information to exhibit **faithful representation**—that is, it should truly capture the economic substance of the transactions, events, or circumstances it describes. Faithful representation requires information to be complete, neutral, and free from material errors. Information is complete if it contains all the information necessary to faithfully represent an economic phenomenon. It is neutral if it is unbiased—that is, the information is not slanted to influence behavior in a particular direction. Finally, information should be free from material errors, which means that estimates are based on appropriate inputs, which in turn are based on the best information available.

Objective 10

Define continuity, relevance, faithful representation, materiality, conservatism, and cost-benefit.

continuity convention (going concern convention)

The assumption that an organization will continue to exist and operate.

relevance

The capability of information to make a difference to the decision maker.

predictive value

A quality of information that allows it to help users form their expectations about the future.

confirmatory value

A quality of information that allows it to confirm or change existing expectations.

faithful representation

A quality of information that ensures that it captures the economic substance of the transactions, events, or circumstances it describes. It requires information to be complete, neutral, and free from material errors.

comparability

A characteristic of information produced when all companies use similar concepts and measurements and use them consistently.

consistency

Using the same accounting policies and procedures from period to period.

verifiability

A characteristic of information that can be checked to ensure it is correct.

Timeliness

The quality that information must reach decision makers while it can still influence their decisions.

understandable

A criterion that requires accountants to present information clearly and concisely.

materiality

The accounting convention that justifies the omission of insignificant information when its omission or misstatement would not mislead a user of the financial statements.

conservatism convention

Selecting the method of measurement that yields the gloomiest immediate results.

Four characteristics can enhance both relevance and faithful representation. The first such characteristic is **comparability**—requiring all companies to use similar concepts and measurements and to use them consistently. Comparability requires **consistency**, using the same accounting policies and procedures from period to period. The second enhancing characteristic is **verifiability**, which means that information can be checked to ensure it is correct. That is, knowledgeable and independent observers would agree that the information presented has been appropriately measured. **Timeliness** is obviously desirable. Information must reach decision makers while it can still influence their decisions. Finally, information should be **understandable**, which requires accountants to present information clearly and concisely.

Materiality

Because accounting is a practical art, accountants often temper their reports by applying judgments about **materiality**. A financial statement item is material if its omission or misstatement would be likely to mislead a user of the financial statements. Items with a sufficiently small value are immaterial. For example, accountants write off as expenses many small outlays that they should theoretically record as assets. Why? Because they are small enough to be immaterial. For example, many corporations have a rule that requires the immediate write-off to expense of all outlays under a specified minimum of, for example, \$100, regardless of the useful life of the asset acquired. In such a case, a company might acquire coat hangers that will last many years but never add them to its balance sheet as assets. Why? The resulting \$100 understatement of assets and stockholders' equity would be too trivial to affect any user decisions. The cost of recording and annually depreciating a \$100 asset is greater than the benefit of more accurate financial statements.

When is an item material? There will probably never be a definitive answer. What is trivial to **IBM** may be material to a two-person start-up company. A working rule is that an item is material if its proper accounting would probably affect the decision of a knowledgeable user. In sum, although materiality is an important convention, it is difficult to use anything other than prudent judgment to tell whether an item is material.

Conservatism Convention

Conservatism is a hallmark of accounting. The **conservatism convention** means selecting the method of measurement that yields the gloomiest immediate results. This attitude affects such working rules as "Anticipate no gains, but provide for all possible losses," and "If in doubt, write it off."

Accountants have traditionally regarded the historical costs of acquiring an asset as the ceiling for its valuation. Asset values may be increased (written up) only when the asset is sold or exchanged, but the asset value may be reduced (written down) without an exchange. For example, companies write down inventories (and recognize a loss) when replacement costs decline, but they never write them up when replacement costs increase.

Critics maintain that conservatism is inherently inconsistent. If replacement market prices are sufficiently objective and verifiable to justify write-downs, why aren't they just as valid for write-ups? Furthermore, the critics maintain that conservatism is not a fundamental concept. Accounting reports should try to present the most accurate picture feasible—neither too high nor too low. Accountants defend their attitude by saying that erring in the direction of conservatism would usually have less severe economic consequences than erring in the direction of overstating assets and net income.

In a way, conservatism is a double-edged sword. Conservatism that leads to understating net income in one period subsequently creates an overstatement of net income in a future period. For example, suppose a company writes down inventory from \$100 to \$80. The company's operating income falls by \$20 in the period of the write-down, but it increases by \$20 in the period it sells the inventory.

Cost-Benefit Criterion

Accounting systems vary in complexity from the minimum crude records kept to satisfy government authorities to the sophisticated budgeting and feedback systems that are at the heart of management planning and control. Recent innovations include huge, multimillion dollar enterprise resource planning (ERP) systems. As companies change their accounting systems, the potential benefits should exceed the additional costs. Often, the benefits are difficult to measure,

but the **cost-benefit criterion** at least implicitly underlies the decisions about the design of accounting systems. Sometimes, the reluctance to adopt suggestions for new ways of measuring financial position and performance is because of inertia. More often, it is because the apparent benefits do not exceed the costs of gathering and interpreting the information. Some companies, such as **Hershey Foods**, have found out too late that huge investments in accounting systems such as ERP sometimes do not deliver the benefits promised.

Appendix 15B: Using Ledger Accounts

This chapter focused on the balance sheet equation, the general framework used by accountants to record economic transactions. This appendix focuses on some of the main techniques that accountants use to record the transactions illustrated in the chapter.

The Account

To begin, consider how the accountant would record the Stora Exor transactions that you encountered in the chapter. Exhibit 15-1 (p. 639) showed their effects on the elements of the balance sheet equation:

	A		=	L	+	SE
	Cash	Inventory		Accounts Payable		Paid-in Capital
1. Initial investment by owners	+100,000		=			+100,000
2. Acquire inventory for cash	-75,000	+75,000	=			
3. Acquire inventory on credit		+35,000	=	+35,000		

This balance-sheet-equation approach emphasizes the concepts, but it can become unwieldy if many transactions occur. Changes in the balance sheet equation can occur many times daily. In large retail businesses, such as **Target**, **Costco**, and **Macy's**, thousands of repetitive transactions occur hourly. In practice, accountants use **ledger accounts** to keep track of how these transactions affect each particular asset, liability, revenue, expense, and so forth. We use simplified versions of ledger accounts called **T-accounts**. We call them T-accounts because they take the form of the capital letter **T**. Increases in the account go on one side of the vertical line of the T-account, and decreases go on the other side. Asset accounts have positive balances on the left side of the T-account. Entries on the left side increase the asset accounts and entries on the right side decrease them. Liabilities and stockholders' equity accounts have positive balances on the right-side. We increase them by recording entries on the right side and decrease them by recording entries on the left side. The following T-accounts illustrate the preceding transactions:

Assets			=	Liabilities + Stockholders' Equity		
Cash				Accounts Payable		
Increases		Decreases		Decreases		Increases
(1) 100,000		(2) 75,000				(3) 35,000
Bal. 25,000						
Inventory				Paid-in Capital		
Increases		Decreases		Decreases		Increases
(2) 75,000						(1) 100,000
(3) 35,000						
Bal. 110,000						

We made the T-account entries using a **double-entry system**, whereby each transaction affects at least two accounts. Each T-account is similar to a column in the balance sheet equation. To keep assets equal to liabilities plus stockholders' equity, the amount of the left-side entries to the T-accounts must always equal the amount of the right-side entries.

Each T-account summarizes the changes in a particular asset, liability, or stockholders' equity. We key each transaction in some way, such as by the numbering in parentheses used in

cost-benefit criterion

An approach that implicitly underlies the decisions about the design of accounting systems. As companies change their accounting systems, the potential benefits should exceed the costs of gathering and interpreting the information.

Objective 11

Use T-accounts, debits, and credits to record transactions.

ledger accounts

A method of keeping track of how transactions affect each particular asset, liability, revenue, and expense.

T-accounts

Simplified versions of ledger accounts that take the form of the capital letter **T**.

double-entry system

A method of record keeping in which each transaction affects at least two accounts.

this illustration or by date or both. This keying facilitates the rechecking (auditing) process by helping accountants trace transactions to their original sources. You can compute the balance of any account by totaling each side of the account and deducting the smaller total amount from the larger. Accounts exist to keep an up-to-date summary of the changes in specific assets, liabilities, and stockholders' equity. Accountants can prepare a balance sheet at any time if they keep the accounts up to date. The accounts contain all the necessary information. For example, the balance sheet for Stora Exor after the first three transactions is as follows:

Assets		Liabilities and Stockholders' Equity	
Cash	\$ 25,000	Liabilities	
Inventory	<u>110,000</u>	Accounts payable	\$ 35,000
		Stockholders' equity	
		Paid-in capital	<u>100,000</u>
Total assets	<u>\$135,000</u>	Total liabilities and stockholders' equity	<u>\$135,000</u>

General Ledger

general ledger

A collection of the group of accounts that supports the items shown in the major financial statements.

We show Stora Exor's general ledger in Exhibit 15-7. A **general ledger** is a collection of the group of accounts that supports the items shown in the major financial statements.¹ Exhibit 15-7 is merely a recasting of the facts that we analyzed in Exhibit 15-1. Study Exhibit 15-7 by comparing its analysis of each transaction against its corresponding analysis in Exhibit 15-1 on p. 639.

Debits and Credits

debit

An entry on the left side of an account.

credit

An entry on the right side of an account.

When placing transaction amounts in the appropriate accounts, accountants often use the technical terms debit and credit. **Debit** means one thing and one thing only—"left side of an account." **Credit** means one thing and one thing only—"right side of an account." Neither debit nor credit has a connotation of "good" or "bad." In our everyday conversation, we sometimes use the words *debit* and *credit* in a general sense that may completely diverge from their technical accounting uses. When you study accounting, forget these general uses of the words. Merely think right-side or left-side entries to T-accounts and whether the right side or left side increases or decreases the type of account you are analyzing.

For example, an accountant making an entry for transaction 4b would say "debit (or charge) Cost of Goods Sold \$100,000 and credit Inventory \$100,000." This is an abbreviated way of saying, "Place \$100,000 on the left (debit) side of the Cost of Goods Sold T-account and place \$100,000 on the right (credit) side of the Inventory T-account." Note that the total dollar amounts of the debits (entries on the left side of the account[s] affected) will always equal the total dollar amount of credits (entries on the right side of the account[s] affected) because the accounting equation must always stay in balance.

You can use *debit* and *credit* as verbs, adjectives, or nouns. The instruction "debit \$1,000 to cash" uses *debit* as a verb, meaning that you should place \$1,000 on the left side of the cash account. When you say "make a debit to cash," *debit* is a noun. In the statement "cash has a debit balance of \$12,000," *debit* is an adjective that indicates that the balance is on the left (rather than right) side of the account.

Assets generally have left-side (debit) balances. Why do expenses also carry debit balances? Expense accounts are places to temporarily record reductions in stockholders' equity. Because stockholders' equity normally has a right-side balance, we place entries on the left side to decrease the account.

The following table summarizes the following rules: (1) debits are on the left, (2) credits are on the right, (3) debits increase and credits decrease assets, and (4) credits increase and debits decrease liabilities and stockholders' equities.

¹The general ledger is usually supported by various subsidiary ledgers that provide details for accounts in the general ledger. For instance, an accounts receivable subsidiary ledger would contain a separate account for each credit customer. For example, the accounts receivable balance of \$1,638.5 million that appears in the **General Mills** 2021 balance sheet is a single account in the company's general ledger. However, that single balance is the sum of the detailed individual accounts receivable balances of thousands of credit customers.

Assets (increases on left, decreases on right)		Liabilities and Stockholders' Equity (decreases on left, increases on right)			
Cash		Accounts Payable		Paid-in Capital	
(1)	100,000 (2)	(6)	20,000 (3)		(1) 100,000
(4a)	10,000 (6)				
(5)	15,000 (7a)		3/31 Bal.		3/31 Bal. 100,000
3/31 Bal.	17,000				
Accounts Receivable					
(4a)	120,000 (5)				
3/31 Bal.	105,000				
Inventory					
(2)	75,000 (4b)				
(3)	35,000				
3/31 Bal.	10,000				
Prepaid Rent					
(7a)	3,000 (7b)				
3/31 Bal.	2,000				
				Retained Earnings	
				3/31 Bal.	29,000*
		* Expense and Revenue Accounts			
		Cost of Goods Sold		Sales	
(4b)	100,000			(4a)	130,000
		Rent Expense			
(7b)	1,000				

Exhibit 15-7
General Ledger of Stora Exor.

Assets		=	Liabilities		+	Stockholders' Equity	
Increase	Decrease		Decrease	Increase		Decrease	Increase
+	–		–	+		–	+
debit	credit		debit	credit		debit	credit
left	right		left	right		left	right

Because revenues increase stockholders' equity, we record them as credits. Because expenses decrease stockholders' equity, we record them as debits.

Accounting Vocabulary

This chapter and its appendices introduce more new terms than any other, so be sure that you understand them thoroughly.

account, p. 638	earnings, p. 640	profits, p. 640
accounts payable, p. 637	expenses, p. 640	recognition, p. 655
accounts receivable, p. 637	explicit transactions, p. 643	recognize, p. 640
accrual basis, p. 642	faithful representation, p. 659	relevance, p. 659
accrue, p. 647	Financial Accounting Standards Board (FASB), p. 653	residual value, p. 645
accrued expenses, p. 647	financial statements, p. 637	retained earnings, p. 638
accrued revenues, p. 649	general ledger, p. 662	retained income, p. 638
adjusting entries, p. 643	going concern	revenue, p. 640
adjustments, p. 643	convention, p. 659	sales, p. 640
assets, p. 638	implicit transactions, p. 643	sales revenue, p. 640
audit, p. 653	income, p. 640	Securities and Exchange Commission (SEC), p. 653
balance sheet, p. 638	income statement, p. 640	sole proprietorship, p. 652
cash basis, p. 642	independent opinion, p. 653	source documents, p. 643
cash dividends, p. 650	International Accounting Standards Board (IASB), p. 653	statement of financial position, p. 638
comparability, p. 660	ledger accounts, p. 661	statement of stockholders' equity, p. 651
compound entry, p. 640	liabilities, p. 638	stockholders' equity, p. 638
confirmatory value, p. 659	long-lived assets, p. 644	straight-line method, p. 645
conservatism convention, p. 660	matching, p. 656	T-accounts, p. 661
consistency, p. 660	materiality, p. 660	timeliness, p. 660
continuity convention, p. 659	net income, p. 640	transaction, p. 637
corporation, p. 637	net worth, p. 652	understandable, p. 660
cost recovery, p. 656	owners' equity, p. 638	unearned revenue, p. 647
cost-benefit criterion, p. 661	paid-in capital, p. 638	unexpired cost, p. 644
credit, p. 662	partnership, p. 652	useful life, p. 645
debit, p. 662	predictive value, p. 659	verifiability, p. 660
deferred revenue, p. 647		
dividends, p. 650		
double-entry system, p. 661		

Assignment Material

The assignment material for each remaining chapter is divided as follows:

- Fundamental Assignment Material
 - General Exercises and Problems
 - Understanding Published Financial Reports
- Additional Assignment Material
 - Questions
 - Critical Thinking Exercises
 - General Exercises and Problems
 - Understanding Published Financial Reports
 - Nike 10-K Problem
- Excel Application Exercise
- Collaborative Learning Exercise
- Internet Exercise

The general exercises and problems subgroups focus on concepts and procedures that are applicable to a wide variety of specific settings. Many instructors believe that these “traditional” types of exercises and problems have proved their educational value over many years of use in introductory textbooks. The understanding published financial reports subgroups focus on real-life situations. They have the same basic aims as the general exercises and problems subgroups. Indeed, some instructors may confine their assignments to the understanding published financial reports subgroups. The distinctive characteristic of the latter subgroups is the use of actual companies and news events to enhance the student’s interest in accounting. Many students and instructors get more satisfaction out of a course that frequently uses actual situations as a means of learning accounting methods and concepts.

Fundamental Assignment Material

MyLab Accounting

GENERAL EXERCISES AND PROBLEMS

15-A1 Balance Sheet Equation

For each of the following independent cases, compute the amounts (in thousands) for the items indicated by letters, and show your supporting computations:

	Case		
	1	2	3
Revenues	\$140	\$ K	\$300
Expenses	120	170	270
Dividends declared	0	5	Q
Additional investment by stockholders	0	30	35
Net income	E	20	P
Retained earnings			
Beginning of year	40	55	90
End of year	D	J	110
Paid-in capital			
Beginning of year	25	10	N
End of year	C	H	85
Total assets			
Beginning of year	80	F	L
End of year	90	275	M
Total liabilities			
Beginning of year	A	90	105
End of year	B	G	95

15-A2 Analysis of Transactions; Preparation of Statements

The Montha Company was incorporated on April 1, 20X2. Montha had 10 holders of common stock. Chenda Montha, who was the president and CEO, held 51% of the shares. The company rented space in chain discount stores and specialized in selling running shoes. Montha’s first location was a store in Centerville Mall.

The following events occurred during April:

- The company was incorporated. Common stockholders invested \$150,000 cash.
- Purchased merchandise inventory for cash, \$35,000.
- Purchased merchandise inventory on open account, \$25,000.
- Merchandise carried in inventory at a cost of \$40,000 was sold for \$110,000, \$35,000 for cash and \$75,000 on open account. Montha carries and will collect these accounts receivable.
- Collection of a portion of the preceding accounts receivable, \$20,000.
- Payments of a portion of accounts payable, \$18,000. See transaction c.
- Special display equipment and fixtures were acquired on April 1 for \$36,000. Their expected useful life was 36 months with no terminal scrap value. Straight-line depreciation was adopted. This equipment was removable. Montha paid \$12,000 as a down payment and signed a promissory note for \$24,000.
- On April 1, Montha signed a rental agreement with Centerville Mall. The agreement called for rent of \$2,000 per month, payable quarterly in advance. Therefore, Montha paid \$6,000 cash on April 1.
- The rental agreement also called for a payment of 10% of all sales. This payment was in addition to the flat \$2,000 per month. In this way, Centerville Mall would share in any success of the

venture and be compensated for general services such as cleaning and utilities. This payment was to be made in cash on the last day of each month as soon as the sales for the month were tabulated. Therefore, Montha made the payment on April 30.

- j. Wages, salaries, and sales commissions were all paid in cash for all earnings by employees. The amount was \$49,000.
- k. Depreciation expense for April was recognized. See transaction g.
- l. The expiration of an appropriate amount of prepaid rental services was recognized. See transaction h.

1. Prepare an analysis of Montha Company's transactions, employing the equation approach demonstrated in Exhibit 15-1. Two additional columns will be needed, one for Equipment and Fixtures and one for Note Payable. Show all amounts in thousands.
2. Prepare a balance sheet as of April 30, 20X1, and an income statement for the month of April. Ignore income taxes.
3. Given these sparse facts, analyze Montha's performance for April and its financial position as of April 30, 20X1.

15-A3 Cash Basis Versus Accrual Basis

Refer to the preceding problem. If Montha Company measured income on the cash basis, what revenue would be reported for April? Which basis (accrual or cash) provides a better measure of revenue? Why?

UNDERSTANDING PUBLISHED FINANCIAL REPORTS

15-B1 Balance Sheet Equation

Nordstrom operates 207 fashion specialty retail stores in 28 states. The company's actual data (slightly simplified) follow for its fiscal year ended January 29, 2011 (in millions of dollars):

Assets, beginning of period	\$6,579
Assets, end of period	E
Liabilities, beginning of period	A
Liabilities, end of period	5,441
Paid-in capital, beginning of period	1,066
Paid-in capital, end of period	D
Retained earnings, beginning of period	506
Retained earnings, end of period	C
Revenues	9,700
Costs and expenses	B
Net income	613
Dividends	266
Additional investments by stockholders	102

Find the unknowns (in millions), showing computations to support your answers.

15-B2 Analysis of Transactions; Preparation of Statements

The Volvo Group, headquartered in Gothenburg, Sweden, is one of the world's leading manufacturers of trucks, buses, and construction equipment, in addition to autos. Volvo's actual condensed balance sheet data for January 1, 2012, follows (in millions of Swedish kroner, SEK):

Assets			Liabilities and Stockholders' Equity	
Cash and cash equivalents	SEK	30,379	Accounts payable	SEK 56,546
Receivables		81,472	Other liabilities	211,017
Inventories		44,599		
Property, plant, and equipment		53,657	Stockholders' equity	85,681
Other assets		143,137		
Total	SEK	<u>353,244</u>	Total	<u>SEK 353,244</u>

Suppose the following summarizes some major transactions of the truck division of Volvo during January, 2012 (in millions):

- a. Sold trucks for cash of SEK 190 and on open account of SEK 460 for a grand total of SEK 650. Volvo carried the trucks in inventory for SEK 390.
 - b. Acquired inventory on account, SEK 500.
 - c. Collected receivables, SEK 300.
 - d. On January 2, used SEK 250 cash to prepay some rent and insurance for 2012.
 - e. Payments on accounts payable (for inventories), SEK 450.
 - f. Paid selling and administrative expenses in cash, SEK 110.
 - g. A total of SEK 90 of prepaid expenses for rent and insurance expired in January 2012.
 - h. Recognized depreciation expense of SEK 20 for January.
1. Prepare an analysis of these truck transactions on the balance sheet of Volvo, employing the equation approach demonstrated in Exhibit 15-1 on p. 639. Show all amounts in millions of SEK. (For simplicity, only a few major transactions are illustrated here.)
 2. Prepare an income statement for these transactions for the month ended January 31, 2012, and a balance sheet as of January 31, 2012, that incorporates these transactions. Ignore income taxes.

15-B3 Cash Basis Versus Accrual Basis

Refer to the preceding problem. If **Volvo** measured income on the cash basis, what revenue would the company report for January from the transactions listed? Which basis (accrual or cash) provides a better measure of revenue? Why?

Additional Assignment Material

QUESTIONS

15-1 What types of questions are answered by the income statement and balance sheet?

15-2 How are assets and liabilities related?

15-3 How are the income statement and balance sheet related?

15-4 Criticize the following statement: “Net income is the difference in the ownership capital account balances at two points in time.”

15-5 Distinguish between the accrual basis and the cash basis of accounting.

15-6 How do adjusting entries differ from routine entries?

15-7 Distinguish between acquisition and expiration.

15-8 Why is it better to refer to the costs, rather than values, of assets such as plant or inventories?

15-9 “Depreciation is cost allocation, not valuation.” Do you agree? Explain.

15-10 Why is unearned revenue a liability?

15-11 What is meant by an account labeled “Accrued wages?” Would it be on an income statement or a balance sheet?

15-12 Criticize the following statement: “As a stockholder, I have a right to more dividends. You have millions stashed away in retained earnings. It’s about time that you let the true owners get their hands on that pot of gold.”

15-13 Can a company having a large retained earnings balance always pay cash dividends?

15-14 “I don’t need to know accounting principles because my business is a sole proprietorship.” Comment on this statement.

15-15 “Audit opinions are not infallible guarantees of financial truth.” Do you agree?

15-16 “The FASB sets standards in the United States, so there is little need to learn International Financial Reporting Standards (IFRS).” Do you agree? Explain.

15-17 Why are ethics and integrity important to accountants?

15-18 When do accountants recognize revenue? Why is this so important in an accrual accounting system?

15-19 What is the major limitation of a basic measurement unit?

15-20 Study Appendix 15A. What does the accountant mean by going concern?

15-21 Study Appendix 15A. What does the accountant mean by relevance? By faithful representation?

15-22 Study Appendix 15A. What is the role of cost-benefit (economic feasibility) in the development of accounting principles?

15-23 Study Appendix 15B. Describe the role of debits and credits in a double-entry bookkeeping system.

CRITICAL THINKING EXERCISES

15-24 Accounting Valuation of Fixed Assets

Consider two types of assets held by **Weyerhaeuser Company**: 1) timber-growing land purchased in 1912 when the company was known as Weyerhaeuser Timber Company and 2) machinery purchased and installed at its paper processing plant in Saskatchewan, Canada, in 2012. How close do you suppose the December 31, 2013, balance sheet value of each asset is to the market value of the asset at that date?

15-25 Marketing, the Income Statement, and the Balance Sheet

The marketing manager of a major electronics company said, “The balance sheet isn’t of much use to me. It is so static. But the income statement is a primary tool for managing my dynamic business.” Why would a marketing manager find the income statement more useful than the balance sheet?

15-26 Revenue Recognition and Evaluation of Sales Staff

Revenue on an accrual-accounting basis must be both earned and realized (or realizable) before accountants recognize it in the income statement. Companies recognize revenue in cash-basis accounting only when they have received the cash. Is an accrual-basis or cash-basis recognition of revenue more relevant for evaluating the performance of a sales staff? Why?

15-27 Relationship Between the Balance Sheet and the Income Statement

Suppose a company has no transactions with its owners during 20X0. That is, paid-in capital remains unchanged, and retained earnings increases by the entire amount of the net income. During 20X0 the company’s net income is \$50,000. At the beginning of the year, the company’s balance sheet equation was as follows:

$$\begin{aligned}\text{assets} &= \text{liabilities} + \text{stockholders' equity} \\ \$450,000 &= \$200,000 + \$250,000\end{aligned}$$

What do you know about the balance sheet equation at the end of 20X0?

15-28 Concepts of Relevance and Faithful Representation

The FASB and IASB both state that relevance and faithful representation are crucial concepts for financial reporting. Why are these concepts so important?

GENERAL EXERCISES AND PROBLEMS

15-29 True or False

Use T or F to indicate whether each of the following statements is true or false. Change each false statement into one that is true.

- Adjustments (adjusting entries) are entries that record explicit day-to-day transactions.
- Dividends are merely expenses like rent and wages.
- Accounts payable should be classified as an asset.
- Compound entry is a transaction that affects more than two accounts.
- The statement of stockholders’ equity shows the changes in each stockholder’s equity account during a certain period.
- The accrual basis recognizes the impact of transactions on financial statements in the periods when revenues and expenses occur.

15-30 Simple Balance Sheet

Fill in the missing numbers from the following simple balance sheet for Cabo Company:

Assets		Liabilities and Stockholders' Equity	
Cash	\$?	Accounts payable	\$ 10,000
Accounts receivable	15,000	Long-term debt	?
Plant and equipment	75,000	Stockholders' equity	\$ 45,000
Total assets	<u>\$100,000</u>	Total Liabilities and stockholders' equity	<u>\$?</u>

15-31 Nature of Retained Earnings

This is an exercise on the relationships between assets, liabilities, and ownership equities.

1. Prepare an opening balance sheet of

Cash	¥6,000	Paid-in-capital	¥6,000

2. Purchase inventory for ¥3,000 cash. Prepare a balance sheet. A heading is unnecessary in this and the subsequent requirements.
3. Sell the entire inventory for ¥5,100 cash. Prepare a balance sheet. Where is the retained earnings in terms of relationships within the balance sheet? That is, what is the meaning of the retained earnings? Explain in your own words.
4. Buy inventory for ¥2,400 cash and equipment for ¥4,500 cash. Prepare a balance sheet. Where is the retained earnings in terms of the relationships within the balance sheet? That is, what is the meaning of the retained earnings? Explain in your own words.
5. Buy inventory for ¥2,100 on an open account. Prepare a balance sheet. Where is the written and account payable in terms of the relationships within the balance sheet? That is, what is the meaning of the account payable and retained earnings? Explain in your own words.

15-32 Income Statement

Here is a proposed income statement of a children's clothing store:

Kids 2 Klad Statement of Profit and Loss, December 31, 20X1			
Revenues:			
Sales	\$1,300,000		
Increase in market value of land and building	50,000		
Cash received from loan	200,000	\$1,550,000	
Deduct expenses:			
Advertising	\$ 100,000		
Sales commissions	60,000		
Utilities	20,000		
Wages	150,000		
Dividends	200,000		
Cost of clothes purchased	800,000	1,330,000	
Net profit		\$ 220,000	

List and describe any shortcomings of this statement.

15-33 Income Statement, Balance Sheet, and Dividends

Matrix Company had retained earnings of £113,560 at the beginning of 2020. During the year the company had total revenue of £1,060,000, total expenses (including taxes) of £990,000, bought property and equipment for £680,000, and paid cash dividends of £24,000. Compute Matrix Company's retained earnings at the end of 2020.

15-34 Customer and Hotel

Suppose Amazon decided to hold its next Annual General Meeting in Fremont Studios in May. To take advantage of a special offer, Amazon booked the studio in advance at a total cost of \$100,000. Amazon made the booking on December 1 for cash. Using the balance-sheet-equation format, analyse the impact of the December payment and the May meeting on the financial position of both Amazon and Fremont Studios.

15-35 Property Owner and Municipality

In the area under Kolkata Municipal Corporation, property taxes are payable by the property owner at a fixed rate on the municipal value of the property. The taxes are levied on a quarterly basis, and an annual advance payment attracts a 2% rebate on the taxes levied. Basu Enterprises, the owner of a two-storied commercial property, is supposed to pay a quarterly property tax of ₹5,000. On April 1, 2020, the company paid the property tax for the entire financial year ending on March 31, 2021, and

availed the rebate. Using the balance-sheet-equation format, analyze the effects of the following on the property owner's and the municipality's financial position:

1. Basu Enterprises' payment of the property tax on April 1, 2020.
2. Adjustment for the April–June quarter, 2020.
3. Adjustment for the July–September quarter, 2020.
4. Adjustment for October–December quarter, 2020.
5. Adjustment for January–March quarter, 2021.

15-36 Adjustments

1. Steinberg Company sells annual subscriptions to its investment-advice magazine for €50. Suppose it sold 5,000 subscriptions in December, 2012, for magazines to be delivered quarterly in 2013. How would Steinberg Company show this on its December 31, 2012, balance sheet? How would it affect the company's 2012 income statement? How would it affect the income statement for the first six months of 2013?
2. Steinberg Company pays its salaried personnel monthly on the fifth day of the following month. That is, it pays January's salaries on February 5. The company's total salaries for 2012 were €240,000, spread evenly over the 12 months. How will this affect the December 31, 2012, balance sheet? When will the December salaries (which are paid on January 5) be charged as expenses on the income statement?

15-37 Find Unknowns

The following data pertain to Andaman Tours, a travel company in Thailand where the currency is the baht (B). Total assets at January 1, 20X0, were B80,000, and at December 31, 20X0, they were B125,000. During 20X0, sales were B265,000, cash dividends were B16,000, and operating expenses (exclusive of costs of goods sold) were B50,000. Total liabilities at December 31, 20X0, were B45,000, and at January 1, 20X0, they were B30,000. There was no additional capital paid in during 20X0. Calculate the following items. (These need not be computed in any particular order.)

1. Stockholders' equity, for January 1, 20X0
2. Net income for 20X0
3. Cost of goods sold for 20X0

15-38 Balance Sheet Equation; Solving for Unknowns

Compute the unknowns (X, Y, Z, A, and B) in each of the individual cases, columns 1–7, in Exhibit 15-8. Each column is independent of the others.

15-39 Fundamental Transaction Analysis and Preparation of Statements

Three former **RIM** employees decided to go into business for themselves and open a store near an office park to sell wireless equipment to young professionals. Their first products were cell phones, PDAs, netbook and notebook computers, and computer accessories. The business was incorporated as Connectivity Plus. The following transactions occurred during April:

- a. On April 1, 20X1, each of the three invested \$12,000 in cash in exchange for 1,000 shares of stock each.
- b. The corporation quickly acquired \$40,000 in inventory, half of which had to be paid for in cash. The other half was acquired on open accounts that were payable after 30 days.
- c. A store was rented for \$500 monthly. A lease was signed for one year on April 1. The first two months' rent was paid in advance. Monthly payments were to be made on the second of each month.
- d. Advertising during April was purchased on open account for \$3,000 from a newspaper owned by one of the stockholders. Additional advertising services of \$6,000 were acquired for cash.
- e. Sales were \$62,000. Merchandise was sold for twice its purchase cost. Sales of \$52,000 were on open account, and the remaining \$10,000 were for cash.
- f. Wages and salaries incurred in April amounted to \$11,000, of which \$4,000 was paid in cash.
- g. Miscellaneous services paid for in cash were \$2,510.
- h. On April 1, fixtures and equipment were purchased for \$6,000 with a down payment of \$1,000 plus a \$5,000 note payable in one year.
- i. See transaction h and make the April 30 adjustment for interest expense accrued at 9.6%. (The interest is not due until the note matures.)
- j. See transaction h and make the April 30 adjustment for depreciation expense on a straight-line basis. The estimated life of the fixtures and equipment is 10 years with no expected residual value. Straight-line depreciation here would be $\$6,000 \div 10 \text{ years} = \$600 \text{ per year}$, or \$50 per month.
- k. Cash dividends of \$6,000 were declared and disbursed to stockholders on April 29.

Given	1	2	3	4	5	6	7
Assets at beginning of period		\$ 9,000				B	\$ 8,200
Assets at end of period		11,000					9,900
Liabilities at beginning of period		6,000				\$12,000	4,000
Liabilities at end of period		Y					6,000
Stockholders' equity at beginning of period	\$9,000	X				A	X
Stockholders' equity at end of period	X	5,000				10,000	Y
Sales			\$16,000		X	14,000	20,000
Inventory at beginning of period			6,000	\$ 8,000		Z	
Inventory at end of period			7,000	6,000		7,000	
Purchase of inventory			10,000	12,000		6,000	
Gross profit			Y		\$3,000	6,000	A
Cost of goods sold*			X	X	4,500	X	B
Other expenses			4,000			4,000	4,700
Net profit	4,000	Z	Z			Y	Z
Dividends	2,000	0				1,500	400
Additional investments by stockholders						5,000	0

*Note that cost of goods sold = beginning inventory + purchases – ending inventory.

Exhibit 15-8

Data for Exercise 15-38

- Using the accrual basis of accounting, prepare an analysis of transactions, employing the equation approach demonstrated in Exhibit 15-1 on p. 639. Use the following headings: Cash, Accounts Receivable, Inventory, Prepaid Rent, Fixtures and Equipment, Accounts Payable, Notes Payable, Accrued Wages Payable, Accrued Interest Payable, Paid-in Capital, and Retained Earnings.
- Prepare a balance sheet and a multiple-step income statement. Also show the components of the change in retained earnings.
- What advice would you give the owners based on the information compiled in the financial statements?

15-40 Measurement of Income for Tax and Other Purposes

The following are the summarized transactions of Attorney James Brown for 2020, his first year in practice:

- Acquired a computer and furniture for \$168,000. Its expected useful life is six years. James will use straight-line depreciation, assuming zero terminal disposal value.
- Fees collected, \$158,000. These fees included \$4,000 paid in advance by some clients on December 31, 2020.
- Rent is paid at the rate of \$1,000 per month, payable quarterly on the twenty-fifth of March, June, September, and December for the following quarter. Total disbursements during 2020 for rent were \$15,000 including the initial payment on January 1.
- Fees billed but uncollected, December 31, 2020, \$40,000.

- e. Utilities expense paid in cash, \$1,400. Additional utility bill unpaid on December 31, 2020, \$200.
- f. Salary expense for assistant and secretary, \$32,000 paid in cash. In addition, \$2,000 was earned but unpaid on December 31, 2020.

James may elect either the cash basis or the accrual basis of measuring income for income tax purposes, provided that he uses it consistently in the subsequent years. Under either alternative, the original cost of equipment and furniture must be written off over its 6-year useful life rather than being regarded as a lump-sum expense in the first year.

1. Prepare income statements for the year on both the cash and accrual bases, using one column for each basis.
2. Which basis do you prefer as a measure of Attorney James Brown's performance? Why? What do you think is the justification for the government's allowing the use of the cash basis for income tax purposes?

15-41 Debits and Credits

Study Appendix 15B. Determine for the following transactions whether the account named in parentheses is to be debited or credited:

1. Paid rent in advance (Prepaid Expenses), \$1,200
2. Bought merchandise on open account (Accounts Payable), \$5,000
3. Borrowed money from First National Bank (Notes Payable), \$12,000
4. Sold merchandise (Merchandise Inventory), \$1,000
5. Paid O'Brien Associates \$3,000 owed them (Accounts Payable)
6. Paid dividends (Cash), \$500
7. Delivered merchandise to customers (Merchandise Inventory), \$3,000
8. Received cash from customers on accounts due (Accounts Receivable), \$2,000

15-42 True or False

Study Appendix 15B. Use T or F to indicate whether each of the following statements is true or false. For each false statement, explain why it is false.

1. Purchase of inventory on account should be credited to Inventory and debited to Accounts Payable.
2. Increases in asset accounts must always be entered on the right.
3. Increases in stockholders' equity should always be entered as credits.
4. Decreases in liability accounts should be recorded on the right.
5. Debit entries must always be recorded on the left. Credit entries can be recorded either on the right or on the left.
6. Money borrowed from the bank should be credited to Cash and debited to Notes Payable.
7. Decreases in accounts must be shown on the credit side.
8. Both increases in liabilities and decreases in assets should be entered on the right.
9. Asset credits should be entered on the right and liability credits on the left.
10. Payments on mortgages should be debited to Cash and credited to Mortgages Payable. Mortgages are liabilities.

15-43 Use of T-Accounts

Study Appendix 15B. The Eastside Tennis Club had the following transactions during June:

- a. Collected \$600 of dues that had been billed in May.
 - b. Sold an old computer for \$150 cash and a promise to pay \$200 in one month. The balance sheet value of the computer was \$350.
 - c. Bought a postage meter on credit for \$210.
 - d. Received the \$200 promised in transaction b.
1. Set up T-accounts for the following accounts:
Cash
Dues Receivable
Accounts Receivable
Equipment
Accounts Payable
 2. Make entries for each of the four transactions into the T-accounts. Label each entry a, b, c, or d.

15-44 Use of T-Accounts

Study Appendix 15B. Refer to problem 15-A2. Make entries for April in T-accounts. Key your entries and check to see that the ending balances agree with the financial statements.

15-45 Use of T-Accounts

Study Appendix 15B. Refer to problem 15-39. Use T-accounts to present an analysis of April transactions. Key your entries and check to see that the ending balances agree with the financial statements.

UNDERSTANDING PUBLISHED FINANCIAL REPORTS**15-46 Balance Sheet Effects**

Standard Chartered Bank, one of the largest financial institutions in the United Kingdom with total assets of £550 billion, showed the following items (among others) on its balance sheet at January 1, 2020 (in millions):

Cash (an asset)	£ 65,105
Total deposits (a liability)	£1,426,504

1. Suppose Delta Company, a small retailer from Bristol, deposited £10,000 in the bank. How would Delta's deposit affect each of the bank's assets, liabilities, and stockholders' equities? How much would the deposit affect Delta's assets, liabilities and owners' equities? Be specific.
2. Suppose Delta Company borrowed £20,000 from Standard Chartered Bank. How would such a transaction affect Delta's assets, liabilities and owners' equities? Be specific.
3. Suppose Standard Chartered Bank makes a £450,000 loan to The Queens Park Hotel for remodeling purposes. How would this loan affect each of the bank's assets, liabilities, and stockholders' equities? Be specific.

15-47 Preparation of Balance Sheet for Daimler AG

Daimler AG, headquartered in Stuttgart, Germany, is one of the largest automobile producers operating across the world with 300,000 employees. Its financial statements included the following items at August 28, 2019 (in millions of euros):

Accrued liabilities	€25,116
Cash	48,108
Total stockholders' equity	b
Total liabilities	c
Long-term debt	15,036
Total revenues	1,066,980
Accounts receivable	11,580
Common stock	54,216
Inventory	a
Accounts payable	78,528
Property, net of accumulated depreciation	149,184
Retained earnings	85,332
Other assets	32,604
Other liabilities	51,576
Other stockholders' equity	11,328
Total assets	321,132

Prepare a consolidated balance sheet including amounts for the following:

- a. Inventory
- b. Total stockholders' equity
- c. Total liabilities

15-48 Net Income and Retained Earnings

Facebook, Inc. is a well-known American technology conglomerate. The following data are from its financial statement for the year ended December 31, 2018 (in millions):

Facebook, Inc.			
Retained earnings, end of year	\$41,981	Dividends paid	\$?
Revenues	55,838	Retained earnings, beginning of year	33,990
Net interest income	448	Operating costs and expenses	30,925
Provision for income taxes	3,249	Cash and cash equivalents	10,019

1. Prepare Facebook's income statement for the year. The final three lines of the income statement were labeled as income before taxes, provision for income taxes, and net income.
2. Compute the change in retained earnings, and use that to determine the amount of dividends paid.
3. Comment briefly on the relative size of the cash dividend.

15-49 Earnings Statement, Retained Earnings

Swift, Inc. is a global engineering consultancy company headquartered in Toronto, Canada. The following is a reproduction of the terms and amounts in the financial statements contained in the company's annual report for the fiscal year ended December 31, 2020 (in millions):

Net revenue	C\$124,142	Retained earnings at the beginning of the year	C\$49,488
Cash	27,704	Cost of products and services	96,520
Interest and other expenses	382	Retained earnings at end of year	56,472
Income tax provision	1,496	Selling and administrative expenses	17,048
Accounts payable	23,312		
Research and development	1,712		

Choose the relevant data and prepare the income statement for the fiscal year. The final three lines of the income statement should be labeled earnings before income taxes, income tax provision, and net income. Also, using the retained earnings account, compute the amount of cash dividends paid during the fiscal year ending December 31, 2020.

15-50 Sole Proprietorship and Corporation

Thomson Company is a sole proprietorship that supplies small auto parts to large automobile manufacturers. The following is the simplified balance sheet of Thompson Company:

Assets		Liabilities and Owner's Equity	
Cash	€ 60,000	Accounts payable	€ 30,000
Accounts receivable	50,000	Other liabilities	70,000
Equipment	290,000	Thompson, capital	300,000
Total assets	€400,000	Total liabilities and owner's equity	€400,000

John Thompson decided to incorporate his company on May 31, 2020, by selling 10,000 shares of stock for €10 each and keeping 20,000 shares for himself. Prepare a balance sheet for the new corporation.

NIKE 10-K PROBLEM

15-51 Interpreting the Income Statement and Balance Sheet

Turn to Nike's income statement and balance sheet in Appendix C. Answer the following questions using the two statements:

1. Compute Nike's percentage increase in revenues and in total assets in fiscal 2021. Which increased more?
2. Illustrate the balance sheet equation, using total assets, total liabilities, and shareholders' equity from Nike's May 31, 2021, balance sheet.
3. Nike's retained earnings increased from \$(191) million to \$3,179 million during fiscal 2021. A decrease of \$665 million was due to transactions not discussed in this chapter. Explain the remainder of the change in retained earnings.
4. Did Nike's net income grow by a larger percentage in fiscal 2021 or fiscal 2020?

EXCEL APPLICATION EXERCISE

15-52 Monthly Transactions Using the Balance Sheet Equation

Goal: Create an Excel spreadsheet to analyze the monthly transactions of a company using the balance sheet equation. Use the results to answer questions about your findings.

Scenario: Montha Company has asked you to prepare a transaction analysis report to help the company analyze what transpired during its first month of operation. The company would like you to record the transactions and calculate the appropriate totals using the balance sheet equation. The background data for your analysis appears in Fundamental Assignment Material 15-A2 on p. 665. Prepare the transaction analysis using a format similar to Exhibit 15-1 on p. 639.

When you have completed your spreadsheet, answer the following questions:

1. What are the total Assets of the firm at the end of April, 20X1?
2. Did the Stockholders' Equity increase or decrease during the month of April, 20X1? What caused the change?
3. Discuss what occurred in the Cash account and its implications.

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 15 Decision Guideline
Row 2: Montha Company
Row 3: Transaction Analysis (in Dollars) for April 20X1
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–L.
4. In row 7, create the following bold-faced column headings:
Column B: Assets
Column H: Liabilities
Column J: Stockholders' Equity
5. Merge and center the Assets heading across columns B–G.
6. Merge and center the Liabilities heading across columns H–I.
7. Merge and center the Stockholders' Equity heading across columns J–L.
8. Create a border around each of the headings created in row 7.
Border tab: Presets: Outline
9. In row 8, create the following center-justified column headings:
Column B: Cash
Column C: A/R
Column D: Inven.
Column E: Ppd. Rent
Column F: Equip.
Column G: Acc. Dep.
Column H: A/P
Column I: N/P
Column J: PIC
Column K: Revenue
Column L: Expense
10. Create a border around each of the column headings created in row 8.
Border tab: Presets: Outline
11. In column A, create the following row headings:
Row 9: Transactions:
Row 10: a. Incorporation
Row 11: b. Inven. for cash
Row 12: c. Inven. for credit
Row 13: d1. Merch. sold
Row 14: d2. COGS
Row 15: e. Collect A/R
Row 16: f. Payment of A/P
Row 17: g. Equip. purchased
Row 18: h. Prepaid rent
Row 19: i. Add'l. rental fees
Row 20: j. Wage expense
Row 21: k. Depreciation exp.
Row 22: l. Rent expense
Skip a row.
Row 24: Balance, 4/30/X1
Skip two rows.
Row 27: Totals

Note: Adjust width of row A to accommodate row headings.

12. Use the data from Fundamental Assignment Material 15-A2 and enter the amounts for transactions a–h and j in the appropriate columns.
13. Use formulas to compute the adjusting entries needed for transactions i, k, and l.
14. Use formulas to calculate the totals in each of the columns for row 24, Balance, 4/30/X1.
15. Use formulas to generate totals for Assets, Liabilities, and Stockholders' Equity in row 27.
Print the total for Assets in column B.
Merge and center the total across columns B–G.
Print the total for Liabilities in column H.
Merge and center the total across columns H–I.
Print the total for Stockholders' Equity in column J.
Merge and center the total across columns J–L.
Change the format of the three total amounts to display as bold-faced.
16. Format all amounts in rows 10–22 as follows:
Number tab: Category: Currency
Decimal places: 0
Symbol: None
Negative numbers: Black with parentheses
17. Format amounts on row 24 as follows:
Number tab: Category: Accounting
Decimal places: 0
Symbol: \$
18. Format amounts on row 27 as follows:
Number tab: Category: Currency
Decimal places: 0
Symbol: \$
Negative numbers: Black with parentheses
19. Modify the Page Setup by selecting File, Page Setup.
Page tab: Orientation: Landscape
Sheet tab: Gridlines: Checked
20. Save your work, and print a copy for your files.

COLLABORATIVE LEARNING EXERCISE

15-53 Implicit Transactions

Form groups of three to six “players.” Each group should have a die and paper (or board) with four columns labeled as follows:

1. Expiration of unexpired costs
2. Realization of unearned revenues
3. Accrual of unrecorded expenses
4. Accrual of unrecorded revenues

The players should select an order in which they wish to play. Then, the first player rolls the die. If they rolls a 5 or 6, the die passes to the next player. If they rolls a 1, 2, 3, or 4, they must, within 20 seconds, name an example of a transaction that fits in the corresponding category; for example, if a 2 is rolled, the player must give an example of realization of unearned revenues.

Each time a correct example is given, the player receives one point. If someone doubts the correctness of a given example, they can challenge it. If the remaining players unanimously agree that the example is incorrect, the challenger gets a point and the player giving the example does not get a point for the example and is out of the game. If the remaining players do not unanimously agree that the answer is incorrect, the challenger loses a point and the player giving the example gets a point for a correct example. If a player fails to give an example within the time limit or gives an incorrect example, they are out of the game (except for voting when an example is challenged), and the remaining players continue until everyone has failed to give a correct example within the time limit. Each correct answer should be listed under the appropriate column. The player with the most points is the group winner. When all groups have finished a round of play, a second level of play can begin. All the groups should get together and list all the examples for each of the four categories by group. Discussion can establish the correctness of each entry; the faculty member or an appointed discussion leader will be the final arbitrator of the correctness of each entry. Each group gets one point for each correct example and loses one point for each incorrect entry. The group with the most points is the overall winner.

INTERNET EXERCISE

I5-54 McDonald's Financial Statements

Go to <https://corporate.mcdonalds.com> to find the **McDonald's** corporate home page. Click on the "Investors" heading. Then click on "Financial Information" and select the most recent annual report.

Answer the following questions:

1. First open the balance sheet. Name two items on the McDonald's balance sheet that most likely represent unexpired (prepaid) costs. Name two items that most likely represent accruals of unrecorded expenses.
2. Has McDonald's grown in the past year? What did you look at to determine this?
3. Now look at McDonald's income statement. Did the company's sales (revenues) grow during the past year? By how much? Did its income increase or decrease? By how much? Do the sales and income changes bode well or poorly for McDonald's future?
4. Which financial statements provide evidence that McDonald's is a corporation, not a sole proprietorship or partnership?
5. Where can you find evidence in the McDonald's annual report that the financial statements were prepared using GAAP?

Understanding Corporate Annual Reports: Basic Financial Statements

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Recognize and define the main types of assets in the balance sheet of a corporation.
2. Recognize and define the main types of liabilities in the balance sheet of a corporation.
3. Recognize and define the main elements of the stockholders' equity section of the balance sheet of a corporation.
4. Recognize and define the principal elements in the income statement of a corporation.
5. Recognize and define the elements that cause changes in stockholders' equity accounts.
6. Explain the purposes of the cash flow statement, identify activities that affect cash, and classify the activities as operating, investing, or financing activities.
7. Assess financing and investing activities using the statement of cash flows.
8. Use both the direct method and the indirect method to explain cash flows from operating activities.
9. Explain the role of depreciation in the statement of cash flows.
10. Describe and assess the effects of the four major methods of accounting for inventories (Appendix 16A).

► NIKE

"Just do it!" Competitive athletes, armchair athletes, and nonathletes around the world recognize Nike's slogan and its "swoosh" logo. In just over three decades, the company grew from a small shoe company to a major producer of athletic footwear and other leisure wear with annual sales of more than \$44 billion as of 2021. The "Just do it!" slogan also would have been apt for early investors in Nike. A dollar invested in Nike stock in 1987 was worth nearly \$168 by 2021. But is Nike stock a good investment now? Prospective investors look to the company's financial statements to help answer that question. Let's look at the kind of information that Nike includes in its financial statements.

Each year, Nike issues an annual report summarizing the 12 months ended on May 31. Like most companies, Nike uses its annual report to provide information about its business, customer engagements, and future plans, some of which are legally required while the others are provided voluntarily to make the stakeholders aware of its current position in the industry. But, for investors, the most important part of Nike's annual report is the financial section, which contains four basic financial statements, footnotes to those statements, and reports by management and auditors. You can examine the financial statements to learn about Nike's financial position at the beginning and end of the year. You can also glean information about its performance during the year. Yet, investors want to know about the future, not just about

the past. Accountants do not predict the future. However, the history recorded in the financial statements gives a baseline for investors to evaluate past performance and make judgments about how likely it is that future performance will be similar to that in the past. This chapter focuses on what you can learn from financial statements such as those of Nike. It extends our discussion of balance sheets and income statements from the preceding chapter and introduces two other major financial statements, the statement of cash flows and the statement of changes in stockholders' equity.

A common misunderstanding is that accounting is a precise discipline that produces exact measurements of a company's financial position and performance. Although accountants do take methodical steps with masses of data, their rules of measurement require judgment. Both U.S. GAAP and international standards (IFRS) allow much room for judgment. Managers and accountants who exercise this judgment have a major effect on a company's financial statements. To understand financial statements fully, you must recognize the judgmental decisions that go into their construction. Questionable accounting judgments in the past by companies such as **Enron**, **WorldCom**, **Tyco**, **HealthSouth**, **AIG**, and **Freddie Mac** in the United States and **Parmalat**, **ComROAD AG**, and **Royal Ahold** in Europe have illustrated just how important accountants' decisions are to users of financial statements. ■



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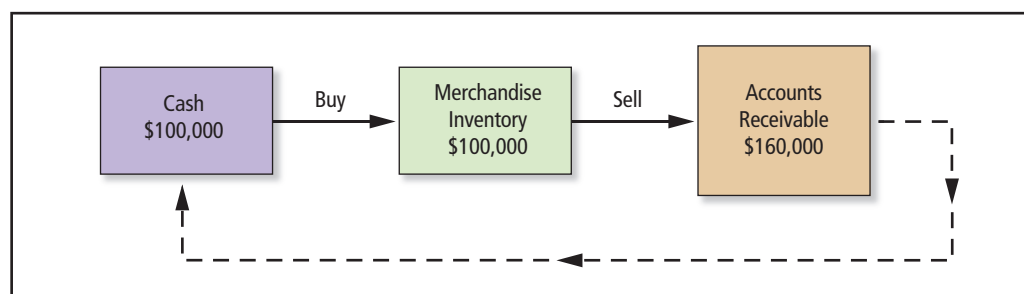
Nike's "swoosh" is recognized throughout the world.

Classified Balance Sheet

Exhibit 16-1 shows the 2021 and 2020 classified balance sheets for **Nike**. We will examine the five main sections of Nike's balance sheet: current assets, noncurrent assets, current liabilities, noncurrent liabilities, and shareholders' equity. By understanding what items Nike and other companies include in each of these categories, you will be able to better interpret the company's financial position. Be sure to locate each of these items in the exhibit as you read the description of the item in the following pages.

Current Assets

Current assets include cash and all other assets that a company reasonably expects to convert to cash or sell or consume within one year or during the normal operating cycle, if longer than a year. A company's **operating cycle** is the time span during which it spends cash to acquire goods and services that it uses to produce its outputs, which in turn it sells to customers, who in turn pay for their purchases with cash. The following diagram illustrates what Nike's operating cycle might look like (dollar amounts are hypothetical):



The box for Accounts Receivable (amounts customers owe to the business) is larger than the other two boxes because the objective of a business is to sell goods at a price higher than their acquisition cost. The total amount of profit a firm earns during a particular period depends on how much its selling prices exceed its costs, including both costs of producing or purchasing the goods to be sold and additional costs incurred during the period. The time span represented by the cycle might be as short as a few days (for a grocery store chain such as **Albertsons** or **Kroger**) or many years (for a timber company such as **Georgia-Pacific** or **Weyerhaeuser**).

As Exhibit 16-1 shows, Nike's current assets include cash and cash equivalents, short-term investments, accounts receivable, inventories, and prepaid expenses and other current assets. Cash consists primarily of balances in checking and other deposit accounts.

Objective 1

Recognize and define the main types of assets in the balance sheet of a corporation.

current assets

Cash and all other assets that a company reasonably expects to convert to cash or sell or consume within one year or during the normal operating cycle, if longer than a year.

operating cycle

The time span during which a company spends cash to acquire goods and services that it uses to produce the organization's output, which it in turn sells to customers, who in turn pay for their purchases with cash.

Exhibit 16-1

Nike, Inc.

Balance Sheet (in millions)

	May 31	
	2021	2020
ASSETS		
Current Assets		
Cash and equivalents	\$ 9,889	\$ 8,348
Short-term investments	3,587	439
Accounts receivable, less allowance for doubtful accounts of \$93 and \$214, respectively, net	4,463	2,749
Inventories	6,854	7,367
Prepaid expenses and other current assets	1,498	1,653
Total current assets	26,291	20,556
Noncurrent Assets		
Property, plant, and equipment		
At cost	10,061	9,661
Less: Accumulated depreciation	5,157	4,795
Property, plant, and equipment, net	4,904	4,866
Operating lease right-of-use assets, net	3,113	3,097
Identifiable intangible assets, net	269	274
Goodwill	242	223
Deferred income taxes and other assets	2,921	2,326
Total noncurrent assets	11,449	10,786
Total assets	<u>\$37,740</u>	<u>\$31,342</u>
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current Liabilities		
Current portion of long-term debt	\$ 0	\$ 3
Notes payable	2	248
Accounts payable	2,836	2,248
Current portion of operating lease liabilities	467	445
Accrued liabilities	6,063	5,184
Income taxes payable	306	156
Total current liabilities	9,674	8,284
Noncurrent Liabilities		
Long-term debt	9,413	9,406
Operating lease liabilities	2,931	2,913
Deferred income taxes and other liabilities	2,955	2,684
Total noncurrent liabilities	15,299	15,003
Total liabilities	24,973	23,287
Redeemable preferred stock	0	0
Shareholders' Equity		
Common stock at stated value:		
Class A convertible—305 and 315 shares outstanding	0	0
Class B—1,273 and 1,243 shares outstanding	3	3
Capital in excess of stated value	9,965	8,299
Retained earnings (deficit)	3,179	(191)
Accumulated other comprehensive income (loss)	(380)	(56)
Total shareholders' equity	12,767	8,055
Total liabilities and shareholders' equity	<u>\$37,740</u>	<u>\$31,342</u>

Cash equivalents are investments that a company can easily convert into cash with little delay, such as money market funds and Treasury bills. They represent an investment of excess cash that a company does not immediately need. The balance sheet shows these securities at their market value. On May 31, 2021, the end of Nike's fiscal year, Nike had \$9,889 million in cash and cash equivalents. A **fiscal year** is the year established for accounting purposes for the preparation of annual reports. Nike's fiscal year is June 1 through May 31.

Short-term investments are temporary investments in marketable securities. Companies often invest cash, which otherwise would be idle, in short-term investments, such as the stocks or bonds of other companies or debt securities issued by governments. Nike had \$3,587 million in short-term investments on May 31, 2021.

Accounts receivable is the total amount owed to the company by its customers. Accountants often classify all accounts receivable as current assets, even though they may not fully collect them within one year. However, Nike divides accounts receivable into current and noncurrent portions depending on whether they are due within the next year. It includes the noncurrent portion in "other assets." Because some customers ultimately will not pay their bill, we reduce the total receivables by an allowance or provision for "doubtful accounts" or "bad debts." Gross accounts receivable less the allowance or provision is the net amount the company expects to collect. On May 31, 2021, Nike had gross accounts receivable due within the next year of \$4,556 million and \$93 million for doubtful accounts, resulting in a net asset of \$4,463 million.

Inventories for wholesalers and retailers consist of merchandise held for sale. Manufacturing companies generally have three inventory accounts: raw materials, goods in the process of being manufactured, and finished products. Accountants regard all inventories as current assets. Companies state inventories at their cost or market price (defined as replacement cost by U.S. GAAP and net realizable value by IFRS), whichever is lower. Cost of manufactured products normally includes raw material cost plus the costs of converting it into a finished product (direct labor and manufacturing overhead). Under IFRS, companies can choose among three alternative methods to account for inventories: FIFO (first-in, first-out), weighted-average cost, or specific identification. U.S. companies have an added alternative, LIFO (last-in, first-out). Appendix 16A describes all four methods. Nike uses FIFO for some of its inventories and weighted-average cost for others. Its 2021 inventories stood at \$6,854 million.

Prepaid expenses are advance payments to suppliers. They are usually small in relation to other assets. Examples are payments in advance for rent or for insurance premiums. They belong in current assets because, if they were not present, the company would need more cash to conduct current operations.

Other current assets are miscellaneous current assets that do not fit into the listed categories. In 2021, Nike shows \$1,498 million of prepaid expenses and other current assets, which is over 5% of total current assets.

Noncurrent Assets: Property, Plant, and Equipment

Property, plant, and equipment are examples of **fixed assets** or **tangible assets**—physical items that a person can see and touch. Companies usually provide details about property, plant, and equipment in a footnote to the financial statements, such as the one for Nike shown in Exhibit 16-2. Footnotes are an integral part of financial statements. They contain explanations for the summary figures that appear in the statements.

Companies typically show land as a separate asset and carry it indefinitely at its original cost. They also initially record buildings and machinery and equipment at cost: the invoice amount, plus freight and installation, less cash discounts. However, unlike land, the recorded values of buildings, machinery, and equipment gradually decline through depreciation (see Chapter 15, pp. 644–645).

The purpose of depreciation is to allocate the asset's original cost to the particular periods that benefit from the use of the asset. The value that appears on the balance sheet is the original cost less the accumulated depreciation (the sum of all depreciation to date on the asset), which we call the net book value. The net book value is simply the result of the allocation process. It is not necessarily a good approximation to other common concepts of value, such as replacement cost or resale value.

cash equivalents

Short-term investments that a company can easily convert into cash with little delay.

fiscal year

The year established for accounting purposes for the preparation of annual reports.

short-term investments

Temporary investments in marketable securities.

fixed assets

(tangible assets)

Physical items that a person can see and touch, such as property, plant, and equipment.

Exhibit 16-2

Nike, Inc.

Footnote 3 to the 2021 Financial Statements

	Property, Plant, and Equipment (millions)	
	2021	2020
Land and improvements	\$ 363	\$ 345
Buildings	3,365	2,442
Machinery and equipment	3,023	2,751
Internal-use software	1,391	1,483
Leasehold improvements	1,608	1,554
Construction-in-process	<u>311</u>	<u>1,086</u>
	10,061	9,661
Less: Accumulated depreciation	<u>5,157</u>	<u>4,795</u>
Net property, plant, and equipment	<u>\$4,904</u>	<u>\$4,866</u>

The amount of depreciation charged as expense each year depends on three factors:

1. The depreciable amount, which is the difference between the total acquisition cost and the estimated residual value. The residual value is the amount a company expects to receive when selling the asset at the end of its economic life.
2. The estimate of the asset's useful life. This estimate often depends more on technological changes and economic obsolescence than on physical wear and tear. Thus, the useful life is usually less than the physical life.
3. The depreciation method. There are three general methods of depreciation: straight-line, accelerated, and activity-based. The straight-line method allocates the same cost to each year of an asset's useful life. Accelerated methods allocate more of the cost to the early years and less to the later years.¹ The activity-based methods allocate cost based on either input activity (such as hours of machine time used) or output activity (such as units of production).

Which method is best? It depends on the firm's goals, the asset involved, and the type of financial statement being prepared. The straight-line method is most popular. More than 90% of all firms use it for at least some assets when preparing financial statements for reporting to the public. They believe that it best matches the cost of an asset with the benefits from its use. In contrast, most U.S. firms use accelerated depreciation when preparing financial statements for tax reporting to the IRS. Why? Because it is the most beneficial method allowed under U.S. tax laws.

Suppose a business spends \$42,000 to buy equipment with an estimated useful life of 4 years and an estimated residual value of \$2,000. If we use the straight-line method of depreciation, the annual depreciation expense in each of the 4 years would be as follows:

$$\begin{aligned}
 & \frac{\text{original cost} - \text{estimated residual value}}{\text{years of useful life}} \\
 &= \frac{(\$42,000 - \$2,000)}{4} \\
 &= \$10,000 \text{ per year}
 \end{aligned}$$

Exhibit 16-3 shows how we would measure the net book value that appears on the balance sheet at the end of each year. In Exhibits 16-1 and 16-2, the original cost of fixed assets on Nike's 2021 balance sheet is \$10,061 million. There is accumulated depreciation of \$5,157 million, the portion of the original cost of the asset that Nike has already charged as depreciation expense. Therefore, the net book value of Nike's property, plant, and equipment at May 31, 2021, is \$10,061 million – \$5,157 million = \$4,904 million.

Leasehold improvements are investments made by a lessee (tenant) in items such as painting, decorating, fixtures, and air-conditioning equipment that it cannot remove from the premises when a lease expires. Companies write off the costs of leasehold improvements in the same manner as depreciation, but we call their periodic write-off amortization rather than depreciation. Nike's leasehold improvements of \$1,608 million are 16% of the original cost of its total property, plant, and equipment.

Nike shows construction in progress separately from other assets because the assets are not yet ready for use. The balance of \$311 million represents construction costs for buildings,

¹ Accelerated depreciation is described in Chapter 11. However, knowledge of accelerated depreciation methods is not necessary for understanding this chapter.

	Balances at End of Year			
	1	2	3	4
Plant and equipment (at original acquisition cost)	\$42,000	\$42,000	\$42,000	\$42,000
Less: Accumulated depreciation (the portion of original cost that has already been charged to operations as depreciation expense)	<u>10,000</u>	<u>20,000</u>	<u>30,000</u>	<u>40,000</u>
Net book value (the portion of original cost not yet charged as expense)	<u>\$32,000</u>	<u>\$22,000</u>	<u>\$12,000</u>	<u>\$ 2,000</u>

Exhibit 16-3

Straight-Line Depreciation (figures assumed)

machinery, or equipment that is not yet completed. Nike does not depreciate the assets until they are ready for use.

Long-term investments are also noncurrent assets. They include long-term holdings of securities of other firms. We discuss the accounting for such investments in Chapter 17. Nike does not show any long-term investments on its balance sheet.

Operating Lease Right-of-Use Assets

Nike primarily leases retail store space, certain distribution and warehouse facilities, office space, equipment, and other non-real estate assets. It determines if an arrangement is a lease at inception and begins recording lease activity at the commencement date. Right-of-use (ROU) assets and lease liabilities are recognized based on the present value of lease payments over the lease term with lease expense recognized on a straight-line basis. The company's incremental borrowing rate is used to determine the present value of future lease payments unless the implicit rate is readily determinable. Nike reported \$3,113 operating lease ROU assets at May 31, 2021.

Intangible Assets

We can physically observe tangible assets such as buildings or equipment. In contrast, **intangible assets** are a class of long-lived assets that are not physical in nature. They are rights to expected future benefits. Examples are franchises, patents, trademarks, and copyrights. In Exhibit 16-1, Nike shows identifiable intangible assets of \$269 million at May 31, 2021.

Sometimes it is hard to determine whether amounts spent for items such as research and development (R&D) are ordinary expenses or should be capitalized as intangible assets. To **capitalize** an amount means to record it as an asset rather than as an expense. The FASB and IASB have given explicit guidance on R&D. Research costs should be charged immediately to expense. The authorities admit that research costs may generate long-term benefits, but the general high degree of uncertainty about the extent and measurement of future benefits has led to conservative accounting—immediately charging research costs as an expense. U.S. GAAP requires companies to expense immediately most development costs also. However, companies reporting under IFRS can capitalize development costs if they can demonstrate the technological and economic feasibility of a project.

Companies divide their intangible assets into two categories, (1) those with definite lives and (2) those with indefinite lives. They spread the costs of definite-lived intangibles over the life of the asset using a method identical to straight-line depreciation—except they call it amortization rather than depreciation. Companies do not depreciate or amortize indefinite-lived intangibles. However, they must annually apply an impairment test to assure that the asset has kept its value. (The specific methods of checking for impairment differ under U.S. GAAP and IFRS, and they are beyond the scope of this text.) If the intangible has lost value, a company must reduce its balance-sheet value by the amount of the decrease and charge that same amount as an impairment expense on the income statement. Nike's identifiable intangible assets shown in footnote 4 in Nike's financial statement consist of indefinite-lived trademarks, acquired trademarks, and other intangible assets.

Another intangible asset, discussed in more detail in the next chapter, is **goodwill**, the excess of the cost of an acquired company over the sum of the fair market values of its identifiable individual assets less its liabilities. For example, Nike acquired **Umbro**, a United Kingdom-based soccer equipment company, for \$576 million in 2008. It could assign only \$233 million to various identifiable assets, such as receivables, plant, and patents, less liabilities assumed by Nike. It recorded the remaining \$343 million as goodwill. This \$343 million represents a value that Nike saw in Umbro beyond its recorded assets less liabilities. Accountants record it as an asset only because Nike was willing to pay \$343 million more than the identifiable value of the assets

intangible assets

Long-lived assets that are not physical in nature. Examples are goodwill, franchises, patents, trademarks, and copyrights.

capitalize

To record an amount as an asset rather than as an expense.

goodwill

The excess of the cost of an acquired company over the sum of the fair market values of its identifiable individual assets less its liabilities.

less liabilities it acquired. The same value may have existed when Umbro was an independent company, but it did not appear on Umbro's balance sheet. This illustrates how an exchange transaction is a basic concept of accounting. Even though many owners, like those of Umbro, could obtain a premium price if they sold their companies, we never record such goodwill. The only goodwill you will find on a balance sheet arises from an actual acquisition when a purchaser pays more than the amount assigned to individual assets less liabilities.

Goodwill remains on a company's books until management determines that its value is impaired. In 2009 Nike performed an impairment test on Umbro and determined that the value of its goodwill in Umbro had fallen to \$144 million. Therefore, Nike reduced the value of its goodwill on its balance sheet by \$343 million – \$144 million = \$199 million and charged \$199 million as an impairment expense on its income statement. Nike reported \$242 goodwill at May 31, 2021. It recognized no impairment loss during the year.

Deferred income taxes and other assets of Nike were \$2,921 million at May 31, 2021. Deferred income tax assets arise because the rules for financial reporting to the public differ from the rules for reporting to tax authorities. Consider them as expected reductions of future income taxes that arise because of past transactions. You can read more about deferred taxes in Appendix 16B.

Liabilities

Assets are only part of the picture of any organization's financial health. Its liabilities, both current and noncurrent, are equally important.

Current liabilities are an organization's debts that fall due within the coming year or within the normal operating cycle if longer than a year. Turn again to Exhibit 16-1 on p. 680. The first current liability is the *current portion of long-term debt*, which shows the payments due within the next year on bonds and other long-term debt. *Notes payable* are short-term debts backed by formal promissory notes held by a bank or business creditors. *Accounts payable* are amounts owed to suppliers who extended credit for purchases on open account. *Current portion of operating lease liabilities* are the payments due within the next year on operating lease liabilities. *Accrued liabilities* (also called *accrued expenses payable*) are amounts owed for wages, salaries, interest, and similar items. The accountant recognizes expenses as they occur—regardless of when a company pays for them in cash. *Income taxes payable* is a special accrued liability of enough magnitude to warrant a separate classification.

This concludes Nike's current liabilities, which total \$9,674 million. However, some other companies also list unearned revenue, also called deferred revenue, among their current liabilities. Such revenue occurs when a company receives cash before delivering the related goods or services. For example, on January 1, 2012, **Warner Music Group Corp.**, one of the world's leading music entertainment companies, with iconic record labels including Atlantic Records, Warner Records, Elektra Records, and Parlophone Records, had \$297 million in deferred revenue because of cash received from customers for fixed fees and minimum guarantees in advance of performance.

Now that you understand both current assets and current liabilities, we can introduce the term **working capital**—current assets less current liabilities. Investors watch working capital carefully to assess whether a company has enough current assets to pay current liabilities as they come due. Nike's working capital on May 31, 2021, was \$26,291 million – \$9,674 million = \$16,617 million.

Noncurrent liabilities, also called **long-term liabilities**, are an organization's debts that fall due beyond one year. Exhibit 16-1 shows Nike's noncurrent liabilities for 2021 as \$15,299 million, making its total liabilities \$24,973 million. Nike has three identified noncurrent liabilities, long-term debt (which we will discuss in more depth), operating lease liabilities, and deferred income taxes. Deferred income tax liabilities are a counterpart to the deferred tax assets discussed earlier. Deferred tax liabilities are expected *increases* in future income taxes that arise because of past transactions. They arise because the financial statements used for reporting to shareholders differ legitimately from those used for reporting to the income tax authorities. Appendix 16B provides more details about deferred taxes.

Exhibit 16-4 is a footnote from Nike's financial statements that provides details about its long-term debts. Note the next-to-last line in this exhibit, "Less: Current maturities." In this line, Nike subtracts the payments due in the next year from long-term debt because it has already included the amount in current liabilities. Nike shows the remaining amount as "Long-term debt" in Exhibit 16-1.

Long-term debt may be secured or unsecured. Secured debt provides debt holders with first claim on specified assets. Mortgage bonds are an example of secured debt. If the company is

Objective 2

Recognize and define the main types of liabilities in the balance sheet of a corporation.

current liabilities

An organization's debts that fall due within the coming year or within the normal operating cycle if longer than a year.

working capital

Current assets less current liabilities.

noncurrent liabilities (long-term liabilities)

An organization's debts that fall due beyond one year.

Long-term debt includes the following (in millions)	May 31	
	2021	2020
2.25% Corporate term debt, payable May 1, 2023	\$ 499	\$ 499
2.4% Corporate term debt, payable March 27, 2025	995	994
2.38% Corporate term debt, payable November 1, 2026	996	995
2.75% Corporate term debt, payable March 27, 2027	995	994
2.85% Corporate term debt, payable, payable March 27, 2030	1,490	116
3.25% Corporate term debt, payable, payable March 27, 2040	986	985
2.6% Japanese Yen note, payable, maturing August 20, 2001, through November 20, 2020	0	2
2.0% Japanese Yen note, payable, maturing August 20, 2001, through November 20, 2020	<u>0</u>	<u>1</u>
Subtotal	9,413	9,409
Less: Current maturities	<u>0</u>	<u>3</u>
Total	<u>\$ 276</u>	<u>\$ 446</u>

Exhibit 16-4

Nike, Inc.
Footnote 8 to the 2021 Financial Statements

unable to meet its regular obligations on the bonds, it may sell the specified assets and use the proceeds to pay off the firm's obligations to its bondholders, in which case secured debt holders have first claim to these proceeds.

Unsecured debt consists of **debentures** (bonds, notes, or loans), which are formal certificates of indebtedness accompanied by a promise to pay interest at a specified annual rate. Unsecured debt holders are creditors who have a general claim against total assets rather than a specific claim against particular assets. Most of Nike's long-term debt is unsecured. Holders of **subordinated** bonds or debentures are junior to the other creditors in exercising claims against assets.

To increase the appeal of their bonds, many companies issue debt that holders can convert into common stock. Convertibility allows bondholders to participate in a company's success without the risk of holding common stock. Suppose Nike issued convertible bonds for \$1,000 when its stock price was \$176, with a provision that investors can convert each bond into 10 common shares. If the stock price increases by 50% to \$264 a share, the bondholder could exchange the \$1,000 bond for 10 shares worth $10 \times \$264 = \$2,640$. If the stock price falls (or does not increase beyond \$100 a share), the bondholder can keep the bond and receive \$1,000 at maturity.

Consider the following example of how a corporation distributes resources when bankruptcy forces it to liquidate. **Liquidation** means converting assets to cash and using the cash to pay off outside claims. The company had a single asset, a building, that it sold for \$120,000 cash:

Assets		Liabilities and Stockholders' Equity	
Cash	\$120,000	Accounts payable	\$ 60,000
		First-mortgage bonds payable	80,000
		Subordinated debentures payable	<u>40,000</u>
		Total liabilities	\$180,000
		Stockholders' equity (negative)	<u>(60,000)</u>
Total assets	<u>\$120,000</u>	Total liabilities and stockholders' equity	<u>\$120,000</u>

The company would pay the mortgage (secured) bondholders in full (\$80,000). It would pay trade creditors, such as suppliers, the remaining \$40,000 for their \$60,000 claim (\$.67 on the dollar). The remaining claimants (the subordinated debenture holders and the stockholders) would get nothing. If the debentures were unsubordinated, the company would use the \$40,000 of cash remaining after paying \$80,000 to the mortgage holders to settle the \$100,000 claims of the unsecured creditors proportionately as follows:

To trade creditors	$6/10 \times \$40,000 =$	\$24,000
To debenture holders	$4/10 \times \$40,000 =$	<u>16,000</u>
Total cash distributed		<u>\$40,000</u>

debentures

Formal certificates of indebtedness that are accompanied by a promise to pay interest at a specified annual rate.

subordinated

A creditor claim that is junior to the other creditors in exercising claims against assets.

liquidation

Converting assets to cash and using the cash to pay off outside claims.

Objective 3

Recognize and define the main elements of the stockholders' equity section of the balance sheet of a corporation.

common stock

Stock that has no predetermined rate of dividends and is the last to obtain a share in the assets when the corporation liquidates. It usually confers voting power to elect the board of directors of the corporation.

limited liability

A provision that a company's creditors cannot seek payment from stockholders as individuals if the corporation itself cannot pay its debts.

preferred stock

Stock that typically has some priority over other shares in the payment of dividends or the distribution of assets upon liquidation.

par value (stated value)

The value often printed on the face of stock certificates.

Stockholders' Equity

The final element of a balance sheet is stockholders' equity (called shareholders' equity by Nike), the total residual interest in the business. As we saw in Chapter 15, it is the excess of total assets over total liabilities. The main elements of stockholders' equity arise from two sources: (1) contributed or paid-in capital and (2) retained income and other comprehensive income.

Paid-in capital typically comes from owners who invest in the business in exchange for shares of stock that specify their ownership interest. Holders of stock are stockholders or shareholders. As per law, there are two major classes of capital stock: common stock and preferred stock. Some companies have several categories of each, all with a variety of different attributes.

All corporations have **common stock**. Such stock has no predetermined rate of dividends and is the last to obtain a share in the assets when the corporation liquidates. Common stockholders usually elect the board of directors of the corporation. Common stock is the riskiest investment in a corporation, being unattractive in dire times because common stockholders can lose their entire investment but attractive in prosperous times because there is no limit to the common stockholder's potential participation in earnings. The corporate form of ownership provides one additional benefit to common shareholders—**limited liability**. This means that a company's creditors cannot seek payment from stockholders as individuals if the corporation itself cannot pay its debts.

Apart from common stock, Nike also mentions redeemable preferred stock in its balance sheet, though the reported figure on May 31, 2021, was zero. Many companies in the United States issue **preferred stock**. It typically has some priority over other shares in the payment of dividends or distribution of assets on liquidation. Regarding its position in the balance sheet, one interesting point may be noted. As per ASC 480, mandatorily redeemable preferred stock should be placed under liabilities only, while preferred stock that is redeemable contingently and at the option of the holder is placed in mezzanine equity, i.e., after total liabilities but before shareholders' equity. Normally, preferred shareholders do not enjoy any voting privileges.

The face of a stock certificate often shows the **par** or **stated value**. For preferred stock, par is a basis for determining the amount of dividends or interest. Many preferred stocks have \$100 par values. That is, a 9%, \$100-par preferred stock would carry a \$9 annual dividend. In contrast, par value has no practical importance for common stock. If a company were to issue stock for a price below par value, shareholders could be held liable for the difference between the issue price and par value if, upon liquidation, the company had insufficient resources to pay its creditors. However, as a practical matter, companies do not issue shares for less than par value. Instead, they set par or stated value at a nominal amount in relation to the market value of the stock on issuance (for example, stock issued for \$70 might have a par value of \$1).

Capital in excess of stated (or par) value is the difference between the amount a company receives when issuing new shares and the stated or par value of the shares issued. Suppose Nike had issued all its outstanding class A and B common shares for cash. The cumulative balance sheet effect at May 31, 2021, would be as follows (in millions):

Cash	<u>\$9,968</u>	Common stock, at stated value	\$ 3
		Capital in excess of stated value	<u>9,965</u>
		Total paid-in capital	<u>\$9,968</u>

Retained earnings, also called *retained income*, is the balance in stockholders' equity due to the cumulative effect over the life of the corporation of all profits or losses generated less amounts distributed to shareholders (see Chapter 15). Retained earnings is the dominant item of stockholders' equity for most companies. For instance, as of May 31, 2021, Nike had shareholders' equity of \$12,767 million of which \$3,179 million or 25% was retained earnings.

Another element of stockholders' equity is *accumulated other comprehensive income*. **Other comprehensive income** consists of a few special types of gains and losses that do not appear on the income statement and thus do not become part of retained earnings. The specific gains and losses are beyond the scope of this text. While you will find accumulated other comprehensive income on most balance sheets, it is generally quite small. Nike's balance on May 31, 2021, was only \$(380), representing a loss.

Many companies have **treasury stock**, which is a corporation's own stock that the company issued and subsequently repurchased but has not permanently retired. They hold it temporarily "in the treasury" to be distributed later, possibly as a part of an employee stock purchase plan or as an executive bonus or for use in acquiring another company. Such a repurchase is a decrease

other

comprehensive income

A few special types of gains and losses that do not appear on the income statement and thus do not become part of retained earnings.

treasury stock

A corporation's own stock that it has issued and subsequently repurchased but has not permanently retired.

in ownership claims. Therefore, it should appear on a balance sheet as a deduction from total stockholders' equity. A company does not pay cash dividends on shares held in the treasury. Companies distribute dividends only to the outstanding shares (those in the hands of stockholders). Nike had no treasury stock in 2021. In contrast, **Chevron Corporation** had more than \$41 billion of treasury stock on January 1, 2020 (in millions):

Shareholders' equity before deducting treasury stock	\$173,186
Treasury stock	(41,498)
Total shareholders' equity	<u>\$131,688</u>

Summary Problems for Your Review

PROBLEM

"The book value of plant assets is the amount that a company would have to spend today to replace the assets." Do you agree? Explain.

SOLUTION

No. Net book value of the plant assets is the result of deducting accumulated depreciation from original cost. This process does not attempt to capture all the technological and economic events that may affect replacement value. Consequently, there is little likelihood that net book value will approximate replacement cost.

PROBLEM

Suppose that on December 31, 2021, **Time Warner** sells 3-year subscriptions to *Time Magazine* for a total of \$150,000 cash.

It regards this sum as unearned revenue. Show the balances in unearned revenue at December 31, 2021, 2022, 2023, and 2024. How much revenue would Time Warner earn from the subscriptions in each of 2022, 2023, and 2024?

SOLUTION

The balance in unearned revenue would decline at the rate of \$50,000 yearly as shown in the following table. Time Warner would recognize \$50,000 as earned revenue in each of 2022, 2023, and 2024.

	December 31			
	2021	2022	2023	2024
Unearned revenue	\$150,000	\$100,000	\$50,000	\$0

Income Statement

Most investors are vitally concerned about a company's ability to produce long-run earnings and dividends. In this regard, income statements are more important than balance sheets. (Other names for the income statement include statement of earnings, statement of profit and loss, and P&L statement.) Income statements first list revenues, the total sales value of products delivered and services rendered to customers. From revenues they deduct expenses to get net income. We next examine how the format of the income statement can help users judge a company's performance.

Operating Performance

An income statement can take one of two major forms: single-step or multiple-step. A single-step statement merely lists all expenses without drawing subtotals. It provides an overall measure of performance, but it does not allow direct assessment of performance in specific areas. In contrast, a multiple-step statement contains one or more subtotals. By dividing expenses into categories, we can more easily evaluate a company's performance in different dimensions.

Objective 4

Recognize and define the principal elements in the income statement of a corporation.

Exhibit 16-5

Nike, Inc.

Statement of Income (millions
except per share data)

	Year Ended May 31	
	2021	2020
Revenues	\$44,538	\$37,403
Cost of sales	<u>24,576</u>	<u>21,162</u>
Gross margin	<u>\$19,962</u>	<u>\$16,241</u>
Demand creation expense	3,114	3,592
Operating overhead expense	<u>9,911</u>	<u>9,534</u>
Total selling and administrative expense	<u>\$13,025</u>	<u>\$13,126</u>
Income from operations	<u>\$ 6,937</u>	<u>\$ 3,115</u>
Other expense (income)		
Interest expense, net	\$ 262	\$ 89
Other expense, net	<u>14</u>	<u>139</u>
Total other expense (income)	<u>\$ 276</u>	<u>\$ 228</u>
Income before income taxes	\$ 6,661	\$ 2,887
Income taxes	<u>934</u>	<u>348</u>
Net income	<u>\$ 5,727</u>	<u>\$ 2,539</u>
Basic earnings per common share*	<u>\$ 3.64</u>	<u>\$ 1.63</u>
*Computation of earnings per share:		
	2021	2020
Net income	\$5,727,000,000	\$2,539,000,000
Divided by average common shares outstanding	1,573,000,000	1,558,800,000
Earnings per share	<u>\$ 3.64*</u>	<u>\$ 1.63</u>

Exhibit 16-5 illustrates the two most common subtotals used to assess operating performance: *gross margin* (or *gross profit*) and *income from operations* (or *operating income* or *operating profit*). Gross margin is sales less cost of goods sold. It measures the amount by which sales prices exceed merchandise costs. A shrinking gross margin can indicate increasing competition in the market for the company's goods or services.

If you try to compare gross margins for two companies, you should be aware that a company's inventory method affects its gross profit. Why? Because the method that determines the value of inventory also determines the cost of goods sold. Appendix 16A provides additional discussion and examples to explain why understanding inventory methods is important to interpreting differences in gross margin.

Operating income (or *loss*) summarizes the results of the basic operating activities of the company—the day-to-day activities that generate sales revenue. Income statements often group depreciation expense, selling expenses, and administrative expenses as “operating expenses” and deduct them from the gross margin to obtain operating income. **Nike** shows two operating expenses, demand creation expense (more often called marketing expense) and operating overhead expense. (Note that cost of goods sold is also an operating expense. Why? Because we also deduct it from sales revenue to obtain “operating income.”) In 2021, Nike had a gross margin of \$19,962 million and operating income of \$6,937 million. This summarizes Nike's success in producing and selling its products.

Financial Management

Managers are responsible for financial management as well as operating management. Financial management focuses on where to get cash and how to use cash for the benefit of the organization. That is, financial management attempts to answer questions such as the following: How much cash should we hold in our checking accounts? Should we pay a dividend? Should we borrow money or issue common stock? The best managers are superb at both operating and financial

Making Managerial Decisions

Suppose that you are a regional manager for **Wal-Mart** who is analyzing the performance of a **Sam's Club** warehouse in Texas. The income statement includes the following (in millions):

	2021	2020
Total revenue	\$140.2	\$140.0
Cost of revenue	<u>125.1</u>	<u>122.5</u>
Gross profit	15.1	17.5
Operating expenses	<u>13.3</u>	<u>13.6</u>
Operating income	<u><u>1.8</u></u>	<u><u>3.9</u></u>

What has caused the operating income to fall by \$2.1 million in 2021?

Answer

Although revenue increased in 2021 by \$0.2 million, cost of revenue climbed by \$2.6 million, causing the gross profit to fall by \$2.4 million. This means that there must have been pressure on prices in 2021 and the warehouse was not able to maintain the markup it achieved in 2020. This decrease in gross profit was offset by a \$0.3 million decrease in operating expenses, so that total operating income was \$2.1 million less in 2021 than in 2020. The warehouse manager was able to control operating expenses but was not able to maintain the warehouse's gross profit.

management. However, many managers are better operating managers than financial managers, or vice versa.

Because financial decisions and operating decisions have their own distinct effect on income, it is useful to separate the two effects in the income statement. Financing decisions affect primarily interest income and expense, so we present them as separate items after operating income. This approach facilitates comparisons of operating income between years and between companies. Some companies make heavy use of debt, which causes high interest expense, whereas other companies incur little debt and interest expense. Nike has a substantial amount of debt, so its interest expense was \$262 million higher than its interest income. Other nonoperating items might also include income or loss on investments and gains or losses from foreign exchange transactions or from disposals of fixed assets. For Nike these totaled \$14 million of nonoperating expense, net.

The final expense on most income statements is income tax expense. Income statements usually deduct income taxes as a separate item placed immediately before net income. Nike's 2021 income statement in Exhibit 16-5 shows income taxes of \$934 million.

The amount left after deducting all operating and nonoperating expenses from revenue is net income, sometimes called *net earnings* or *net profits* or simply the "bottom line." Nike's 2021 net income was \$5,727 million.

Income statements conclude with the disclosure of earnings per share (EPS). Most companies report two EPS numbers: basic EPS and diluted EPS. Diluted EPS includes the potential effect of issuing additional common shares to holders of convertible securities or options. We focus only on basic EPS. Exhibit 16-5 illustrates basic **earnings per share (EPS)** as the net income divided by the average number of common shares outstanding during the year. Nike's basic EPS was \$3.64 per share in 2021.

earnings per share (EPS)
Net income divided by the average number of common shares outstanding during the year.

Statement of Changes in Stockholders' Equity

To explain the changes in the stockholders' equity accounts, companies prepare a *statement of stockholders' equity* (or *statement of changes in stockholders' equity*), which shows the changes in each of the stockholders' equity accounts. Nike's statement is in Exhibit 16-6. The statement shows the four main stockholders' equity accounts: Common Stock, Capital in Excess of Stated Value, Accumulated Other Comprehensive Income, and Retained Earnings. We will focus on the changes in retained earnings. As the last column in Exhibit 16-6 demonstrates, net income increases retained earnings, and dividends reduce retained earnings. Note especially that dividends are not expenses; companies do not deduct them in computing net income, as explained in Chapter 15 on p. 650. Nike also reduced retained earnings by buying back some of its common shares, essentially giving some shareholders cash in exchange for their equity claims.

Objective 5

Recognize and define the elements that cause changes in stockholders' equity accounts.

Exhibit 16-6

Nike, Inc.
*Statement of Stockholders'
 Equity for the Year Ended May
 31, 2021 (millions of dollars)*

	Common Stock	Capital in Excess of Stated Value	Accumulated Other Comprehensive Income	Retained Earnings
Balance, May 31, 2020	\$3	\$8,299	\$(56)	\$ (191)
Net income (Exhibit 16-5)				5,727
Dividends on common stock				(1692)
Repurchase of common stock		(28)		(622)
Stock options exercised		954		
Issuance of shares to employees		129		(43)
Stock-based compensation		611		
Other comprehensive income (loss)			(324)	
Balance, May 31, 2021	<u>\$3</u>	<u>\$9,965</u>	<u>\$380</u>	<u>\$3,179</u>

Summary Problem for Your Review

PROBLEM

The Felski Company had the following items on its December 31, 20X1, balance sheet and 20X1 income statement:

Revenues	\$830,000
Inventories	19,000
Notes payable	90,000
Long-term debt, excluding current portion	81,000
Goodwill, patents, and trademarks	70,000
Interest income	19,000
Accounts receivable, net	38,000
Provision for income taxes	55,000
Other long-term assets	78,000
Interest expense	45,000
Deferred income tax liability—long-term	36,000
Cash and equivalents	80,000
Retained earnings	?
Income taxes payable	8,000
Cost of sales	490,000
Additional paid-in capital	35,000
Prepaid expenses	48,000
Common stock (120,000 shares outstanding)	120,000
Property, plant, and equipment, at cost	680,000
Accounts payable	81,000
Current portion of long-term debt	12,000
Less: Accumulated depreciation	260,000
Selling and administrative expenses	190,000

Prepare in proper form the December 31, 20X1, balance sheet and the 20X1 income statement for Felski Company. Include the proper amount for retained earnings.

SOLUTION

See Exhibit 16-7 for the balance sheet and Exhibit 16-8 for the income statement. To determine the amount of retained earnings, begin by computing total liabilities and shareholders' equity = total assets = \$753,000.

Exhibit 16-7

Felski Company

Balance Sheet, December 31, 20X1

ASSETS:

Current assets:

Cash and equivalents	\$ 80,000
Accounts receivable, net	38,000
Inventories	19,000
Prepaid expenses	48,000
Total current assets	<u>185,000</u>

Noncurrent assets:

Property, plant, and equipment, at cost	680,000
Less: Accumulated depreciation	<u>260,000</u>
Property, plant, and equipment, net	420,000
Goodwill, patents, and trademarks	70,000
Other long-term assets	<u>78,000</u>
Total noncurrent assets	<u>568,000</u>

Total assets	<u><u>\$753,000</u></u>

LIABILITIES AND SHAREHOLDERS' EQUITY:

Current liabilities:

Notes payable	\$ 90,000
Accounts payable	81,000
Income taxes payable	8,000
Current portion of long-term debt	<u>12,000</u>
Total current liabilities	<u>191,000</u>

Noncurrent liabilities:

Long-term debt, excluding current portion	81,000
Deferred income tax liability	<u>36,000</u>
Total noncurrent liabilities	<u>117,000</u>

Total liabilities	<u>308,000</u>

Shareholders' equity:

Common stock (120,000 shares @ \$1.00)	120,000
Additional paid-in capital	35,000
Retained earnings	<u>290,000</u>
Total shareholders' equity	<u>445,000</u>

Total liabilities and shareholders' equity	<u><u>\$753,000</u></u>

Exhibit 16-8**Felski Company***Income Statement for the Year Ended December 31, 20X1*

Revenues	\$830,000
Cost of sales	<u>490,000</u>
Gross profit	\$340,000
Selling and administrative expenses	<u>190,000</u>
Income from operations	<u>\$150,000</u>
Other income (expense):	
Interest expense	\$ (45,000)
Interest income	<u>19,000</u>
Total other income (expense)	<u>\$ (26,000)</u>
Income before income taxes	\$124,000
Provision for income taxes	<u>55,000</u>
Net income	<u>\$ 69,000</u>
Earnings per share (\$69,000 ÷ 120,000)	<u>\$ 0.58</u>

Then,

$$\begin{aligned}
 \text{Total shareholders' equity} &= \text{total liabilities and shareholders' equity} - \text{total liabilities} \\
 &= \$753,000 - \$308,000 \\
 &= \$445,000
 \end{aligned}$$

$$\begin{aligned}
 \text{Retained earnings} &= \text{shareholders' equity} - \text{common stock} - \text{additional paid-in capital} \\
 &= \$445,000 - \$120,000 - \$35,000 \\
 &= \$290,000
 \end{aligned}$$

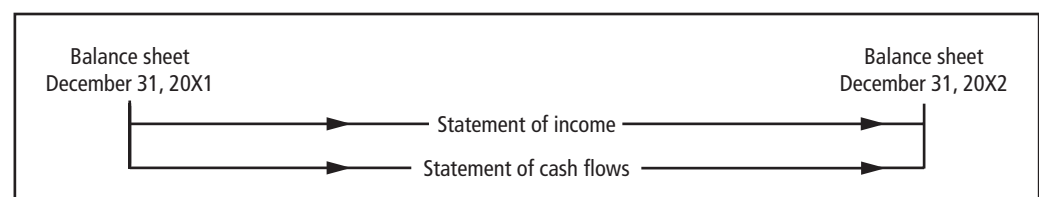
Statement of Cash Flows

Another required statement, the statement of cash flows, has important information to help decision makers assess a company's generation and use of cash. The **statement of cash flows** reports the cash receipts and cash payments of an organization during a particular period. The statement has the following purposes:

- It shows the relationship of net income to changes in cash balances. Cash balances can decline despite positive net income and vice versa.
- It reports past cash flows as an aid in
 - a. predicting future cash flows.
 - b. evaluating management's generation and use of cash.
 - c. determining a company's ability to pay interest and dividends and to pay debts when they are due.

Basic Concepts

Recall that balance sheets show the status of an entity at a point in time. In contrast, statements of cash flows and income statements cover periods of time. They explain why the balance sheet items have changed. The accompanying diagram depicts this linkage, where the arrows represent the flow of events that affect a company's balance sheet during the year:

**statement of cash flows**

A statement that reports the cash receipts and cash payments of an organization during a particular period.

The income statement summarizes events that contribute to changes in retained earnings. The statement of cash flows summarizes events that explain changes in cash—where cash came from during a period and where it was spent.

The statement of cash flows explains changes in cash and cash equivalents, both of which a company can use almost immediately to meet obligations. Recall from p. 681 that cash equivalents are highly liquid short-term investments that a company can easily convert into cash with little delay. Hereafter, when we refer to cash, we mean both cash and cash equivalents.

Typical Activities Affecting Cash

The fundamental approach to the statement of cash flows includes two steps: (1) List the activities that increased cash (cash inflows) and those that decreased cash (cash outflows), and (2) place each cash inflow and outflow into one of three categories according to the type of activity that caused it: operating activities, investing activities, and financing activities.

Following are examples of activities frequently found in statements of cash flows:

Operating Activities	
<i>Cash Inflows:</i>	<i>Cash Outflows:</i>
Collections from customers	Cash payments to suppliers
Receipt of cash interest or dividends	Cash payments to employees
Other operating receipts	Interest paid
	Taxes paid
	Other operating cash payments
Investing Activities	
<i>Cash Inflows:</i>	<i>Cash Outflows:</i>
Sale of property, plant, and equipment	Purchase of property, plant, and equipment
Sale of securities that are not cash equivalents	Purchase of securities that are not cash equivalents
Receipt of loan principal repayments	Lending cash
Financing Activities	
<i>Cash Inflows:</i>	<i>Cash Outflows:</i>
Borrowing cash from creditors	Repayment of amounts borrowed
Issuing equity securities	Repurchase of equity shares (including the purchase of treasury stock)
	Payment of dividends

Let's look briefly at each of the three categories. **Cash flows from operating activities** are generally the effects of transactions that affect the income statement. **Cash flows from investing activities** include (1) lending and collecting principle repayments on loans and (2) acquiring and selling long-term assets. **Cash flows from financing activities** include obtaining cash from creditors and owners, repaying creditors or buying back stock from owners, and paying cash dividends.

Perhaps the most troublesome classifications are the receipts and payments of interest and the receipts of dividends. Standard setters in the United States decided to include these items with cash flows from operating activities, even though they are a result of investment and financing activities. Why? Mainly because they affect the computation of income. In contrast, payments of cash dividends are financing activities because they do not affect income.

Most companies reporting under IFRS use the same method as those reporting under U.S. GAAP. However, companies using IFRS have the option to classify dividend or interest payments as either operating or financing activities and interest or dividend receipts as either operating or investing activities.

Objective 6

Explain the purposes of the cash flow statement, identify activities that affect cash, and classify the activities as operating, investing, or financing activities.

cash flows from operating activities

The section in the statement of cash flows that lists the cash-flow effects of transactions that affect the income statement.

cash flows from investing activities

The section in the statement of cash flows that lists the cash-flow effects of (1) lending and collecting on loans and (2) acquiring and selling long-term assets.

cash flows from financing activities

The section in the statement of cash flows that lists the cash-flow effects of obtaining cash from creditors and owners, repaying creditors or buying back stock from owners, and paying cash dividends.

Focus of a Statement of Cash Flows

To see the basic ideas underlying the statement of cash flows, we first consider a simple hypothetical company, the Michael Foster Company, and later we will look at **Nike's** statement of cash flows. Exhibit 16-9 shows Foster Company's summary transactions for 20X2, Exhibit 16-10 shows its 20X2 income statement, and Exhibit 16-11 shows condensed balance sheets for 20X1 and 20X2. Because the statement of cash flows explains the causes for the change in cash, our first step is to compute the amount of the change (which represents the net effect we need to explain):

Cash, December 31, 20X1	\$25,000
Cash, December 31, 20X2	<u>16,000</u>
Net decrease in cash	<u>\$ 9,000</u>

Exhibit 16-12 illustrates a statement of cash flows that explains this \$9,000 decrease in cash. Let's look at each of the three sections of this cash flow statement.

Cash Flows from Financing Activities

Although most companies list operating activities as the first section of the cash flow statement, it is easier to understand the cash flows from financing activities, so we will begin with that section. It shows cash flows to and from providers of capital. The easiest way to determine cash flows from financing activities is to examine changes in the cash account in the balance sheet equation and identify those associated with financing activities.

Foster Company had three such transactions in 20X2, as shown in Exhibit 16-9:

Transaction 9, issue long-term debt, \$120,000

Transaction 10, issue common stock, \$98,000

Transaction 11, pay dividends, \$19,000

The first two of these transactions are cash inflows, and the last is a cash outflow. Notice that we put cash outflows in parentheses. Therefore, Foster's net cash inflow from financing activities totals \$199,000:

Foster Company	
Cash Flows from Financing Activities, 20X2	
Proceeds from issuance of long-term debt	\$120,000
Proceeds from issuance of common stock	98,000
Payment of dividends	<u>(19,000)</u>
Net cash provided by financing activities	<u>\$199,000</u>

A general rule for financing activities is as follows:

- Increases in cash (cash inflows) stem from increases in liabilities or paid-in capital.
- Decreases in cash (cash outflows) stem from decreases in liabilities or paid-in capital or payment of dividends.

The following is a list of some financing activities and their effect on cash:

Type of Transaction	Increase (+) or Decrease (–) in Cash
Increase long-term or short-term debt	+
Reduce long-term or short-term debt	–
Sell common or preferred shares	+
Repurchase common shares	–
Pay dividends	–
Convert debt to common stock	No effect

Objective 7

Assess financing and investing activities using the statement of cash flows.

Transaction	Assets				Liabilities and Stockholders' Equity				
	Cash	Accounts Receivable	Inventories	Fixed Assets, Gross	Accumulated Depreciation	Liabilities			
						Accounts Payable	Wages and Salaries Payable	Long-Term Debt	Stockholders' Equity
Balance, 12/31/X1	+ 25	+ 25	+ 60	+ 330	— 110	+ 6	+ 4	+ 5	+ 210
1a. Purchase inventory on account			+ 140			+ 140			
1b. Payments to suppliers	— 72					— 72			
2a. Sales on credit		+ 200							+ 200
2b. Cash collections from customers	+ 180	— 180							
2c. Cost of goods sold			— 100						
3a. Wages and salaries expense							+ 36		— 100
3b. Payments to employees	— 15						— 15		— 36
4. Depreciation expense					— 17				— 17
5. Interest expense—paid-in capital	— 4								— 4
6. Income tax expense—paid-in capital	— 20								— 20
7. Purchase of fixed assets for cash	— 287			+ 287					
8. Sales of fixed assets*	+ 10			— 36	+ 26				
9. Issue long-term debt for cash	+ 120							+ 120	
10. Issue common stock for cash	+ 98								+ 98
11. Pay cash dividends	— 19								— 19
Balance, 12/31/X2	+ 16	+ 45	+ 100	+ 581	— 101	+ 74	+ 25	+ 125	+ 308
									+ 109

*Foster Company sold assets with a gross book value of \$36,000 and accumulated depreciation of \$26,000, receiving cash of \$10,000.

Exhibit 16-9

Foster Company Summarized Transactions, 20X2 (in thousands of dollars)

Exhibit 16-10

Foster Company
*Statement of Income for the
 Year Ended December 31, 20X2
 (in thousands)*

Sales		\$200
Costs and expenses		
Cost of goods sold	\$100	
Wages and salaries	36	
Depreciation	17	
Interest	<u>4</u>	
Total costs and expenses		157
Income before income taxes		<u>43</u>
Income taxes		20
Net income		<u>\$ 23</u>

Assets				Liabilities and Stockholders' Equity			
	20X2	20X1	Increase (Decrease)		20X2	20X1	Increase (Decrease)
Current assets				Current liabilities			
Cash	\$ 16	\$ 25	\$ (9)	Accounts payable	\$ 74	\$ 6	\$ 68
Accounts receivable	45	25	20	Wages and salaries payable	25	4	21
Inventories	<u>100</u>	<u>60</u>	<u>40</u>	Total current liabilities	<u>99</u>	<u>10</u>	<u>89</u>
Total current assets	<u>161</u>	<u>110</u>	<u>51</u>	Long-term debt	125	5	120
Fixed assets, gross	581	330	251	Stockholders' equity	<u>417</u>	<u>315</u>	<u>102</u>
Less accum. depreciation	<u>(101)</u>	<u>(110)</u>	<u>9</u>	Total liabilities and stockholders' equity	<u>\$641</u>	<u>\$330</u>	<u>\$311</u>
Net fixed assets	<u>480</u>	<u>220</u>	<u>260</u>				
Total assets	<u>\$641</u>	<u>\$330</u>	<u>\$311</u>				

Exhibit 16-11

Foster Company
Balance Sheets as of December 31 (in thousands)

Exhibit 16-12

Foster Company
*Statement of Cash Flows for
 the Year Ended December 31,
 20X2 (in thousands)*

Cash Flows from Operating Activities			
Cash collections from customers			\$180
Cash payments			
To suppliers	\$72		
To employees	15		
For interest	4		
For taxes	<u>20</u>		
Total cash payments			(111)
Net cash provided by operating activities			<u>\$ 69</u>
Cash Flows from Investing Activities			
Purchases of fixed assets	\$(287)		
Proceeds from sale of fixed assets	<u>10</u>		
Net cash used in investing activities			(277)
Cash Flows from Financing Activities			
Proceeds from issue of long-term debt	\$120		
Proceeds from issue of common stock	98		
Dividends paid	<u>(19)</u>		
Net cash provided by financing activities			199
Net decrease in cash			<u>\$ (9)</u>
Cash, December 31, 20X1			25
Cash, December 31, 20X2			<u>\$ 16</u>

Cash Flows from Investing Activities

Another part of the cash flow statement, cash flows from investing activities, lists cash flows from the purchase or sale of plant, property, equipment, and other long-lived assets. It is usually the second section in the statement. To determine the cash flows from investing activities, you need to look at transactions that increase or decrease long-lived assets, loans made by the company, or securities it owns that are not cash equivalents. Foster Company has only one such asset, fixed assets, and its related accumulated depreciation account. There were two cash transactions relating to fixed assets during 20X2:

Transaction 7, purchase fixed assets for cash, \$287,000

Transaction 8, sale of fixed assets for cash, \$10,000

The first of these transactions is a cash outflow, and the second is a cash inflow. The investing activities section of Foster's cash flow statement is as follows:

Foster Company	
Cash Flows from Investing Activities, 20X2	
Purchase of fixed assets	\$(287,000)
Proceeds from sale of fixed assets	10,000
Net cash used by investing activities	<u>\$(277,000)</u>

Because there is a net cash outflow, investing activities used cash during January. This contrasts with financing activities, which provided cash.

The general rule for investing activities is as follows:

- Increases in cash (cash inflows) stem from sales of long-lived assets, collection of loans, and sales of investments.
- Decreases in cash (cash outflows) stem from purchases of long-lived assets, loans made to others, and purchases of investments.

Following are examples of investing activities and their effects on cash:

Type of Transaction	Increase (+) or Decrease (–) in Cash
Purchase fixed assets for cash	–
Purchase fixed assets by issuing debt	No effect
Sell fixed assets for cash	+
Purchase securities that are not cash equivalents	–
Sell securities that are not cash equivalents	+
Make a loan	–
Collect a loan	+

Noncash Investing and Financing Activities

Sometimes financing or investing activities do not affect cash but are similar to transactions that have a cash-flow effect. Companies must list such activities in a separate schedule accompanying the statement of cash flows. In our example, Foster Company did not have any noncash investing or financing activities. However, suppose Foster's purchase of fixed assets was not for cash but was financed as follows:

- Foster acquired \$150,000 of the fixed assets by issuing common stock.
- Foster acquired the other \$137,000 of fixed assets by signing a note payable for \$137,000.

Foster could have taken the \$150,000 and \$137,000 in cash and then used that cash to buy fixed assets, but it never actually received the cash. Thus, there is no entry to the statement of cash flows. However, because of the similarities between this noncash transaction and the purchase for cash, readers of statements of cash flows want to be informed of such noncash activities.

Companies must report such items in a schedule of noncash investing and financing activities. If Foster Company had acquired the store equipment for common stock and a note payable, the purchase of fixed assets for \$287,000 shown earlier would not appear in the investing section of the statement of cash flows. Instead, Foster Company’s schedule for these hypothetical transactions would be as follows:

Foster Company	
Schedule of noncash investing and financing activities, 20X2	
Common stock issued to acquire store equipment	\$150,000
Note payable for acquisition of store equipment	\$137,000

Objective 8

Use both the direct method and the indirect method to explain cash flows from operating activities.

Cash Flow from Operating Activities

Analyzing the results of financing and investing activities informs investors about management’s ability to make financial and investment decisions. However, users of financial statements are even more concerned with assessing management’s operating decisions. They focus on the first major section of cash flow statements, cash flows from operating activities (or cash flows from operations). This section shows the cash effects of transactions that affect the income statement.

Approaches to Calculating the Cash Flow from Operating Activities

We can use either of two approaches to compute cash flows from operating activities (or cash flow from operations). The **direct method for operating cash flows** subtracts operating cash disbursements from operating cash collections to arrive at cash flows from operations. The **indirect method for operating cash flows** adjusts the previously-calculated accrual net income from the income statement to reflect only operating cash receipts and cash disbursements. Both methods show the same total amount of cash provided by (or used for) operating activities. The only difference is the format and individual components of the statement.

The IASB and FASB prefer the direct method because it is a straightforward listing of cash inflows and cash outflows and is easier for investors to understand. The boards have a joint proposal that would mandate use of the direct method, and it may be approved in the near future. However, today almost all companies use the indirect method, which links cash flows directly with net income, emphasizing how income and cash flows differ. We will discuss the direct method first because you will probably find it easier to understand. However, it is essential to understand also the indirect method that most companies use.

Consider first the types of cash flows that accountants classify as operating activities. Exhibit 16-13 lists many such activities. These cash flows are associated with revenues and expenses on the income statement. Notice that recording revenues from the sales of goods or services on account does not increase cash immediately. Instead, the increase in cash occurs when a company collects its accounts receivable.

The cash effects of expenses are similar. Sometimes—depreciation is an example—the cash outflow precedes the recording of the expense on the income statement. For example, Foster Company paid \$287,000 in cash for its fixed assets and recorded the purchase as an investing cash outflow. The company then records depreciation expenses as it uses the equipment, long after the cash payment. Thus, depreciation is never a cash flow.

Other times the cash outflow follows the recording of the expense. For example, most companies pay salaries and wages after employees have earned them. Suppose that Foster Company pays salaries and wages on the tenth day of each month for the amount earned the previous month. Then, the accrual of the expense would occur one month, and the related cash outflow would come the following month. The expense appears in the first month’s income statement, but the cash outflow appears in the second month’s statement of cash flows.

Now let’s examine the two formats used for showing the cash flow effects of operations.

direct method for operating cash flows

A method for computing cash flows from operating activities that subtracts operating cash disbursements from cash collections to arrive at cash flows from operations.

indirect method for operating cash flows

A method for computing cash flows from operating activities that adjusts the previously calculated accrual net income from the income statement to reflect only cash receipts and cash disbursements.

Exhibit 16-13

Analysis of Effects of
Transactions on Cash Flows
from Operating Activities

Type of Transaction	Increase (+) or Decrease (–) in Cash
Operating activities	
Sales of goods and services for cash	+
Sales of goods and services on credit	No effect
Collection of accounts receivable	+
Receive dividends or interest	+
Recognize cost of goods sold	No effect
Purchase inventory for cash	–
Purchase inventory on credit	No effect
Pay accounts payable	–
Accrue operating expenses	No effect
Pay operating expenses	–
Accrue taxes	No effect
Pay taxes	–
Accrue interest	No effect
Pay interest	–
Prepay expenses for cash	–
Record the using up of prepaid expenses	No effect
Charge depreciation	No effect

Cash Flow from Operations—The Direct Method

The direct method consists of a listing of cash receipts (inflows) and cash disbursements (outflows). The easiest way to construct the statement of cash flows from operations using the direct method is to examine the cash column of the balance sheet equation. The following entries from Exhibit 16-9 affect cash and are not financing or investing activities:

Transaction	Cash Effect
(1b) Payments to suppliers	–72,000
(2b) Collections from customers	+180,000
(3b) Payments to employees	–15,000
(5) Interest expense and payment	–4,000
(6) Income tax expense and payment	–20,000

Therefore, the direct-method cash flow statement is as follows:

Foster Company	
Cash Flows from Operating Activities, 20X2	
Cash collections from customers	\$180,000
Cash payments:	
To suppliers	(72,000)
To employees	(15,000)
For interest	(4,000)
For taxes	(20,000)
Net cash provided by operating activities	<u>\$ 69,000</u>

This completes the statement of cash flows in Exhibit 16-12. We can see that operations generated \$69,000 of cash, and Foster Company raised an additional \$199,000 from financing activities, for a total of \$268,000. However, because the company used \$277,000 for investing, cash still declined \$9,000 over the year.

Cash Flow from Operations—The Indirect Method

Most income statement items have a parallel item in the statement of cash flows. Each sale eventually results in cash inflows; each expense entails cash outflows at some time. When the cash inflow from a sale or the cash outflow for an expense occurs in one accounting period and we

record the sales revenue or expense in another, net income can differ from the cash flows from operations. The indirect method reconciles these differences by starting with net income (which is revenues less expenses) and then listing all the adjustments necessary to turn net income into cash flows from operating activities. We can construct the indirect method cash flow statement for Foster Company from 20X2's income statement and the beginning and ending balance sheets in Exhibits 16-10 and 16-11, respectively. Exhibit 16-14 illustrates the indirect method, and we will next explain the entries in this exhibit.

If Foster's sales were all for cash and it paid all expenses in cash as incurred, the cash flows from operating activities would be identical to the net income. Thus, you can think of the first line of Exhibit 16-14, net income, as the cash flow from operating activities when revenues equal cash inflows and expenses equal cash outflows. The subsequent adjustments recognize the differences 1) between revenues and cash inflows and 2) between expenses and cash outflows.

The first adjustment is to add the depreciation expense to net income. We do this because we deducted depreciation of \$17,000 when computing the net income of \$23,000, but depreciation does not cause an operating cash outflow. Depreciation represents an expense for which there is never an operating cash flow. The related cash flow was an investing outflow when Foster purchased the equipment.

The remaining adjustments represent situations where net income and cash flows from operations differ only because of timing. That is, the timing of revenues or expenses differs from that of the related operating cash inflow or outflow.

Consider the sales revenue of \$200,000 shown on the income statement. If all sales were for cash, the associated cash flows would occur at the time of sale, and the cash inflow would equal the sales revenue. However, Foster's sales are all on account. Thus, the sale initially increases accounts receivable, and the cash inflow occurs when Foster collects the receivables. You can compute the amount of cash collections from the income statement and balance sheet data in one of two ways. First, you can compute the total collections Foster could possibly collect during the year, which is the accounts receivable balance at the beginning of the year plus the sales during the year. From this, you subtract the amount that Foster has not yet collected at the end of the year, the ending accounts receivable. This gives collections in 20X2 of \$180,000:

Beginning accounts receivable	\$ 25,000
+ Sales	<u>200,000</u>
Potential collections	\$225,000
– Ending accounts receivable	<u>(45,000)</u>
Cash collections from customers	<u>\$180,000</u>

Alternatively, you can start with the sales for the year. If accounts receivable had remained unchanged, cash collections would equal sales. If accounts receivable increased, collections fell short of the sales, causing net income to be higher than cash flows from operations. If accounts receivable decreased, then collections exceeded sales, causing net income to be lower than cash

Net income	\$23,000
Adjustments to reconcile net income to net cash provided (used) by operating activities:	
Depreciation	17,000
Net increase in accounts receivable	(20,000)
Net increase in inventories	(40,000)
Net increase in accounts payable	68,000
Net increase in wages and salaries payable	<u>21,000</u>
Net cash provided by operating activities	<u>\$69,000</u>

Exhibit 16-14

Foster Company

Cash Flows from Operating Activities—Indirect Method

flows from operations. In 20X2, Foster's accounts receivables increased from \$25,000 to \$45,000 so cash collections were only \$180,000:

Sales	\$200,000
Decrease (increase) in accounts receivable*	<u>(20,000)</u>
Cash collections from customers	<u>\$180,000</u>

*The format "decrease (increase)" means that decreases are positive amounts and increases are negative amounts.

Because Foster's accounts receivable increased in 20X2, we need to deduct the \$20,000 from net income to get cash provided by operating activities. Entry 1 in Exhibit 16-15 shows this adjustment.

Just as we adjusted sales to compute cash collections from customers, we can adjust the cost of goods sold from the income statement to compute cash outflow for payments to suppliers. To do this, we look at one income statement account, cost of goods sold, and two balance sheet accounts, inventory and accounts payable. We adjust cost of goods sold to get cash payments to suppliers in two steps: Cost of Goods Sold → Purchases → Payments to Suppliers.

These two steps yield the following:

Step 1:	
Ending inventory, December 31, 20X2	\$100,000
+ Cost of goods sold in 20X2	<u>100,000</u>
Inventory to account for	\$200,000
– Beginning inventory, December 31, 20X1	<u>(60,000)</u>
Inventory purchased in 20X2	<u>\$140,000</u>
Step 2:	
Inventory purchased in 20X2	\$140,000
+ Beginning accounts payable, December 31, 20X1	<u>6,000</u>
Total amount to be paid	\$146,000
– Ending accounts payable, December 31, 20X2	<u>(74,000)</u>
Amount paid in cash during 20X2	<u>\$ 72,000</u>

In step 1, we compute the amount of inventory purchased in 20X2, independent of whether we purchase the inventory for cash or credit. The calculation requires taking the amount of

Net Income		Adjustments		Cash Provided by Operating Activities	
1) Sales revenues	\$200,000	Increase in accounts receivable	\$(20,000)	Cash collections from customers	\$180,000
2) Cost of goods sold	(100,000)	Increase in inventories	(40,000)	Cash payments to suppliers	(72,000)
		Increase in accounts payable	68,000		
3) Wages and salaries expense	(36,000)	Increase in wages and salaries payable	21,000	Cash payments to employees	(15,000)
4) Interest	(4,000)	None		Cash payments for interest	(4,000)
5) Income taxes	(20,000)	None		Cash payments for income taxes	(20,000)
6) Depreciation	(17,000)	Depreciation	17,000	Net cash provided by (used for) operating activities	<u>\$ 69,000</u>
Net income	<u>\$ 23,000</u>	Total adjustments	<u>\$ 46,000</u>		

Exhibit 16-15

Foster Company

Comparison of Net Income and Cash Provided by Operating Activities

inventory used in 20X2 (that is, the cost of goods sold), plus the amount of inventory left at the end of the year, less the amount that was already in inventory at the beginning of the year.

If Foster had bought all its inventory for cash, we could stop at this point. Its cash outflow to suppliers would be equal to the amount purchased, \$140,000. However, because Foster purchased inventory on credit, we must take step 2. If Foster had paid off all its accounts payable by the end of the year, it would have paid an amount equal to the beginning accounts payable plus the purchases in 20X2, a total of \$146,000. But \$74,000 remained payable at the end of 20X2, meaning that of the \$146,000 of potential payments, Foster paid only $\$146,000 - \$74,000 = \$72,000$ in 20X2.

From these two steps, we can determine the two adjustments to net income needed to adjust it to a cash outflow number:

Cost of goods sold in 20X2	\$100,000
Increase (decrease) in inventory during 20X2	40,000
Decrease (increase) in trade accounts payable during 20X2	<u>(68,000)</u>
Payments to suppliers during 20X2	<u>\$ 72,000</u>

This gives us the two adjustments to net income required to compute cash provided by operating activities. Exhibit 16-15 shows this in entry 2. First, remember that we subtract cost of goods sold in computing net income just as we subtract the cash payments to suppliers in determining cash provided by operating activities. Any adjustment showing a cash outflow greater than the cost of goods sold will lead to cash provided by operations that is less than net income. Because the increase in inventory caused the cash outflow to exceed the cost of goods sold by \$40,000, net income will be \$40,000 more than cash provided by operations. In contrast, the increase in accounts payable caused the cash outflow to fall short of cost of goods sold by \$68,000, which results in net income that is \$68,000 less than cash provided by operations.

Before considering the other adjustments in Exhibit 16-15, let's create a general approach to adjustments. Then we can apply the approach to wages and salaries.

- Adjust for revenues and expenses not requiring cash
 - Add back depreciation and other noncash expenses
- Adjust for changes in noncash assets and liabilities relating to operating activities
 - Add decreases in assets
 - Deduct increases in assets
 - Add increases in liabilities
 - Deduct decreases in liabilities

Adjustments discussed so far have included adding back the \$17,000 of depreciation (entry 6 in Exhibit 16-15), deducting the \$20,000 increase in accounts receivable (an asset), deducting the \$40,000 increase in inventory (an asset), and adding the \$68,000 increase in accounts payable (a liability). Take time now to verify that each of these adjustments is consistent with the rules in the general approach.

Now let's consider the wages and salaries expense. Notice that Wages and Salaries Payable, a liability account, increased from \$4,000 at the beginning of the year to \$25,000 at the end of the year. Thus, we need to add a \$21,000 adjustment for wages and salaries, as shown in entry 3 of Exhibit 16-15. This \$21,000 is the result of charging \$36,000 for wages and salaries in the income statement but paying only \$15,000 in cash. This means that Foster's expense exceeded the cash outflow by \$21,000, as shown in the adjustment we made in Exhibit 16-14 that added \$21,000 to net income when computing net cash provided by operating activities.

Finally, Foster pays both interest expense and taxes in cash when incurred. Thus, they require no adjustments—the cash flow equals the expense, as shown in entries 4 and 5.

To summarize, look at the bottom line of Exhibit 16-15. The comparison of net income to cash flows from operating activities begins with the net income of \$23,000 from the first column, adds the adjustments of \$46,000 in the middle column, and ends with the \$69,000 net cash provided by operating activities in the right-hand column. Exhibit 16-14 shows this same information in the proper indirect-method format that gives the details of all \$46,000 of adjustments.

Making Managerial Decisions

Managers often want quick approximations of the financial statement effects of their decisions. Suppose we have a simple company that sells only on a cash basis and pays all expenses except depreciation in cash. In a recent month, the company had sales of \$100,000 and expenses of \$85,000, of which \$20,000 was depreciation. Therefore, it had net income of \$15,000. Prepare two statements of cash flows from operating activities, one using the direct method and one using the indirect method. Describe the basic difference between the two methods.

Answer

The direct method shows differences between income and cash flow by adjusting the individual items on the income statement to a cash basis. In this example, sales revenue of \$100,000 is already the same as the cash collected from customers of \$100,000. Then, we adjust the income statement expense of \$85,000 by the \$20,000 of depreciation to get cash expenses of \$65,000.

Direct Method

Cash collections from customers	\$100,000
Cash expenses	<u>65,000</u>
Cash provided by operating activities	<u>\$ 35,000</u>

In contrast, the indirect method starts with the net income, revenues less expenses, of \$15,000. Then, we must list the adjustments needed to convert this to cash from operations. In this example, the list contains only one adjustment, depreciation.

Indirect Method

Net income	\$15,000
Add: Depreciation	<u>20,000</u>
Cash provided by operating activities	<u>\$35,000</u>

Reconciliation Statement

When a company uses the direct method for reporting cash flows from operating activities, users of the financial statements would miss information that relates net income to operating cash flows. Thus, direct-method statements must also include a supplementary schedule reconciling net income to net cash provided by operations. Such a supplementary statement is essentially an indirect-method cash flow statement. In essence, companies that choose to use the direct method must also report using the indirect method. In contrast, those using the indirect method never explicitly report the information on a direct-method statement. The supplementary statement included with direct-method cash flow statements would be identical to the body of Exhibit 16-14, but we would label it “Reconciliation of Net Income to Net Cash Provided by Operating Activities.”

Interpreting the Cash Flow Statement

Let’s look back on what we learned from Foster Company’s cash flow statement. For growing companies, cash often declines. Why? Because growing companies usually need cash for investment in various business assets required for expansion, including investment in accounts receivable and inventories. Notice that Foster Company’s total assets nearly doubled between 20X1 and 20X2, so we should not be surprised at the decrease in cash.

The statement in Exhibit 16-12 on p. 696 gives a direct picture of where Foster’s cash came from and where it went. Operations generated \$69,000 of cash, investing activities used \$277,000, and the company raised \$199,000 from financing activities. The excess of cash outflows over cash inflows reduced cash in total by \$9,000. Without the statement of cash flows, the readers of the annual report would have to conduct their own analyses of the beginning and ending balance sheets, the income statement, and the changes in retained income to get a grasp of the impact of financial management decisions.

Many analysts focus on **free cash flow**—cash flows from operations less capital expenditures. This is the cash flow left over after undertaking the firm’s operations and making the investments necessary to ensure its continued operation. Some also subtract dividends, assuming they are necessary to keep shareholders happy. A company that cannot generate enough cash from operations to cover its investments must raise more capital, either by selling assets or by issuing debt or equity. If investment supports growth, this situation may be acceptable. If the investment is merely to maintain the status quo, the company is probably in trouble.

free cash flow

Cash flows from operations less capital expenditures.

Foster Company has a large negative free cash flow, $\$69,000 - \$287,000 = -\$218,000$, meaning that it cannot maintain its current plans without raising substantial capital, which it did during 20X2.

The Foster Company illustration demonstrates how a firm may simultaneously (1) have a significant amount of net income, as computed by accountants on the accrual basis, and yet (2) have a decline in cash that could become severe. Indeed, many growing businesses are desperate for cash even though reported net income zooms upward. For example, in the years leading up to Enron's bankruptcy, it had annual net income between \$500,000 million and \$1 billion, but it used much more cash for investment activities than it generated from operations—an average of about \$2 billion a year more. Examining its free cash flow might have provided a warning to investors of bad things to come.

Role of Depreciation

Readers of indirect-method statements of cash flows sometimes misunderstand the reason for adding depreciation to net income when computing cash flows from operating activities. Depreciation is an allocation of historical cost to expense. Therefore, depreciation expense does not entail a current outflow of cash. Consider again the comparison of Foster Company's net income and cash flows in Exhibit 16-15 on p. 701. Why do we add the \$17,000 of depreciation to net income to compute cash flow? We do so because we had earlier subtracted depreciation in calculating net income. Thus, adding back depreciation merely cancels its earlier deduction. Unfortunately, use of the indirect method may at first glance create an erroneous impression that we add depreciation because it, by itself, is a source of cash. If that were really true, a corporation could double or triple its bookkeeping entry for depreciation expense when it needs cash! Of course, this is not correct. What would happen? Reported income would decline, but cash provided by operations would not change. Suppose we doubled Foster Company's depreciation:

	With Depreciation of \$17,000	With Depreciation of \$34,000
Sales	\$200,000	\$200,000
Cash expenses (all expenses except depreciation)*	(160,000)	(160,000)
Depreciation	(17,000)	(34,000)
Net income	\$ 23,000	\$ 6,000
Nondepreciation adjustments [†]	29,000	29,000
Add depreciation	17,000	34,000
Net cash provided by operating activities	<u>\$ 69,000</u>	<u>\$ 69,000</u>

* $\$100,000 + \$36,000 + \$4,000 + \$20,000 = \$160,000$.

[†] $\$(20,000) + \$(40,000) + \$68,000 + \$21,000 = \$29,000$.

The doubling would affect depreciation and net income, but it would not affect cash provided by operations, which would still amount to \$69,000.

Statement of Cash Flows for Nike

Exhibit 16-16 contains the 2021 statement of cash flows for **Nike**. Most corporations use this general format for their statement of cash flows. Like Nike, they use the indirect method to report the cash flows from operating activities.

We have discussed most of the items in Exhibit 16-16 earlier in the chapter, but two deserve mention here. First, Nike deducts deferred income taxes from net income. Nike paid more taxes to the government than it charged on its income statement so cash flow is less than net income. Second, stock-based compensation is compensation expense that was not paid in cash so, like depreciation, Nike adds it back to net income.

Objective 9

Explain the role of depreciation in the statement of cash flows.

Cash provided (used) by operations:

Net income	\$5,727
Income charges not affecting cash	
Depreciation	744
Deferred income taxes	(385)
Stock-based compensation	611
Amortization and other	53
Net foreign currency adjustments	(138)
Changes in certain working capital components:	
Increase in accounts receivable	(1,606)
Decrease in inventories	507
Increase in prepaid expenses and other current assets	(182)
Increase in accounts payable, accrued liabilities, and income taxes payable	<u>1,326</u>
Cash provided (used) by operations	<u>6,657</u>

Cash provided (used) by investing activities:

Purchases of short-term investments	(9,961)
Maturities of short-term investments	4,236
Sales of short-term investments	2,449
Additions to property, plant, and equipment	(695)
Other investing activities	<u>171</u>
Cash provided (used) by investing activities	<u>(3,800)</u>

Cash provided (used) by financing activities:

Repayment of borrowings	(197)
Decrease in notes payable	(52)
Proceeds from exercise of stock options and other stock issuances	1,172
Repurchase of common stock	(608)
Dividends—common and preferred	<u>(1,638)</u>
Other financing activities	(136)
Cash provided (used) by financing activities	1,459
Other*	<u>143</u>
Net increase in cash and equivalents	1,541
Cash and equivalents, beginning of year	<u>8,348</u>
Cash and equivalents, end of year	<u><u>\$9,889</u></u>

*This is the effect of exchange rate changes, which is beyond the scope of our discussion.

Exhibit 16-16

Nike, Inc.
Statement of Cash Flows for
the Year Ended May 31,
2021 (millions)

Annual Reports

This completes our overview of financial statements. You have learned about the four main statements: the balance sheet, the income statement, the statement of cash flows, and the statement of changes in stockholders' equity. Companies include all four reports in their **annual report**, which management prepares for the company's shareholders. (See the Business First box on p. 706 for more about annual reports.) In addition to the financial statements, annual reports generally contain a letter to shareholders from the chairman and/or CEO, discussions of financial results, and other information that management thinks is important to shareholders. U.S. companies also include the financial statements in another more-detailed report, the 10-K, that they submit to the SEC. You can access 10-K reports through the SEC's EDGAR database (<http://www.sec.gov/edgar.shtml>).

annual report

A report prepared by management for the company's shareholders.

The Changing Face of Annual Reports

Until the last decade, annual reports were generally glossy documents produced by companies about 3 months or more after year-end. In addition to including the major financial statements and their footnotes, annual reports also contained much other information about the company. However, the Internet has changed the way investors get information about a company. Today, much information is available more quickly on the Web than on paper. Nearly all publicly-held companies include their basic financial statements on their Web sites, usually in a section labeled “Investors” or “Investor Relations.” You might also find them under the category “SEC Filings.” If so, look for a filing called “10-K.” The 10-K contains a great deal of information, and the basic financial statements will be under “Item 8.”

Some financial statements will be in PDF or HTML files that you can read but you cannot easily navigate. An example is **Honda Motor Company, Ltd.** (http://world.honda.com/investors/library/annual_report/). However, an increasing number of companies are making financial statements available in an interactive format; see **Adidas**, for example (<https://report.adidas-group.com/2020/en/>, date of access February 9, 2022). With this format you can go to any section of the annual report with a click of your mouse.

There is also a worldwide competition for the best annual reports. In 2019, the League of American Communications Professions announced its latest winners of best annual reports in different industry categories as well as on an overall basis as follows:

Best Overall	Korea Hydro & Nuclear Power (Korea)
Best Among Banks	Industrial Bank of Korea (Korea)
Best Among Conglomerates	Alibaba Group (China)
Best Among Healthcare Firms	Nemours Children's Health (United States)
Best in Technology	Nucleus Software Exports Ltd. (India)
Best in Transportation	PT Pelabuhan Tanjung Priok (Indonesia)

Some executives use their annual report to educate investors. The best example is Warren Buffett, chairman and CEO of **Berkshire Hathaway**, who always includes a long letter explaining his philosophies as well as his company's performance. His letter to shareholders in the 2020 annual report is 13 pages long (<https://www.berkshirehathaway.com/2020ar/2020ar.pdf>, date of access February 9, 2022) and includes a section explaining the “irrational reaction of many investors to changes in stock prices.”

Annual reports have been a key source of information for investors for years. Because the Internet allows them to be more timely and to contain more in-depth information, today they are more important than ever.

Sources: LACP 2019/2020 Vision Awards Annual Reports Competition, <https://www.lacp.com/201920vision/overall.htm>, date of access February 9, 2022; Honda Motor Company, 2021 Annual report; Adidas, 2020 Annual Report; Berkshire Hathaway, 2020 Annual Report.

Summary Problem for Your Review

PROBLEM

The Buretta Company has prepared the data in Exhibit 16-17. In December 20X1, Buretta paid \$54 million cash for a new building acquired to accommodate an expansion of operations. This was financed partly by a new issue of long-term debt for \$40 million cash. During 20X1, the company also sold fixed assets for \$5 million cash, which was equal to its book value. All sales and purchases of merchandise were on credit.

Because the net income of \$4 million was the highest in the company's history, Mr. Buretta, the chairman of the board, was perplexed by the company's extremely low cash balance.

1. Prepare a statement of cash flows. Ignore income taxes. You may wish to use Exhibit 16-12, p. 696, as a guide. Use the direct method for reporting cash flows from operating activities.
2. Prepare a supporting schedule that reconciles net income to net cash provided by operating activities.
3. What is revealed by the statement of cash flows? Will it help Mr. Buretta understand what has happened? Why?

Exhibit 16-17

Buretta Co. Financial Statements

Income Statement and Changes in Retained Earnings for the Year Ended December 31, 20X1 (millions)

Sales		\$100
Less cost of goods sold		
Inventory, December 31, 20X0	\$ 15	
Purchases	104	
Cost of goods available for sale	\$119	
Inventory, December 31, 20X1	<u>46</u>	73
Gross profit		\$ 27
Less other expenses		
General expenses	\$ 8	
Depreciation	8	
Property taxes	4	
Interest expense	<u>3</u>	23
Net income		\$ 4
Retained earnings, December 31, 20X0		7
Total		\$ 11
Dividends		<u>1</u>
Retained earnings, December 31, 20X1		<u>\$ 10</u>

Balance Sheets as of December 31 (millions)

Assets	20X1	20X0	Increase (Decrease)
Cash	\$ 1	\$20	\$(19)
Accounts receivable	20	5	15
Inventory	46	15	31
Prepaid general expenses	4	2	2
Fixed assets, net	91	50	41
	<u>\$162</u>	<u>\$92</u>	<u>\$ 70</u>
Liabilities and Stockholders' Equity			
Accounts payable for merchandise	\$ 39	\$14	\$ 25
Accrued property tax payable	3	1	2
Long-term debt	40	—	40
Capital stock	70	70	—
Retained earnings	10	7	3
	<u>\$162</u>	<u>\$92</u>	<u>\$ 70</u>

SOLUTION

1. See Exhibit 16-18. We can explain cash flows from operating activities as follows (in millions):

Sales	\$100
Less increase in accounts receivable	(15)
Cash collections from customers	<u>\$ 85</u>
Cost of goods sold	\$ 73
Plus increase in inventory	<u>31</u>
Purchases	\$104
Less increase in accounts payable	(25)
Cash paid to suppliers	<u>\$ 79</u>
General expenses	\$ 8
Plus increase in prepaid general expenses	<u>2</u>
Cash payment for general expenses	<u>\$ 10</u>
Property taxes	\$ 4
Less increase in accrued property tax payable	(2)
Cash paid for property taxes	<u>\$ 2</u>
Cash paid for interest	<u>\$ 3</u>

Exhibit 16-18

Buretta Company
*Statement of Cash Flows for the
 Year Ended December 31, 20X1*
(in millions)

Cash Flows from Operating Activities		
Cash collections from customers		\$ 85
Cash payments		
Cash paid to suppliers	\$(79)	
General expenses	(10)	
Interest paid	(3)	
Property taxes	(2)	(94)
Net cash provided by operating activities		\$ (9)
Cash Flows from Investing Activities		
Purchases of fixed assets (building)	\$(54)	
Proceeds from sale of fixed assets	5	
Net cash used by investing activities		(49)
Cash Flows from Financing Activities		
Long-term debt issued	\$ 40	
Dividends paid	(1)	
Net cash provided by financing activities		39
Net decrease in cash		\$ (19)
Cash balance, December 31, 20X0		20
Cash balance, December 31, 20X1		<u>\$ 1</u>

- Exhibit 16-19 reconciles net income to net cash provided by operating activities.
- The statement of cash flows shows where cash has come from and where it has gone. Operations used \$9 million of cash. Why? Exhibit 16-19 shows that large increases in accounts receivable (\$15 million) and inventory (\$31 million), plus a \$2 million increase in prepaid expenses, used \$48 million of cash. In contrast, Buretta generated only \$39 million (i.e., \$4 + \$8 + \$25 + \$2 million). Exhibit 16-18 explains the \$9 million use of cash slightly differently. It shows directly the \$85 million of cash receipts and \$94 million in disbursements. Investing activities also consumed cash because Buretta invested \$54 million in a building, and it received only \$5 million from sales of fixed assets. Financing activities generated \$39 million cash, which was \$19 million less than the \$58 million used by operating and investing activities.

Mr. Buretta should no longer be puzzled. The statement of cash flows shows clearly that cash payments exceeded receipts by \$19 million. However, he may still be concerned about the depletion of cash. Either Buretta Company must change operations so that it does not require so much cash, or it must curtail investment, or it must raise more long-term debt or ownership equity. Otherwise, Buretta Company will soon run out of cash.

Exhibit 16-19

Buretta Company
*Reconciliation of Net Income to
 Net Cash Provided by Operating
 Activities for the Year Ended
 December 31, 20X1 (millions)*

Net income (from income statement)	\$ 4
Adjustments to reconcile net income to net cash provided by operating activities	
Add: depreciation, which was deducted in the computation of net income but does not decrease cash	8
Deduct: Increase in accounts receivable	(15)
Deduct: Increase in inventory	(31)
Deduct: Increase in prepaid general expenses	(2)
Add: Increase in accounts payable	25
Add: Increase in accrued property tax payable	2
Net cash provided by operating activities	<u>\$ (9)</u>

Highlights to Remember

1. **Recognize and define the main types of assets in the balance sheet of a corporation.** Assets are divided into current and noncurrent categories. Common current assets are cash, accounts receivable, inventories, and prepaid expenses. The largest noncurrent asset is generally property, plant, and equipment. The amount shown for property, plant, and equipment is its acquisition cost minus accumulated depreciation.
2. **Recognize and define the main types of liabilities in the balance sheet of a corporation.** Liabilities are divided into current liabilities and long-term liabilities. Current liabilities include notes payable and accounts payable. Long-term debt in the form of debentures or mortgages is the most common noncurrent liability.
3. **Recognize and define the main elements of the stockholders' equity section of the balance sheet of a corporation.** Stockholders' equity contains paid-in capital, accumulated other comprehensive income, and retained earnings. Paid-in capital is often divided into a par value amount and an amount in excess of par value.
4. **Recognize and define the principal elements in the income statement of a corporation.** Income statements contain revenues and expenses. Multistep income statements have some of the following subtotals: gross margin (gross profit), operating income, and income before income taxes.
5. **Recognize and define the elements that cause changes in stockholders' equity accounts.** The statement of changes in stockholders' equity includes analysis of changes in all stockholders' equity accounts. For large profitable companies, retained earnings may be by far the largest component of stockholders' equity. Net income increases retained earnings and losses and dividends decrease them.
6. **Explain the purposes of the cash flow statement, identify activities that affect cash, and classify the activities as operating, investing, or financing activities.** The statement of cash flows lists cash inflows and cash outflows in one of three categories. Operating cash flows include collections from customers and payments to suppliers, employees, the government, and others. Investing cash flows include purchases and sales of fixed assets. Financing cash flows include borrowings and repayment of borrowings, sales of shares of stock, and payment of dividends.
7. **Assess financing and investing activities using the statement of cash flows.** Financing activities include cash flows to and from providers of capital. Investing activities include cash flows from the purchase or sale of plant, property, equipment, and other long-lived assets.
8. **Use both the direct method and the indirect method to explain cash flows from operating activities.** In the direct method, cash flows from operating activities include all cash receipts from customers and all cash payments to suppliers, employees, the government, and others for activities supporting operations. The indirect method begins with net income, adds depreciation and other noncash expenses, adds (subtracts) decreases (increases) in operating current assets, and adds (subtracts) increases (decreases) in operating current liabilities.
9. **Explain the role of depreciation in the statement of cash flows.** Depreciation is not a cash inflow. When using an indirect method cash flow statement, we add it to net income to get cash flow from operating activities only to offset the fact that we deducted it in computing net income.

Appendix 16A: Accounting for Inventory

A company's inventory method affects its income statement as well as its balance sheet. This appendix focuses on how choices in accounting for inventory can significantly affect a company's reported net income.

Each period, accountants divide the costs of merchandise acquired between cost of goods sold and cost of items remaining in ending inventory using one of several inventory methods. If unit prices and costs did not fluctuate, all inventory methods would show identical results. But prices change, and these changes raise central issues regarding cost of goods sold (income measurement) and inventories (asset measurement).

Let's explore inventory accounting using a simple example. Consider a new vendor of a cola drink at the fairgrounds. He began the week with no inventory. He bought one can of cola on Monday for 30 cents, a second can on Tuesday for 40 cents, and a third can on Wednesday for 56 cents. He then sold one can on Thursday for 90 cents. What is his gross margin? What is his ending inventory?

Objective 10

Describe and assess the effects of the four major methods of accounting for inventories.

Four Major Inventory Methods

In choosing an inventory method, it is important to recognize the link between the cost of goods sold and the valuation of ending inventory. The cola vendor began his business, acquired three cans of cola during the week, and had a total cost of goods available for sale of \$1.26. At the end of the period, he must allocate this \$1.26 either to cans sold or to cans in ending inventory. This example illustrates an important principle to remember as you study various inventory methods: By assigning a value to ending inventory, an inventory method also implicitly assigns a value to cost of goods sold, which equals the cost of goods available for sale less the value of the ending inventory.

U.S. GAAP accepts four principal inventory methods: specific identification; weighted average; first-in, first-out (FIFO); and last-in, last-out (LIFO). International standards are similar but do not permit LIFO. Exhibit 16-20 provides a quick glimpse into the nature of these four methods and applies them to our example of the cola vendor. As you can see, the choice of an inventory method can significantly affect gross margin and hence net income. (It can also affect ending inventory valuation for balance sheet purposes.)

Specific Identification

specific identification

An inventory method that recognizes the actual cost paid for the specific physical item sold.

The **specific identification** method (column 1) recognizes the actual cost paid for the specific physical item sold. Gross profit depends on which can the vendor sells. As Exhibit 16-20 shows, cost of goods sold could be either 30, 40, or 56 cents. Therefore, gross profit for operations of Monday–Thursday could be 60 cents, 50 cents, or 34 cents, depending on the particular can handed to the customer. By reaching for the “Monday” can instead of the “Wednesday” can, the vendor makes a gross profit of 60 cents instead of 34 cents.

Specific identification, which uses physical observation or the labeling of items in stock with individual numbers or codes, is easy and economically justifiable for relatively expensive, low-volume merchandise, such as custom artwork, diamond jewelry, and automobiles. It is especially appropriate when each product is unique. However, many organizations have large amounts of physically identical products. While bar-code and scanning technology could allow use of the specific identification method, it is often not worth the effort. In addition, because the specific item handed to the customer affects the cost of goods sold, the specific identification method permits managers to manipulate income and inventory values when filling a sales order by selecting a particular item from several physically equivalent items with different historical costs.

	(1) Specific Identification			(2)	(3)	(4)
	(1A)	(1B)	(1C)	FIFO	LIFO	Weighted Average
Income statement for the period						
Monday–Thursday						
Sales (1 unit at 90)	90	90	90	90	90	90
Deduct cost of goods sold*						
1 30-cent (Monday) unit	30			30		
1 40-cent (Tuesday) unit		40				
1 56-cent (Wednesday) unit			56		56	
1 weighted-average unit						
[(30 + 40 + 56) ÷ 3 = 42]						42
Gross profit for Monday–Thursday	<u>60</u>	<u>50</u>	<u>34</u>	<u>60</u>	<u>34</u>	<u>48</u>
Ending inventory, Thursday, 2 units:						
[(30 + 40 + 56) – cost of goods sold]	<u>96</u>	<u>86</u>	<u>70</u>	<u>96</u>	<u>70</u>	<u>84</u>

*The cost of goods sold can also be computed as follows, using FIFO cost of goods sold as an example:

Beginning inventory	0
+ Purchases	126
= Cost of goods available for sale	126
– Ending inventory	96
= Cost of goods sold	<u>30</u>

Exhibit 16-20

Comparison of Inventory Methods for Cola Vendor (all monetary amounts are in cents)

First-In, First-Out (FIFO) Method

The **first-in, first-out (FIFO)** method (column 2) assumes that a company sells or uses up first the stock acquired earliest. Thus, FIFO assumes that the vendor sells the “Monday” can before the “Tuesday” or “Wednesday” cans regardless of the actual can delivered to the customer. By using the latest costs to measure the ending inventory, FIFO tends to provide inventory valuations that closely approximate the actual market value of the inventory at the balance sheet date. In addition, in periods of rising prices, FIFO leads to higher gross profit (60 cents in Exhibit 16-20). Why? Because older, lower costs become the cost of goods sold expense (and the newer, higher costs remain in ending inventory). Higher reported incomes may favorably affect investor attitudes toward the company. Similarly, higher reported incomes may lead to higher salaries, higher bonuses, or higher status for the management of the company. Unlike specific identification, FIFO dictates the order in which acquisition costs will become cost of goods sold. Therefore, managers cannot affect income by choosing to sell one item rather than another, identical one.

first-in, first-out (FIFO)

An inventory method that assumes that a company sells or uses up first the stock acquired earliest.

Last-In, First-Out (LIFO) Method

The **last-in, first-out (LIFO)** method (column 3) assumes that a company sells or uses up first the stock acquired most recently. That is, whereas FIFO associates the most recent costs with inventories, LIFO treats the most recent costs as cost of goods sold. Thus, LIFO assumes that the vendor sells the “Wednesday” can first, regardless of the actual can delivered. Many accountants believe that LIFO provides a more realistic income number because net income measured using LIFO matches current sales prices with more current acquisition costs.

last-in, first-out (LIFO)

An inventory method that assumes that a company sells or uses up the stock acquired most recently first.

In contrast, LIFO inventory values on the balance sheet are less realistic because they are older costs. In a period of rising prices and constant or growing inventories, LIFO yields lower net income than the other inventory methods (34 cents in Exhibit 16-20) because it charges recent higher costs as cost of goods sold. Why is lower net income such an important feature of LIFO? Because when a company reports lower income to the tax authorities, it pays lower taxes. In the United States, the IRS accepts LIFO for income tax purposes but requires companies that use LIFO for tax purposes to use it also for financial reporting purposes. Therefore, it is not surprising that almost two-thirds of U.S. corporations use LIFO for at least some of their inventories.

A disadvantage of LIFO is that it permits management to influence income by the timing of purchases of inventory items. Consider our cola vendor. Suppose acquisition prices increase from 56 cents on Wednesday to 68 cents on Thursday, the day of the sale of the one unit. How does the acquisition of one more unit on Thursday affect net income? Under LIFO, cost of goods sold would change from 56 cents to 68 cents (the cost of the last unit purchased, the one bought on Thursday), and profit would fall by 12 cents. In contrast, a FIFO valuation of the cost of goods sold and gross profit would be unchanged:

	LIFO		FIFO	
	Without Thursday Purchase	With Thursday Purchase	Without Thursday Purchase	With Thursday Purchase
(Amounts are in cents)				
Sales	90	90	90	90
Cost of goods sold	<u>56</u>	<u>68</u>	<u>30</u>	<u>30</u>
Gross profit	<u>34</u>	<u>22</u>	<u>60</u>	<u>60</u>
Ending inventory (cents)				
(30 + 40)	<u>70</u>			
(30 + 40 + 56)		<u>126</u>		
(40 + 56)			<u>96</u>	
(40 + 56 + 68)				<u>164</u>

LIFO layers (LIFO increments)

Separately identifiable additions to a LIFO inventory.

Another disadvantage of LIFO is that income can soar when a company reduces its inventories. Under LIFO, inventory consists of **LIFO layers** (or **LIFO increments**), which are separately identifiable additions to inventory. For example, on Wednesday our cola vendor had three LIFO layers:

- Layer 1: 30-cent unit purchased on Monday
- Layer 2: 40-cent unit purchased on Tuesday
- Layer 3: 56-cent unit purchased on Wednesday

As a company grows, the LIFO layers tend to pile on one another as the years go by. Thus, many LIFO companies show inventories that have ancient layers (going back more than 50 years in some instances). The reported LIFO value may, therefore, be far below what FIFO values might otherwise show.

When a company reduces its inventory, old LIFO layers become the cost of goods sold. These old values may be much below current replacement values, leading to overstatement of income. In other words, in times of rising prices the LIFO method gives lower net income because it uses the most recent values for the cost of goods sold. But when a company reduces its inventories, LIFO can lead to just the opposite effect. Cost of goods sold includes old values, and net income is higher under LIFO than under other methods.

Suppose our cola vendor worked the fair for 20 years and never had less than one can of cola in inventory. By the end of the 20 years, he could buy a can of cola for \$3 and sell it for \$4. Now, he decides to get out of the cola business and sells his last can for \$4. What would be his profit on that last can under LIFO? It would be $\$4 - \$3.30 = \$0.70$. Why? Because the original cost of the Monday can would finally become the cost of goods sold. Under FIFO, profit would be only $\$4 - \$3 = \$1$ because the cost of goods sold would be the cost of a recently purchased can of cola.

Weighted-Average Cost

weighted-average cost

An inventory method that assigns the same unit cost to each unit available for sale.

The **weighted-average cost** method assigns the same unit cost to each unit available for sale during the period. The unit cost is the cost of all units available for sale divided by the number of units available, as shown in Exhibit 16-20. The weighted-average method usually produces a gross profit somewhere between that obtained under FIFO and that under LIFO (48 cents as compared with 60 cents and 34 cents in Exhibit 16-20).

To better understand the term *weighted average*, assume that our cola vendor bought two cans rather than one on Monday at 30 cents each. To get the weighted average, we must consider not only the price paid, but also the number of units purchased:

$$\begin{aligned}\text{weighted average} &= \text{cost of goods available for sale} \div \text{units available for sale} \\ \text{weighted average} &= [(2 \times 30 \text{ cents}) + (1 \times 40 \text{ cents}) + (1 \times 56 \text{ cents})] \div 4 \\ &= 156 \text{ cents} \div 4 = 39 \text{ cents}\end{aligned}$$

Inventory Methods and Physical Flow of Inventories

Which inventory method should a company use? One way to choose an inventory method is to match the cost flow with the physical flow of inventory units. Consider four different ways that our cola vendor might physically store and sell his cola. (1) Let someone (either the seller or the purchaser) choose a specific can from the inventory available at the time of sale. This physical flow is consistent with a specific-identification cost flow. (2) The vendor could put each new can acquired into the top of a cooler. As each customer arrives, the vendor sells the top can. This is consistent with a LIFO cost flow. (3) The vendor might place each new can at the back of the cooler to chill and sell the oldest, coldest can at the front of the cooler first. This is consistent with FIFO. (4) Finally, if the vendor just mixes the cans together and chooses randomly the can to sell, all cans have an equal likelihood of being chosen so all should have the same cost—the average-cost method.

Even if it is possible to match the cost flow with the physical flow, the accounting profession has concluded that the physical flow of units should not determine the choice of the inventory method. U.S. companies may choose any of the four methods (and companies reporting under IFRS may choose among three methods, excluding LIFO) to record the cost of goods sold, but they must apply the method consistently. That is, they cannot change the choice of method from period to period.

Now suppose the vendor sells the remaining two cans of inventory on Friday. Exhibit 16-21 shows the results. Note that cumulative gross profit over the life of the vendor's business would

	(1) Specific Identification			(2)	(3)	(4) Weighted Average
	(1A)	(1B)	(1C)	FIFO	LIFO	
Sales, 2 units at 90 on Friday	180	180	180	180	180	180
Cost of goods sold (Thursday ending inventory from Exhibit 16-20)	96	86	70	96	70	84
Gross profit, Friday only	84	94	110	84	110	96
Gross profit, Monday–Thursday (from Exhibit 16-20)	60	50	34	60	34	48
Gross profit, Monday through Friday (3 cans sold)	<u>144</u>	<u>144</u>	<u>144</u>	<u>144</u>	<u>144</u>	<u>144</u>

Exhibit 16-21

Income Statements for Friday Only and for Monday–Friday for Cola Vendor (all monetary amounts are in cents)

be the same \$1.44 under any of the inventory methods. The inventory method affects only how the total profit is divided among the accounting periods. Nevertheless, to evaluate performance over a particular period, we must understand how the inventory method affects a company's financial statements for that period.

Lower-of-Cost-or-Market (LCM) Method

Regardless of the inventory method used, accountants must decrease the inventory value if the inventory's market price drops below its acquisition cost. As a general rule, the acquisition cost provides a ceiling for the valuation of all assets; companies can decrease inventory values below cost when prices fall, but they cannot increase values above cost when prices rise.

Inventory accounting uses the **lower-of-cost-or-market (LCM)** method, whereby accountants compare the current market price of inventory with its cost (derived by specific identification, FIFO, LIFO, or weighted average) and select the lower of the two as the inventory value. Market generally means the current replacement cost under U.S. GAAP or net realizable value under IFRS.

Consider the following facts. A company has 100 units in its ending FIFO inventory on December 31, 20X0, at \$7.90 per unit. Its tentative gross profit for 20X0 is \$990:

Sales	\$2,180
Cost of goods available for sale	\$1,980
Ending inventory, at cost of 100 units	<u>790</u>
Cost of goods sold	<u>1,190</u>
Gross profit	<u>\$ 990</u>

However, market prices during the final week of December suddenly declined to \$4 per unit. An inventory write-down of $790 - (100 \times \$4) = \$390$ is in order. Therefore, reported income for 20X0 would be $990 - \$390 = \$600$. The theory states that of the \$790 cost, \$390 expired during 20X0 because we cannot justify carrying the cost forward to the future as an asset.

Now suppose the market price rises to \$8 per unit in January 20X1. U.S. GAAP does not permit restoration of the December write-down. The \$4 cost as of December 31 is the "new cost" of the inventory. In contrast, IFRS allow companies to increase inventory values up to the original acquisition cost, \$7.90 per unit, but not above that.

lower-of-cost-or-market (LCM)

An inventory method in which accountants compare the current market price of inventory with its cost (derived by specific identification, FIFO, LIFO, or weighted average) and select the lower of the two as the inventory value.

Summary Problem for Your Review

PROBLEM

Refer to Exhibit 16-20, p. 710. Suppose the vendor sold two cans on Thursday for 90 cents each. All other data are unchanged.

1. Compute (a) the gross profit for Monday–Wednesday, (b) the gross profit for Thursday, and (c) the ending inventory on Thursday under FIFO and under LIFO.

2. Assume the same facts as in number 1, except that the vendor purchased one additional can of cola on Thursday for 65 cents. Compute Thursday's gross profit under FIFO and under LIFO.

SOLUTION

All amounts are in cents.

1. a. The vendor would recognize no gross profit on Monday–Wednesday because there were no sales.
b.

	FIFO	LIFO
Sales	180	180
Cost of goods sold		
Beginning inventory (from Exhibit 16-20)	126	126
Purchases	<u>0</u>	<u>0</u>
Cost of goods available for sale	126	126
Ending inventory	<u>56</u>	<u>30</u>
Cost of goods sold	<u>70</u>	<u>96</u>
Gross profit, Thursday	<u>110</u>	<u>84</u>

- c. The ending inventory on Thursday was one Wednesday unit at 56 cents under FIFO and one Monday unit at 30 cents under LIFO.

2. Note how the late purchase affects LIFO gross profit but not FIFO gross profit:

	FIFO	LIFO
Sales	180	180
Cost of goods sold		
Beginning inventory (from Exhibit 16-20)	126	126
Purchases	<u>65</u>	<u>65</u>
Cost of goods available for sale	191	191
Ending inventory*	<u>121</u>	<u>70</u>
Cost of goods sold	<u>70</u>	<u>121</u>
Gross profit, Thursday	<u>110</u>	<u>59</u>

*Wednesday and Thursday units for FIFO (56 cents + 65 cents) and Monday and Tuesday units for LIFO (30 cents + 40 cents).

Appendix 16B: Shareholder Reporting, Income Tax Reporting, and Deferred Taxes

Reports to stockholders must abide by generally accepted accounting principles (GAAP). In contrast, reports to income tax authorities must abide by the income tax rules and regulations. Tax regulations are the same as GAAP in many respects, but in others they diverge. Therefore, there is nothing immoral or unethical about “keeping two sets of books.” In fact, it is necessary.

Keep in mind that the income tax laws are patchworks that governments often design to give taxpayers special incentives, such as incentives for making investments. For example, tax authorities in some countries have permitted taxpayers to write off the full cost of new equipment as expense in the year acquired. Although tax authorities may permit (or even require) such a total write-off, GAAP does not permit it for shareholder reporting purposes.

Depreciation causes the largest differences between tax and shareholder reporting. Most companies use straight-line depreciation for reporting to shareholders. Why? Managers believe that it best matches expenses with revenues. But companies use accelerated depreciation for tax reporting where it is allowed because it postpones (or defers) tax payments. Governments often provide this deferral opportunity to motivate companies to increase the amount they invest.

For reporting to shareholders, accountants must match income tax expense with the revenues and expenses that cause the taxes. When revenues and expenses on the statement to tax authorities differ from the revenues and expenses on the shareholders' report, deferred taxes can arise. Most often, deferred taxes arise when tax expenses exceed book expenses. The result is a deferred tax liability.

Consider a simple example. The total depreciation on a company's only asset over a 2-year period, 20X0–20X1, was \$20,000. Revenue was \$100,000 each year, expenses (other than depreciation) were \$80,000, and the income tax rate was 40%. For tax purposes, the company charged the entire \$20,000 of depreciation as an expense in 20X0; for shareholder reporting, it charged \$10,000 each year.

Exhibit 16-22 illustrates tax deferral. Total operating income over the 2 years was \$20,000, and total taxes were \$8,000. According to tax law, all \$20,000 of operating income and \$8,000 of taxes applied to 20X1. In contrast, for financial reporting, the company recognized half of the operating income each year, so it should recognize half of the taxes each year. Although \$4,000 of taxes was related to 20X0 revenues and expenses, the payment was postponed (deferred) to 20X1. The 20X0 financial reporting income statement included a \$4,000 expense for deferred taxes, and the obligation for future payment of the tax is a liability on the 20X0 balance sheet. In 20X1, \$4,000 of tax expense was again related to the revenues and expenses of the period. However, the tax payment was \$8,000. The payment covers the \$4,000 expense for 20X1 and pays off the \$4,000 of taxes deferred from 20X0.

	20X0	20X1	Total
Income statement for tax purposes			
Revenue	\$100,000	\$100,000	\$200,000
Expenses, except depreciation	80,000	80,000	160,000
Depreciation	<u>20,000</u>	<u>0</u>	<u>20,000</u>
Operating income (or taxable income)	\$ 0	\$ 20,000	\$ 20,000
Taxes payable at 40%	<u>0</u>	<u>8,000</u>	<u>8,000</u>
Net income	<u>\$ 0</u>	<u>\$ 12,000</u>	<u>\$ 12,000</u>
Income statement for shareholder reporting			
Revenue	\$100,000	\$100,000	\$200,000
Expenses, except depreciation	80,000	80,000	160,000
Depreciation	<u>10,000</u>	<u>10,000</u>	<u>20,000</u>
Operating income	\$ 10,000	\$ 10,000	\$ 20,000
Less income taxes			
Paid or payable almost immediately	0	8,000	8,000
Deferred	<u>4,000</u>	<u>(4,000)</u>	<u>0</u>
Net income	<u>\$ 6,000</u>	<u>\$ 6,000</u>	<u>\$ 12,000</u>
	December 31		
	20X0	20X1	
Balance sheet effect			
Liability: Deferred income taxes	\$4,000	\$0	

Exhibit 16-22

Illustration of Deferred Taxes

Accounting Vocabulary

annual report, p. 705	first-in, first-out (FIFO), p. 711	operating cycle, p. 679
capitalize, p. 683	fiscal year, p. 681	other comprehensive income, p. 686
cash equivalents, p. 681	fixed assets, p. 681	par value, p. 686
cash flows from financing activities, p. 693	free cash flow, p. 703	preferred stock, p. 686
cash flows from investing activities, p. 693	goodwill, p. 683	short-term investments, p. 681
cash flows from operating activities, p. 693	indirect method for operating cash flows, p. 698	specific identification, p. 710
common stock, p. 686	intangible assets, p. 683	stated value, p. 686
current assets, p. 679	last-in, first-out (LIFO), p. 711	statement of cash flows, p. 692
current liabilities, p. 684	LIFO increments, p. 712	subordinated, p. 685
debentures, p. 685	LIFO layers, p. 712	tangible assets, p. 681
direct method for operating cash flows, p. 698	limited liability, p. 686	treasury stock, p. 686
earnings per share (EPS), p. 689	liquidation, p. 685	weighted-average cost, p. 712
	long-term liabilities, p. 684	working capital, p. 684
	lower-of-cost-or-market (LCM), p. 713	
	noncurrent liabilities, p. 684	

MyLab Accounting

Fundamental Assignment Material

GENERAL EXERCISES AND PROBLEMS

I6-A1 Balance Sheet and Income Statement

The Reigle Company had the following items on its December 31, 20X0, balance sheet and 20X0 income statement (in dollars except for number of shares outstanding):

Cash and equivalents	\$ 60,000
Revenues	790,000
Notes payable	51,000
Long-term debt, excluding current portion	210,000
Accounts receivable, net	48,000
Provision for income taxes	60,000
Other long-term assets	110,000
Interest expense	55,000
Deferred income tax liability—long-term	44,000
Retained earnings	204,000
Income taxes payable	37,000
Cost of sales	470,000
Inventories	36,000
Prepaid expenses	15,000
Common stock (50,000 shares outstanding)	25,000
Property, plant, and equipment, at cost	580,000
Accounts payable	43,000
Interest income	15,000
Goodwill, patents, and trademarks	75,000
Current portion of long-term debt	16,000
Less: Accumulated depreciation	170,000
Selling and administrative expenses	150,000
Additional paid-in capital	?

Prepare in proper form the December 31, 20X0, balance sheet and the 20X0 income statement for Reigle Company. Include the proper amount for additional paid-in capital.

16-A2 Statement of Cash Flows, Direct Method

Ridgewood Antiques had a cash balance on December 31, 20X0, of \$50,000. Its net income for 20X1 was \$361,000. Its 20X1 transactions affecting income or cash were (in thousands):

1. Sales of \$1,600, all on credit. Cash collections from customers, \$1,270.
2. The cost of items sold, \$850. Purchases of inventory totaled \$900; inventory and accounts payable were affected accordingly.
3. Cash payments on trade accounts payable, \$725.
4. Salaries and wages: accrued, \$190; paid in cash, \$180.
5. Depreciation, \$48.
6. Interest expense, all paid in cash, \$11.
7. Other expenses, all paid in cash, \$100.
8. Income taxes accrued, \$40; income taxes paid in cash, \$35.
9. Bought plant and facilities for \$235 cash.
10. Issued debt for \$110 cash.
11. Paid cash dividends of \$39.

Prepare a statement of cash flows using the direct method for reporting cash flows from operating activities. Omit supporting schedules.

16-A3 Reconciliation of Net Income and Net Cash Provided by Operating Activities

Refer to Problem 16-A2. Prepare a supporting schedule that reconciles net income to net cash provided by operating activities for Ridgewood Antiques.

16-A4 Depreciation and Cash Flows

Manitoba Snowmobiles, Inc. had sales of \$695,000, all received in cash. Total operating expenses were \$600,000. All except depreciation were paid in cash. Depreciation of \$80,000 was included in the \$600,000 of operating expenses. Ignore income taxes.

1. Compute net income and net cash provided by operating activities.
2. Assume that depreciation is tripled. Compute net income and net cash provided by operating activities.

UNDERSTANDING PUBLISHED FINANCIAL REPORTS**16-B1 Classified Balance Sheet**

Intel, the world's largest microprocessor chip company, lists the following balance sheet items for December 26, 2020 (in millions):

Property, plant, and equipment, at cost	\$134,229
Short-term investments	2,292
Common stock and capital in excess of par value	25,556
Cash and cash equivalents	5,865
Trading assets	15,738
Other accrued liabilities	12,670
Accounts receivable	6,782
Other current assets	2,745
Assets held for sale	5,400
Accumulated depreciation	(77,645)
Accounts payable	?
Identified intangible assets	9,026
Income taxes payable	4,578
Inventories	8,427
Deferred income taxes	3,843
Contract liabilities	1,367
Other long-term assets	5,917
Other long-term liabilities	3,614
Accumulated other comprehensive income (loss)	(751)
Goodwill	26,971
Accrued compensation and benefits	3,999
Equity investments	5,152
Other long term investments	2,192
Short-term debt	2,504
Long-term debt	33,897
Retained earnings	56,233

Prepare a balance sheet in proper form for Intel. Include the proper amount for accounts payable.

I6-B2 Preparation of Statement of Cash Flows

Walgreen Co., the largest drugstore chain in the United States, had the following items in its financial statements for the year ended August 31, 2020 (in millions):

Net sales	\$139,537
Net earnings	424
Additions to property and equipment	(1,374)
Depreciation and amortization	1,927
Cash dividends paid	(1,747)
Other noncash expenses	464
Goodwill and intangible asset impairment	2,016
Decreases in other current liabilities	(16)
Business, investment, and asset acquisitions, net of cash acquired	(718)
Decrease in inventories	63
Decrease in trade accounts payable	(25)
Increases in other current assets	(31)
Equity earnings from equity method investments	(382)
Stock purchases	(1,589)
Other cash used for financing activities	(157)
Other cash used for investing activities	(19)
Proceeds related to employee stock plans	55
Increases in accrued expenses and other liabilities	1,008
Decrease in accounts receivable	163
Repayments on long-term debt	(21,414)
Retained earnings	34,210
Stock compensation expense	137
Deferred income taxes	(43)
Decreases in income taxes payable	(221)
Proceeds from sale of other assets	90
Proceeds from sale lease back transactions	724
Total assets	87,174
Cash and cash equivalents at beginning of year	?
Cash and cash equivalents at end of year	746
Effect of exchange rate changes	(1)
Net decrease in cash and cash equivalents	(460)
Net changes in short-term debt with maturities of 3 months or less	(161)
Proceeds from debt	20,367

Select the items from this list that would appear in Walgreens' statement of cash flows and prepare the statement in proper form. Fill in the appropriate amount for cash and cash equivalents at the beginning of the period. Use the indirect method for reporting cash flows from operating activities. (Note: Deferred income taxes, stock compensation expense, and gain on sale of business are noncash expenses, and proceeds related to employee stock plans is a financing activity.)

I6-B3 Cash Provided by Operations

Target Corporation had net earnings of \$4,368 million in the fiscal year ending January 30, 2021. Additional information follows (in millions):

	Year Ended January 30, 2021	
Depreciation and amortization	\$ 2,485	
Share-based compensation expenses	\$ 200	
Non-cash losses	\$ 86	
Loss on debt extinguishment	\$ 512	
Cost of sales	\$66,177	
Deferred income taxes	\$ (184)	
Changes in noncash working capital accounts:		
Inventory	\$ 1,661	Increase
Other assets	\$ 137	Increase
Accrued liabilities	\$ 1,931	Increase
Accounts payable	\$ 2,925	Increase

Compute the net cash provided by operating activities. Explain why the net cash provided by operating activities is greater than the net income. (Note that share-based compensation expense, loss on debt extinguishment, and deferred income taxes are noncash expenses.)

Additional Assignment Material

MyLab Accounting

QUESTIONS

16-1 “The operating cycle for a company is one year.” Do you agree? Why?

16-2 Why should short-term prepaid expenses be classified as current assets?

16-3 Enumerate the items most commonly classified as current assets.

16-4 State the factors that determine the amount of depreciation charged as expense.

16-5 Criticize the following: “Depreciation is the loss in value of a fixed asset over a given span of time.”

16-6 What factors influence the estimate of useful life in depreciation accounting?

16-7 “To capitalize an amount spent means that it will not be charged as an expense.” Do you agree? Explain.

16-8 “Goodwill may have nothing to do with the personality of the manager or employees.” Do you agree? Explain.

16-9 “Working capital helps tell potential investors whether a company has enough current assets to pay current liabilities as they become due.” Do you agree? Explain.

16-10 What is the purpose of convertible debt instruments?

16-11 “Common shareholders have limited liability.” Explain.

16-12 What is the role of the par value of stocks or bonds?

16-13 What is other comprehensive income? Where do you find it on the balance sheet? Is it usually large or small in amount?

16-14 “Treasury stock is negative stockholders’ equity.” Do you agree? Explain.

16-15 What advantages does a multiple-step income statement have over a single-step statement?

16-16 Name the three items that most often cause changes in retained earnings as shown in the statement of changes in stockholders’ equity.

16-17 What are the purposes of a statement of cash flows?

16-18 What three types of activities are summarized in the statement of cash flows?

16-19 What is cash flow from operating activities? Give examples.

16-20 Name three major investing activities included in a statement of cash flows.

16-21 What is cash flow from financing activities? Give examples.

16-22 Where does interest received or paid appear on the statement of cash flows? Explain.

16-23 Delta Inc. borrowed \$15.2 million in 2020 to arrange the cash needed for some investment. How will the transaction be reported in the statement of cash flows? If the loan carries an interest at 8% p.a., how will the same be reported?

16-24 The Matrix Company purchased a fixed asset for \$2.5 million. How should this be reported in the investing activities section of a statement of cash flows?

16-25 Why are noncash investing and financing activities listed on a separate schedule accompanying the statement of cash flows?

16-26 What are the two major ways of computing net cash provided by operating activities? How do they differ?

16-27 “Under the indirect method of preparing a statement of cash flows, depreciation is added to net income and hence represents a source of cash.” Do you agree?

16-28 Why is there usually a difference between cash paid to suppliers and purchases in the financial statements of a certain period?

16-29 Why do analysts focus on free cash flow rather than just on cash flow from operating activities?

16-30 “Depreciation is an integral part of a statement of cash flows.” Do you agree? Explain.

16-31 What is the need for a reconciliation statement when a company prepares cash flow statements under the direct method?

16-32 Study Appendix 16A. Name and briefly describe each of the four inventory methods that are generally accepted in the United States.

16-33 Study Appendix 16A. Suppose prices are rising and inventories are increasing. Which of the four generally accepted inventory methods will usually result in the highest net income? Explain.

16-34 Study Appendix 16A. “Purchases of inventory at the end of a fiscal period can have a direct effect on income under LIFO.” Do you agree? Explain.

16-35 Study Appendix 16A. “In applying the lower-of-cost-or-market method to inventories, inventory values are written down when replacement cost falls. If the replacement cost then increases, inventory values are written up, but not to an amount greater than the original cost.” Do you agree? Explain.

16-36 Study Appendix 16B. “The presence of a deferred tax liability on the balance sheet means that cumulative tax payments have exceeded the cumulative tax expense charged on financial reports to shareholders.” Do you agree? Explain.

CRITICAL THINKING EXERCISES

16-37 Production Facilities and Depreciation

A manager complained about the amount of depreciation charged on the plant for which she was responsible: “The market value of my plant just continues to increase, yet I am hit with large depreciation charges on my income statement and the value of my plant and equipment on the balance sheet goes down each year. This doesn’t seem fair.” Comment on this statement, focusing on the relation of asset values on the balance sheet to market values of the assets.

16-38 R&D and the Recognition of Intangible Assets

A pharmaceutical company has undertaken a research activity to invent a drug to limit the abnormal growth of cancer cells. The research, if becomes successful, can be a breakthrough in the treatment of cancer, a disease that claims millions of lives worldwide every year. The progress so far has been encouraging, though multiple phases of trials are left before the company can apply for a patent. The CEO of the company wants to capitalize the cost of research, to which the chief accountant differs. What is your advice?

16-39 Using the Income Statement to Evaluate Sales Success

The net income of a company is the result of many factors. Sometimes managers want to measure the performance of one part of the organization separate from the effects of other parts. How might a company evaluate the success of its sales efforts using a classified income statement? Assume that the sales department is responsible for pricing and, thus, influences both the total amount sold and the margin on the items sold.

16-40 Capital Investment and the Statement of Cash Flows

Suppose a company is finding it difficult to meet the growing demand of its product with its presently installed capacity. The company needs to establish a new production unit and also to modernize the existing facility with some highly automated production technology. The company has decided to sell some of the old machinery and purchase new ones. It will also sell some investments to free up cash for this purpose. The remaining amount will be availed from a financial institution as a 10-year loan at 7% interest p.a. Describe how an investor might use the statement of cash flows to learn how the company has executed the expansion program.

16-41 Purchasing Operations and LIFO Versus FIFO

Study Appendix 16A. Suppose that the evaluation of the purchasing officer for a refinery is based on the gross margin on the oil products produced and sold during the year. During the year, the price of a barrel of oil has increased from \$50 to \$70. All the inventory of oil at the beginning of the year is valued at \$50 or less. On the last day of the year, the purchasing agent is contemplating the purchase of additional oil at \$70 per barrel. Is the agent more likely to purchase additional oil if the company uses the FIFO or the LIFO method for its inventories? Explain.

GENERAL EXERCISES AND PROBLEMS

16-42 Meaning of Book Value

Twenty years ago Sigurdson Corp. purchased an office building in Oslo for 12 million Norwegian kroner (Kr), 4 million of which was attributable to land. Sigurdson has fully paid off the mortgage. The current balance sheet follows (in millions):

Cash	Kr 3.0	Stockholders' equity	<u>Kr 8.3</u>
Land	4.0		
Building at cost	Kr 8.0		
Accumulated depreciation	<u>6.7</u>		
Book value		1.3	
Total assets		<u>Kr 8.3</u>	

The company is about to borrow Kr 18 million on a first mortgage to modernize and expand the building. This amounts to 60% of the Kr 30 million appraised value of the combined land and building before the modernization and expansion. Prepare a balance sheet after Sigurdson Corp. obtains the loan and expands and modernizes the building, but before it charges any further depreciation. Comment on the usefulness of the balance sheet.

16-43 Balance Sheet and Income Statement

The fiscal year for Hokkaido Company ends on May 31. Results for the year ended May 31, 20X1, included the following (in millions of Japanese yen except for number of shares outstanding):

Cash and cash equivalents	¥ 45,000
Cost of goods sold	195,000
Inventories	29,000
Other current assets	6,000
Fixed assets, net	217,000
Net sales	422,000
Receivables	22,000
Debentures	77,000
Research and development expenses	42,000
Administrative and general expenses	65,000
Other income (expenses), net	(12,000)
Capital construction fund*	28,000
Selling and distribution expenses	41,000
Other current liabilities	9,000
Treasury stock	(13,000)
Long-term investments	?
Accounts payable	24,000
Mortgage bonds payable	84,000
Deferred income tax liability	12,000
Redeemable preferred stock	15,000
Common stock, at par (50,000 shares outstanding)	5,000
Paid-in capital in excess of par	102,000
Income tax expense	51,000
Accrued expenses payable	20,000
Retained income	48,000
Intangible assets	21,000

*A noncurrent asset

Prepare in proper form the balance sheet as of May 31, 20X1, and the income statement for the year ended May 31, 20X1. Include the proper amount for long-term investments.

16-44 Simple Changes in Retained Earnings and Total Stockholders' Equity

Sydney Company had retained earnings of \$56,000 and total stockholders' equity of \$75,000 at the beginning of 20X1. During 20X1 the company had net income of \$21,000, declared and paid cash dividends of \$8,000, and had other comprehensive income of \$4,000. Sydney Company neither issued nor bought back shares in 20X1. Compute the retained earnings and total stockholders' equity at the end of 20X1.

16-45 Cash Received from Customers

Sales for Metallic Paints in 2020 were £300,000, 70% of them on credit and 30% for cash. During the year, accounts receivable increased from £28,000 to £33,500, an increase of £5,500. What amount of cash did Metallic Paints receive from customers during 2020?

16-46 Cash Paid to Suppliers

Cost of goods sold for Metallic Paints during 2020 was £200,000. Beginning inventory was £32,000 and ending inventory was £44,500. Beginning trade accounts payable were £6,500 and ending trade accounts payable was £20,500. What amount of cash did Metallic Paints pay to suppliers?

16-47 Cash Paid to Employees

Metallic Paints reported wage and salary expenses of £77,500 on its 2020 income statement. It reported cash paid to employees of £68,000 on its statement of cash flows. The beginning balance of accrued wages and salaries payable was £4,000. What was the ending balance in accrued wages and salaries payable? Ignore payroll taxes.

16-48 Simple Cash Flows from Operating Activities

Hoogendoorn and Associates provides consulting services in Amsterdam. In 20X0, net income was € 230,000 on revenues of € 510,000 and expenses of € 280,000 (€ stands for euro, the European currency). The only noncash expense was depreciation of € 50,000. The company has no inventory.

Accounts receivable increased by € 17,000 during 20X0, and accounts payable and salaries payable were unchanged.

Prepare a statement of cash flows from operating activities. Use the direct method. Omit supporting schedules.

16-49 Net Income and Cash Flow

Refer to Problem 16-48 Prepare a schedule that reconciles net income to net cash provided by operating activities.

16-50 Net Loss and Cash Flows from Operating Activities

The Halifax Company had a net loss of \$25,000 in 20X2. The following information is available:

Depreciation	\$19,000
Decrease in accounts receivable	4,000
Increase in inventory	3,000
Increase in accounts payable	18,000
Increase in salaries and wages payable	5,000

Present a schedule that reconciles net income (loss) to net cash provided by operating activities.

16-51 Preparation of a Statement of Cash Flows

Roticcio Agro Products produces and sells beverages under the brand name “Real.” By the end of 2020, company’s cash balance had dropped to CHF24,000, despite net income of CHF478,000 in 2020. Its transactions affecting income or cash in 2020 were as follows (in thousands):

1. Sales were CHF6,006, all on credit. Cash collections from customers were CHF5,780.
2. The cost of items sold was CHF4,192.
3. Inventory increased by CHF112.
4. Cash payments on trade accounts payable were CHF4,260.
5. Payments to employees were CHF610; accrued wages payable decreased by CHF48.
6. Other operating expenses, all paid in cash, were CHF210.
7. Interest expense, all paid in cash, was CHF52.
8. Income Tax expense was CHF210; cash payments for income taxes were CHF214.
9. Depreciation was CHF302.
10. A warehouse was required for CHF1,080 cash.
11. Equipment was sold for CHF74 cash; original cost was CHF392, accumulated depreciation was CHF318.
12. Received CHF56 for issue of common stock.
13. Retired long term debt for CHF42 cash.
14. Paid cash dividends of CHF178.

Prepare a statement of cash flows using the direct method for reporting cash flows from operating activities. Omit supporting schedules.

16-52 Reconciliation of Net Income and Net Cash Provided by Operating Activities

Refer to Problem 16-51. Prepare a supporting schedule to the statement of cash flows that reconciles net income to net cash provided by operating activities.

16-53 Depreciation and Cash Flows

The annual report of Texas Iron and Steel Works provides the following condensed income statement and reconciliation schedule (in millions):

Sales	\$406
Expenses	<u>\$338</u>
Net income	<u>\$ 68</u>
Reconciliation Schedule of Net Income to Net Cash Provided by Operating Activities	
Net income	\$68
Add noncash expenses	
Depreciation	34
Deduct net increase in noncash operating working capital	<u>(30)</u>
Net cash provided by operating activities	<u>\$72</u>

A shareholder has suggested that the company should switch from straight-line to accelerated depreciation on its annual report to shareholders. She believes this will increase the cash flow provided by operating activities. As per her calculations, using accelerated methods would increase depreciation to \$54 million, an increase of \$20 million; net cash flow from operating activities would then be \$92 million.

1. Suppose the company adopts the accelerated depreciation method. Compute net income and net cash flow from operating activities. Ignore income taxes.
2. Use your answer to number 1 to prepare a response to the shareholder.

16-54 Cash Flows; Indirect Method

The O'Toole Company has the following balance sheet data (in millions):

December 31			December 31		
	20X2	20X1	Change		
Current assets				Current liabilities (detailed)	
Cash	\$ 12	\$ 25	\$ (13)		\$ 101
Receivables, net	65	30	35	Long-term debt	\$ 24
Inventories	<u>100</u>	<u>50</u>	<u>50</u>	Stockholders' equity	\$ 77
Total current assets	\$177	\$105	\$ 72		
Plant assets					
(net of accumulated depreciation)	<u>275</u>	<u>100</u>	<u>175</u>		
Total assets	<u>\$452</u>	<u>\$205</u>	<u>\$ 247</u>	Total liabilities and stockholders' equity	<u>\$452</u>

Net income for 20X2 was \$60 million. Net cash inflow from operating activities was \$72 million. Cash dividends paid were \$10 million. Depreciation was \$20 million. Fixed assets were purchased for \$195 million, \$120 million of which was financed via the issuance of long-term debt, the balance outright for cash. Sean O'Toole, Jr., the president and majority stockholder of O'Toole Company, was a superb operating executive. He was imaginative and aggressive in marketing and ingenious and creative in production. But he had little patience with financial matters. After examining the most recent balance sheet and income statement, he muttered, "We've enjoyed 10 years of steady growth; 20X2 was our most profitable ever. Despite such profitability, we're in the worst cash position in our history. Just look at those current liabilities in relation to our available cash! This whole picture of the more you make, the poorer you get, just does not make sense. These statements must be cockeyed."

1. Prepare a statement of cash flows using the indirect method, which includes a schedule reconciling net income to net cash provided by operating activities in the body of the statement.
2. Using the statement of cash flows and other information, write a short memorandum to Mr. O'Toole, explaining why there is such a squeeze on cash.

16-55 Preparation of Statement of Cash Flows

South African Imports Company has assembled the (a) balance sheet and (b) income statement and change in retained earnings for 20X1 shown in Exhibit 16-23. On December 30, 20X1, South African Imports paid R103 million in cash to acquire a new warehouse to expand operations. (R stands for rand, the South African currency.) This was partly financed by an issue of long-term debt for R 50 million cash. The company sold plant assets for their book value of R 6 million during 20X1. Because net income was R 26 million, the highest in the company's history, Julie Botha, the CEO, was distressed by the company's extremely low cash balance.

1. Prepare a statement of cash flows using the direct method for reporting cash flows from operating activities. You may wish to use Exhibit 16-12 on p. 696 as a guide.
2. Prepare a schedule that reconciles net income to net cash provided by operating activities.
3. What is revealed by the statement of cash flows? Does it help you reduce Ms. Botha's distress? Why? Briefly explain to Ms. Botha why cash has decreased even though net income was R 26 million.

Balance Sheet December 31, 20X1 (in millions)

	20X1	20X0	Change
Assets			
Cash	R 5	R 25	R(20)
Accounts receivable	55	28	27
Inventory	72	50	22
Prepaid general expenses	4	3	1
Plant assets, net	<u>207</u>	<u>150</u>	<u>57</u>
	<u>R343</u>	<u>R256</u>	<u>R 87</u>
Liabilities and shareholders' equity			
Accounts payable for merchandise	R 74	R 60	R 14
Accrued tax payable	3	2	1
Long-term debt	50	—	50
Capital stock	100	100	—
Retained earnings	<u>116</u>	<u>94</u>	<u>22</u>
	<u>R343</u>	<u>R256</u>	<u>R 87</u>

Income Statement and Change in Retained Earnings for the Year Ended December 31, 20X1 (in millions)

Sales		R315
Less cost of goods sold		
Inventory, December 31, 20X0	R 50	
Purchases	<u>210</u>	
Cost of goods available for sale	R260	
Inventory, December 31, 20X1	<u>72</u>	<u>188</u>
Gross profit		R127
Less other expenses		
General expense	R 51	
Depreciation	40	
Taxes	<u>10</u>	<u>101</u>
Net income		R 26
Dividends		4
Net income of the period retained		R 22
Retained earnings, December 31, 20X0		<u>94</u>
Retained earnings, December 31, 20X1		<u>R116</u>

Exhibit 16-23

South African Imports Co.
Financial Statements

I6-56 LIFO and FIFO

Study Appendix 16A. The inventory of the West Virginia Coal Company on June 30 shows 500 tons at \$62 per ton. A physical inventory on July 31 shows a total of 600 tons on hand. Revenue from sales of coal for July totals \$105,000. The following purchases were made during July: July 5, 1,000 tons at \$64 per ton; July 15, 250 tons at \$66 per ton; July 25, 300 tons at \$69 per ton.

1. Compute the inventory value as of July 31, using (a) FIFO and (b) LIFO.
2. Compute the gross profit using each method.

I6-57 Lower of Cost or Market—U.S. GAAP

Study Appendix 16A. Hamlin Toy Company prepared financial statements using U.S. GAAP. It uses cost or market, whichever is lower, for its inventories.

There were no sales or purchases during the periods indicated, although selling prices generally fluctuated in the same directions as replacement costs. What amount for merchandise inventories would you show on the quarterly balance sheet on the dates listed next?

	Invoice Cost	Replacement Cost
March 31, 20X1	\$200,000	\$170,000
June 30, 20X1	200,000	180,000
September 30, 20X1	200,000	205,000
December 31, 20X1	200,000	150,000

16-58 Lower of Cost or Market—IFRS

Study Appendix 16A. Hamlin Toy Company prepares financial statements using IFRS. It uses cost or market, whichever is lower, for its inventories. There were no sales or purchases during the periods indicated. What amount for merchandise inventories would you show on the quarterly balance sheet on the dates listed next?

	Invoice Cost	Realizable Value
March 31, 20X1	\$200,000	\$170,000
June 30, 20X1	200,000	180,000
September 30, 20X1	200,000	205,000
December 31, 20X1	200,000	150,000

16-59 LIFO, FIFO, and Cash Effects

Study Appendix 16A. Kalitzki Implements Company had sales revenue of \$710,000 in 20X2. Pertinent data for its only product in 20X2 included the following:

Inventory, December 31, 20X1	15,000 units at \$12	\$180,000
February purchases	20,000 units at \$14	280,000
August purchases	34,000 units at \$16	544,000
Sales for the year	30,000 units	

1. Prepare a statement of gross margin for 20X2. Use two columns, one assuming LIFO and one assuming FIFO.
2. Assume that Kalitzki is reporting to the tax authorities and has a 45% income tax rate. Suppose all transactions are for cash. Which inventory method results in more cash for Kalitzki? By how much?

16-60 LIFO and FIFO; Prices Rising and Falling

Study Appendix 16A. The Omaha Fertilizer Company had inventory on December 31, 20X0, of 20,000 bags at \$10 = \$200,000. Purchases during 20X1 were 30,000 bags. Sales were 28,000 bags for sales revenue of \$17 per bag. Prepare a four-column comparative statement of gross margin for 20X1:

1. Assume that purchases were at \$12 per unit. Assume FIFO and then LIFO (columns 1 and 2).
2. Assume that purchases were at \$8 per unit. Assume FIFO and LIFO (columns 3 and 4).
3. Assume Omaha Fertilizer is reporting for tax purposes and has an income tax rate of 35%. Suppose all transactions are for cash.
 - a. Which inventory method in number 1 results in more cash for Omaha Fertilizer Company? By how much?
 - b. Which inventory method in number 2 results in more cash for Omaha Fertilizer Company? By how much?

UNDERSTANDING PUBLISHED FINANCIAL REPORTS

16-61 Various Intangible Assets

Consider the following:

1. a. Pfizer Incorporation's annual report indicated that R&D expenditures on account of the COVID-19 vaccine were \$3,292 million during 2020. How did this amount affect income before income taxes, which was \$7,202 million? The company reports using U.S. GAAP.
- b. Suppose the entire \$3,292 million arose from outlays for patents from various outside parties on December 30, 2020. What would be the operating income for 2020?

- c. How would the Pfizer balance sheet, December 31, 2020, be affected by your treatment of R&D in a?
- d. Suppose Pfizer used IFRS and identified \$1,000 million of the \$3,292 million of R&D costs as development costs for which the technical and economic feasibility has been demonstrated. How would your answer to part a change?
2. Suppose on December, 2020, AT&T acquired new patents on 5G telecommunication technology for \$30 million. Technology changes quickly. The technology is expected to remain useful for 4 years rather than 15-year life of the patent. What will be the amortization for 2021?
3. Walmart purchased the Indian e-commerce firm Flipkart a few years ago for approximately \$16 billion. Of the \$16 billion purchase price, only about \$3 billion could be assigned to identifiable individual assets. What was the total amount of goodwill from the purchase recorded on the Walmart's balance sheet? How should Walmart account for the goodwill in the years after acquisition?

16-62 Various Liabilities

For each of the following cases, indicate how the financial statement will be affected. Identify the affected accounts specifically.

1. Dyson sells electric appliances including vacuum cleaners. On January 1, 2020, Dyson had a liability of £382 million for future warranty claims. Suppose that experience in recent years has indicated that warranty costs for vacuum cleaners average 3.2% of sales, and sales of vacuum cleaners for January 2020 were £500 million. During January 2020, Dyson paid £15 million to service warranties on previously sold vacuum cleaners.
2. Suppose in Malaysia customers buying soft drinks pay a 6-sen deposit on each bottle/can purchased. (Many other states and countries have similar laws to promote recycling.) The bottler or distributor then pays 6 sen plus 1 sen handling fee for each returned bottle or can. About 80% of the bottles and cans are redeemed. Suppose Coca-Cola sold 2.5 million can diet coke in August and paid RM125,000 for cans returned (RM1 = 100 sen).
3. Development Bank of Singapore (DBS) received S\$50,000 savings deposit on April 1. On June 30, it recognized interest thereon at an annual rate of 2.5%. On July 1, the depositor closed his account with the bank.
4. Suppose the Royal Theatre Company sold for £240,000 pound cash a "season's series" of tickets in advance of December 31 for four opera shows, each to be held in successive months beginning in January.
(a) What is the effect on the balance sheet, December 31? (b) What is the effect on balance sheet, January 31?

16-63 Exercises in Assets, Liabilities, and Stockholders' Equity

Samsung is a South Korean multinational conglomerate headquartered in Seoul. Suppose the following data pertains to Samsung's operation during the fiscal 2020.

1. On December 31, 2019, the end of Samsung's fiscal year, it had accounts receivable totaling ₩20,906,600 million on its books and, after subtracting estimated uncollectible accounts of ₩577,500 million, the company reported net accounts receivable of ₩20,329,100 million on its balance sheet. In fiscal 2020, accounts receivable before subtracting estimated uncollectible decreased by ₩343,200 million and estimated uncollectible accounts decreased by ₩60,500 million. What amount was reported for net accounts receivable on Samsung's December 31, 2020, balance sheet?
2. Samsung began the 2020 fiscal year with approximately ₩2,691,700 million in its liabilities for warranties account. The company paid ₩2,918,300 million during the year to settle warranty claims, and it accrued warranty expenses of ₩2,922,700 million. What was the liability for warranties shown on Samsung's December 31, 2020, balance sheet?
3. Retained earnings at the end of fiscal 2019 were ₩35,964,500 million on Samsung's balance sheet. During fiscal 2020, Samsung's net income was ₩7,781,400 million and Samsung paid dividends of ₩917,400 million. In addition, repurchases of stock and other items decreased Samsung's retained earnings by ₩4,035,900 million. What was the balance in retained earnings in Samsung's December 31, 2020, balance sheet?

16-64 Classified Income Statement and Balance Sheet

Suppose the following are all the items related to Google's financial statements for the 3-month period ended on March 31, 2020. Recast the income statement and balance sheet to show as many meaningful totals and subtotals as the data allow. All figures are in million dollars.

Google's Income Statement

Revenue	\$34,814
Cost of revenue	7,904
Research and development	5,034
Sales and marketing	6,828
General and administrative	2,300
Other income (expense)	(22)
Provision for income taxes	2,510

Exhibit 16-24

Google *Financial Statements*
for the 3 Months Ended March
31, 2020

Google's Balance Sheet

Cash and cash equivalents	\$ 12,776
Short term investments	106,282
Accounts receivable, net of allowance for doubtful accounts of \$644	21,922
Inventory	2,824
Deferred income taxes	4,700
Other current assets	5,216
Property and equipment net of accumulated depreciation of \$21,904	16,450
Equity and other investments	18,136
Goodwill	39,396
Intangible assets	5,512
Other long-term assets	2,806
Accounts payable	7,580
Accrued compensation	6,544
Income taxes	1,916
Short-term unearned revenue	27,858
Securities lending payable	2,420
Other current liabilities	6,022
Long-term debt	23,876
Long-term unearned revenue	2,524
Deferred income taxes	2,912
Other long-term liabilities	17,050
Common stock and paid-in capital—shares authorized 48,000; outstanding 16,800	130,546
Retained earnings	6,772
Accumulated other comprehensive income	1,462
Operating lease right-of-use assets	10,673

16-65 Classified Balance Sheet—Britain

J. Sainsbury plc operates Sainsbury's Supermarkets, Britain's longest-standing major food retailing chain with 934 stores throughout the United Kingdom and sales of nearly £21 billion in 2011. The company's classified balance sheet for March 19, 2011, is in Exhibit 16-25.

Suppose J. Sainsbury plc used the format adopted by most U.S. companies for its balance sheet. How would the format of its balance sheet differ from that shown?

16-66 Gain on a Ship That Sank

A few years ago, a Mediterranean Shipping Company cargo ship sank in the Atlantic Sea. The accident resulted in a gain €0.21 per share for the company. How could this happen? Consider the accounting for shipping companies. Shipping companies insure their cargoes at market value, €7.2 million for Mediterranean. However, the cargo's book value is often much less because of large accumulated depreciation amounts. The book value of Mediterranean's cargo was only €1.25 million.

1. Suppose Mediterranean received the insurance payment and immediately purchased another cargo for €7.2 million. Compute the effect of the accident on pretax income. Also compute the effect on Mediterranean's total assets.
2. Do you think a casualty loss should generate a reported gain? Why?

16-67 Identification of Operating, Investing, and Financing Activities

The items listed below were found on the 2011 statement of cash flows of **Chevron Corporation**, a company engaged in the exploration, production, refining, and distribution of petroleum products. For each item, indicate which section of the statement should contain the item—the operating, investing, or financing section. Does Chevron use the direct or indirect method for reporting cash flows from operating activities?

- a. Capital expenditures
- b. Proceeds from issuances of long-term debt
- c. Net income
- d. Net (increase) decrease in operating working capital
- e. Cash dividends—common stock
- f. Acquisition of Atlas Energy
- g. Proceeds from asset sales
- h. Net borrowings (payments) of short-term obligations
- i. Depreciation, depletion, and amortization
- j. Repayments of long-term debt and other financing obligations

16-68 Interest Expense

Dr. Oetker is a German multinational company that produces baking powder, cake mixes, frozen pizza, pudding, cake decoration, cornflakes, and various other food products. The company has been financed significantly by loan from major financial institutions. Suppose that in fiscal, 2020, the company reported interest expense of €34,797,000 on its income statement. Footnote showed a cash payment for interest of €31,037,500. Accrued interest, a current liability on the balance sheet, was €4,052,500 at the beginning of fiscal 2020.

1. Describe how the transaction relating to interest would be shown in the body of the statement of cash flows if the company used the direct method of reporting the cash flows from operating activities. Be specific, including amount shown.
2. Describe how the company would show the transactions relating to interest on a supplementary schedule that reconciles net income and net cash provided by the operating activities.

16-69 Indirect and Direct Cash Flow from Operations

Exclusive Furnitures runs a retail chain with presence over 200 locations in Mexico. The following items were in a slightly simplified version of company's statement of cash flows for the fiscal year ending December 31, 2020 (millions):

Increase in merchandise inventories	MXN12,840
Net income	30,840
Depreciation and amortization	17,100
Other noncash expenses	5,380
Increase in payables	16,080
Increase in other operating liabilities, net	9,020
Increase in receivables	1,620

The company's income statement showed (in millions):

Total revenues	MXN1,778,300
Cost of merchandise	1,554,780
Operating expenses	174,740
Operating income	48,780
Other expenses, net	1,120
Income before income taxes	47,660
Income tax	16,820
Net income	<u>MXN30,840</u>

1. Prepare a statement of cash flows from operating activities using the indirect method.
2. Prepare a statement of cash flows from operating activities using the direct method. Assume that all other expenses and income taxes were paid in cash, all operating liabilities relate to operating expenses, and that all depreciation and other noncash expenses are included in operating expenses.

16-70 Statement of Cash Flows, Direct and Indirect Methods

Nature Fresh Inc., a Cologne-based food processing company, had the following income statement for the year ended December 31, 2020 (in millions):

Total revenues		€32,631
Costs and expenses		
Cost of sales	€19,776	
Selling, general, and administrative	9,108	
Interest	<u>390</u>	
Total costs and expenses		<u>29,274</u>
Earnings before income taxes		3,357
Income taxes		<u>1,308</u>
Net earnings		<u><u>2,049</u></u>

The company's net cash provided by operating activities (slightly modified), prepared using the indirect method, was as follows:

Net earnings	€2,049
Adjustments to reconcile net earnings to net cash provided by operating activities	
Depreciation and amortization expenses	1,113
Other noncash expenses	351
Changes in	
Accounts receivable	(294)
Merchandise inventories	(411)
Accounts payable	162
Accrued salaries, wages, and related benefits	18
Income taxes payable	(36)
Other liabilities	<u>579</u>
Net cash provided by operating activities	<u><u>3,531</u></u>

Prepare a statement showing the net cash provided by operating activities using the direct method. Assume that depreciation and amortization expenses, other noncash expenses, accrued salaries, wages, and related benefits, and other liabilities relate to selling, general, and administrative expenses.

16-71 Comparison of Inventory Methods

Study Appendix 16A. **Unisys Corporation** is a producer of computer-based information systems. The following actual data and descriptions are from the company's 2011 annual report as of December 31 (in millions):

	2011	2010
Inventories	\$64.8	\$88.9

A footnote states that "Inventories are valued at the lower of cost or market. Cost is determined principally on the first-in, first-out method."

The income statement for 2011 included the following (in millions):

Total revenues	\$3,853.8
Cost of revenue	<u>2,866.8</u>

Suppose a division of Unisys had the accompanying data regarding computer parts that it acquires and resells to customers for maintaining equipment:

	Units	Total
Inventory (December 31, 2011)	100	\$ 800
Purchase (February 20, 2012)	200	2,000
Sales (March 17, 2012)	150	2,250
Purchase (April 25, 2012)	140	1,820
Sales (June 27, 2012)	160	2,400

- For these computer parts only, prepare a tabulation of the cost-of-goods-sold section of the income statement for the 6 months ended June 30, 2012. Support your computations. Round totals to the nearest dollar. Show your tabulation for four different inventory methods: (a) FIFO, (b) LIFO, (c) weighted-average, and (d) specific identification.
For part d, assume that the purchase of February 20 was identified with the sale of March 17. Also assume that the purchase of April 25 was identified with the sale of June 27; the additional units sold were identified with the beginning inventory.
- By how much would income taxes differ if Unisys used (a) LIFO instead of FIFO for this inventory item? (b) weighted average instead of FIFO? Assume a 40% tax rate.

16-72 Effects of Late Purchases

Study Appendix 16A. Refer to the preceding problem. Suppose **Unisys** acquired 60 extra units at \$15 each on June 29, 2012, a total of \$900. How would gross margin and income taxes be affected under FIFO? (That is, compare FIFO results before and after the purchase of 60 extra units.) Under LIFO? (That is, compare LIFO results before and after the purchase of 60 extra units.) Show computations and explain.

16-73 LIFO and FIFO at Big Bazar

Big Bazar, one of the largest retail chains in India, uses the FIFO inventory method. On December 31, 2019, the company reported merchandise inventory of ₹824 million. At the beginning of the fiscal year, the inventory amount was ₹848 million. Cost of merchandise sold for fiscal 2019 (the year ended December 2019) was ₹3,688 million, and operating income was ₹536 million. During the year, Big Bazar purchased merchandise for ₹3,664 million. Suppose Big Bazar had changed to LIFO on the first day of the fiscal 2019, using the current inventory amount (₹848 million) as the first LIFO layer. Assuming that its LIFO inventory on January 1, 2020, was ₹784 million instead of the FIFO value of ₹824 million.

- Compute Big Bazar's cost of merchandise sold and operating income for the year ended January 1, 2020, assuming that the switch to LIFO had been made at the beginning of fiscal 2019.
- How would the switch to LIFO have affected Big Bazar's fiscal 2019 income taxes, assuming a 40% tax rate? Assume that Big Bazar switches to LIFO for both financial reporting and tax purposes.
- Were the prices Big Bazar paid for merchandise inventory rising or falling during fiscal 2019? How do you know?

16-74 Effect of LIFO

Study Appendix 16A. **General Mills**, producer of Wheaties, Cheerios, Gold Medal Flour, and many other food products, reported fiscal 2011 income before taxes of \$2,428 million. Part of footnote 2 to the financial statements stated the following:

All inventories in the United States other than grain and certain organic products are valued at the lower of cost, using the last-in first-out (LIFO) method, or market.

Inventories valued at the lower of LIFO cost or market are as follows (in millions):

	May 29, 2011	May 30, 2010
Inventories	\$1,609	\$1,344

If LIFO inventories were valued at the lower of FIFO cost or market, the inventories would have been \$168 million and \$142 million higher than those reported for fiscal 2011 and 2010, respectively.

Suppose the FIFO method had always been used for all inventories. Calculate General Mills' operating income for fiscal 2011. By how much would the cumulative operating income for all years through 2011 differ from that reported? Would it be more or less than that reported?

NIKE 10-K PROBLEM

16-75 Using Financial Statements

Use the **Nike** 10-K report in Appendix C to answer the following questions.

1. What is Nike's principal business activity? What percentage of its sales are in the United States?
2. How much did Nike's gross margin and gross margin as a percentage of revenue increase (decrease) in fiscal 2021 compared with fiscal 2020?
3. Compare Nike's working capital in fiscal 2020 with that in fiscal 2021?
4. Nike had an increase in cash of \$1,541 million in fiscal 2021. What were the major causes of this increase in cash?
5. Did Nike's board declare any cash dividends in fiscal 2021? If so, how much? On what financial statement did you find this?

EXCEL APPLICATION EXERCISE

16-76 Analyzing Differences Between Inventory Valuation Methods

Goal: Create an Excel spreadsheet to analyze differences between inventory valuation methods during inflationary and deflationary economies. Use the results to answer questions about your findings.

Scenario: The Omaha Fertilizer Company has asked you to compute its cost of goods sold and ending inventories for 20X1 using both FIFO and LIFO inventory valuation methods. Your computations will include scenarios for both rising and declining purchase prices. The company has a beginning inventory balance on January 1, 20X1, of 20,000 bags purchased at \$10 per bag. For Scenario 1, assume that the company purchased 30,000 bags of fertilizer at \$12 per bag in 20X1. For Scenario 2, assume that the company purchased 30,000 bags of fertilizer at \$8 per bag in 20X1. The company sold 28,000 bags of fertilizer at \$17 per bag during 20X1.

Note: This scenario is based on data in General Exercises and Problems 16-60. It requires study of Appendix 16A.

When you have completed your spreadsheet, answer the following questions:

1. In scenario 1, which assumes rising prices, which method's ending inventory most accurately reflects current replacement cost? Why?
2. In scenario 2, which assumes declining prices, which method's ending inventory most accurately reflects current replacement cost? Why?
3. Does LIFO always show the highest cost of goods sold (COGS)? Explain.

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 16 Decision Guideline
Row 2: Omaha Fertilizer Company
Row 3: Inventory Valuation Analysis
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–F.
4. In row 7, create the following column headings:
Column B: Beginning Inventory
Column C: Inventory Purchases
Column D: Available Inventory
Column E: COGS
Column F: Ending Inventory
5. Change the format of the column headings in row 7 to permit the titles to be displayed on multiple lines within a single cell.

Alignment tab: Wrap text: Checked

6. Change the format of the column headings in row 7 to display as bold-faced.

Note: Adjust column widths so that headings only use two lines.

Adjust row height to ensure that row is same height as adjusted headings.

7. Change the format of each column heading in row 7 to be center justified.
8. In row 8, create the following bold-faced row heading:
Column A: Scenario #1 (\$12 per bag):

Note: Adjust the column width as necessary.

9. In row 9, create the following right-justified row heading:
Column A: FIFO

10. Use formulas to calculate the amounts for columns B–F in row 9.

Note: Formulas for COGS and Ending Inventory (columns E and F, respectively) will need a multistep formula if they are composed of items that do not all have the same inventory/purchase price. An example of the multistep formula needed in this situation would be $= (a \times b) + (c \times d)$

See Exhibit 16-20 for examples on how to calculate COGS and Ending Inventory.

11. Skip a row.
12. In row 11, create the following right-justified row heading:
Column A: LIFO
13. Use formulas to calculate the amounts for columns B–F in row 11.
14. Skip two rows.
15. In row 14, create the following bold-faced row heading:
Column A: Scenario #2 (\$8 per bag):
16. In row 15, create the following right-justified row heading:
Column A: FIFO
17. Use formulas to calculate the amounts for columns B–F in row 15.
18. Skip a row.
19. In row 17, create the following right-justified row heading:
Column A: LIFO
20. Use formulas to calculate the amounts for columns B–F in row 17.
21. Format all amounts in rows 9, 11, 15, and 17 as follows:

Number tab:	Category:	Currency
	Decimal places:	0
	Symbol:	\$
	Negative numbers:	Black with parentheses

22. Accentuate the COGS and Ending Inventory columns by applying cell-shading to columns E and F for rows 7–17.

Patterns tab:	Color:	Lightest gray

23. Save your work and print a copy for your files.

COLLABORATIVE LEARNING EXERCISE

16-77 Income Statement and Balance Sheet Accounts

Form teams of two persons each. Each person should make a list of 10 account names, with approximately half being income statement accounts and half being balance sheet accounts. Give the list to the other member of the team, who is to identify the financial statement (*I* for income statement or *B* for balance sheet) on which it belongs. If there are errors or disagreements in classification, discuss the account and come to an agreement about which financial statement it belongs to.

INTERNET EXERCISE

16-78 Tata Steel Limited's Financial Statements

Go to <https://tatasteel.com> to locate financial information for **Tata Steel Ltd.**, an India-based global steel manufacturer and supplier. Click on “Menu” and follow the link to “Investors,” “Integrated Report/Annual Report,” and to the most recent annual report and related documents. Answer the following questions about the company:

1. Examine Tata Steel's income statement. What does the company call this statement? Does it use the single-step or multiple-step format? What subtitles does Tata Steel use in its income statement? What was Tata Steel's net income in the most recent year? Was this more or less income than the company had in the preceding year?
2. Now look at Tata Steel's balance sheet. What is the company's largest current asset? What is its largest current liability? What is the balance in its property account? What was the original cost of the property and the accumulated depreciation and impairment? (See the notes to the financial statements.)
3. What is the largest component of Tata Steel's stockholders' equity? What proportion of total stockholders' equity does it represent? What does this imply about Tata Steel's profitability in the past?
4. Examine Tata Steel's statement of cash flows. Is the company's cash flow from operating activities more or less than its net earnings? Why? Did cash increase or decrease during the year? By how much?
5. Compare Tata Steel's depreciation and amortization to its cash used for acquiring fixed assets. Which is larger? What does this tell you?

Understanding and Analyzing Consolidated Financial Statements

LEARNING OBJECTIVES

When you have finished studying this chapter, you should be able to:

1. Contrast accounting for investments using the equity method and the market-value method.
2. Explain the basic ideas and methods used to prepare consolidated financial statements.
3. Describe how goodwill arises and how to account for it.
4. Use financial statement analysis to evaluate an organization's performance.
5. Explain and use a variety of popular financial ratios.
6. Identify the major implications that efficient stock markets have for accounting.

► BERKSHIRE HATHAWAY

In 1960 Warren Buffett, then 30 years old, asked 10 friends to invest \$10,000 each in an investment partnership. That partnership eventually became **Berkshire Hathaway**, and today each \$10,000 investment is worth more than \$225 million. Berkshire has provided investors with a compounded annual return of 20% between 1965 and 2020. Buffett was named by *Forbes* magazine as the eighth richest person in the United States in 2021 with a fortune worth \$102 billion. Known as the “Oracle of Omaha,” Buffett is revered for his investment savvy. Berkshire Hathaway's annual meeting, where Buffett spends hours presenting his investment philosophy (and often his life philosophy), regularly attracts nearly 40,000 participants.

Berkshire Hathaway Inc. is a holding company located in Omaha, Nebraska. It owns all or part of more than 75 companies, including 100% ownership of companies as diverse as **Burlington Northern Santa Fe**, **MidAmerican Energy**, **GEICO Auto Insurance**, **International Dairy Queen**, and **Fruit of the Loom**. These companies are separate entities, each with its own financial records. However, authorities require Berkshire to combine their financial records when preparing its financial statements for the public.

Berkshire is not the only company that has to combine the financial records of its subsidiaries. Pick up the annual report of almost any major company, and you will find **consolidated financial statements**. This term means that the company has combined the books of two or more separate legal entities into one set of financial statements. Berkshire Hathaway's annual report states that its “Consolidated Financial Statements include the accounts of Berkshire consolidated with the accounts of all subsidiaries and affiliates in which we hold a controlling financial interest.”

The consolidated Berkshire statements in the company's annual report combine the financial results of multiple companies making millions of transactions in many different currencies throughout the world. Consolidated financial statements show all these transactions as if they were made by a single company, rather than multiple separate companies.

Berkshire also has smaller investments in companies in which it does not hold a controlling financial interest, such as **Coca Cola**, **Procter & Gamble**, and **American Express**. It lists these on its balance sheet at market values or under the equity method, as explained in this chapter.

consolidated financial statements

Financial statements that combine the books of two or more separate legal entities into one set of financial statements.

This chapter contains two parts. You can study either part or both, depending on your specific interest. Part One shows how to account for the investments one company makes in another, such as Berkshire's investment in its subsidiaries and affiliates, with a focus on consolidated financial statements. Part Two covers the analysis of consolidated financial statements, focusing on the financial statements of **Nike**, which are included in Appendix C at the end of the book. ■

Part One: Intercorporate Investments Including Consolidations

Firms often invest in the equity securities of another company. The investing company may be simply investing excess cash, or it may be seeking some degree of control over the investee. The way we account for these investments depends on management's reasons for making the investment.

The following sections will describe three methods of accounting for intercorporate investments: (1) market-value method, (2) equity method, and (3) consolidation. Accountants require investors without significant influence over the decisions of an investee firm to account for the investment using the market-value method. Investors that have significant influence but not control use the equity method. Investors that have control use the consolidation approach. The primary indicator of whether an investor has significant influence or control is the percentage ownership of the investee firm, although other evidence beyond percentage ownership can override this primary indicator. Accountants assume an investor that holds less than 20% of another company cannot significantly influence the decisions of the investee and therefore this investor uses the market-value method. They assume that investors with between 20% and 50% ownership have the ability to exert significant influence on, but do not control, the investee. These investors use the equity method. Finally, companies with an interest in excess of 50% have control and use the consolidation approach. For example, during 2005 **General Motors** purchased additional shares of GM Daewoo, increasing its ownership from 44.6% to 50.9%. Therefore, General Motors had to change its accounting for GM Daewoo from the equity method to consolidation.

Market-Value and Equity Methods

Companies that hold less than 50% of the common stock of another company generally use either the market-value method or the equity method. Let's look at each.

Market-Value Method

An investment in less than 20% of the common stock of another company normally requires use of the market-value method. An investor using the **market-value method** shows the investment on its balance sheet at market value (also called *fair value*). Companies often call such investments "marketable securities" in the financial statements.

The effect of such securities on the income statement depends on whether management classifies them as trading securities or available-for-sale securities. **Trading securities** are investments the investor company intends to sell in the near future. **Available-for-sale securities** are investments that the investor company does not intend to sell in the near future.

Trading securities and available-for-sale securities provide returns to the investor in two ways: (1) dividend revenue and (2) changes in market value. The investor company records dividend revenue on its income statement when received for both types of investments. It also accounts for changes in market value for both types of investments by increasing or decreasing the value of the asset. However, on the owners' equity side, the investor company accounts for changes in market value differently for trading securities than for available-for-sale securities.

As you can see from Exhibit 17-1, the only difference between trading securities and available-for-sale securities is how the change in market value gets incorporated into stockholders' equity. For trading securities, price increases and decreases are included in net income and therefore become part of retained earnings. For available-for-sale securities, price increases and decreases affect a different component of stockholders' equity, other comprehensive income or loss.



Xinhua/Alamy Stock Photo

Warren Buffett, Chairman and CEO of Berkshire Hathaway, shares his philosophy of business and life at the company's annual meeting each May in Omaha, Nebraska.

Objective 1

Contrast accounting for investments using the equity method and the market-value method.

market-value method

The method of accounting for investments in equity securities that shows the investment on the balance sheet at market value.

trading securities

Investments "held for current resale," that is, investments that the investor company intends to sell in the near future.

available-for-sale securities

Investments that the investor company does not intend to sell in the near future.

Exhibit 17-1
 Summary of Trading and Available-for-Sale Securities

Income Statement Effects	Balance Sheet Effects
Trading Securities:	Trading Securities:
Net income includes:	Asset: Investment shown at current market value
Dividend revenue	Stockholders' equity:
Change in market value (add increases and deduct decreases)	Retained earnings increased by the amount of net income (which <i>includes</i> increases and decreases in market value)
Available-for-Sale Securities:	Available-for-Sale Securities:
Net income includes:	Asset: Investment shown at current market value
Dividend revenue	Stockholders' equity:
	Retained earnings increased by the amount of net income (which <i>excludes</i> increases and decreases in market value)
	Comprehensive income includes the change in market value (add increases and deduct decreases)

Equity Method

Now consider investing companies that have the power to exert significant influence on investees. Usually this means that they hold 20% to 50% of the common shares of the investee. These companies must use the **equity method**, which adjusts the acquisition cost of an investment for the investor's share of earnings or losses of the investee after the date of investment and for dividends received. Investors increase both income and the carrying amount of the investment by their share of the investee's earnings, and they decrease the carrying amount of the investment for dividends received.

Let's compare the market value and equity methods. Suppose **Berkshire Hathaway** acquires 40% of the voting stock of Verisign Inc. for \$8,000 million. In year 1, Verisign has a net income of \$3,000 million and pays cash dividends of \$1,000 million. Berkshire's 40% shares of income and dividends would be \$1,200 million and \$400 million, respectively. At the end of the year, the market value of Berkshire's investment is \$9,100 million. For illustrative purposes, suppose that Berkshire could use either the market-value or equity method. (In reality, Berkshire must use the equity method because 40% ownership indicates significant influence.) The following balance sheet equation shows how Berkshire would record the transactions under each of the methods (in hundred millions):

	Equity Method				Market-Value Method			
	Assets		=	Liab. & Stk. Eq.	Assets		=	Liab. & Stk. Eq.
	Cash	Investments		Liab. Stk. Eq.	Cash	Investments		Liab. Stk. Eq.
1. Acquisition	-80	+80	=		-80	+80	=	
2. Net income of Verisign		+12	=	+12	No entry and no effect			
3. Dividends from Verisign	+ 4	- 4	=		+ 4		=	+ 4
4. Increase in Verisign market value	No entry and no effect			—	—	+11		+11
Effects for the year	-76	+88	=	+12	-76	+91	=	+15

The investment account will have a net increase of \$800 million for the year. The dividend will increase the cash account by \$400 million.

The investment account will increase by the \$1,100 million increase in market value. The dividend will increase the cash account by \$400 million.

If accounting rules allowed Berkshire to account for this investment using the *market-value method*, Berkshire would recognize income when Verisign declares the \$400 million dividend. In addition, at the end of the accounting period, Berkshire would determine the market price of the shares and increase income (if it is a trading security) or other comprehensive income (if it is an available-for-sale security) for the \$1,100 million increase in market value. If Berkshire classified the investment as a trading security, the \$1,100 million would be part of retained earnings (because net income becomes part of retained earnings). If Berkshire classified the investment as an available-for-sale security, the \$1,100 million would be in the other comprehensive income account. Either way it would be part of stockholders' equity.

Under the *equity method*, Berkshire would recognize income as Verisign earns it rather than when Verisign pays dividends or when market values change. The recorded value of Berkshire's investment in Verisign grows by its \$1,200 million share of Verisign's net income, and Berkshire's income increases by that same \$1,200 million. The \$400 million of dividends Verisign pays to Berkshire increases Berkshire's cash and decreases the amount of its investment in Verisign by \$400 million. The dividends do not affect Berkshire's net income.

Making Managerial Decisions

Berkshire Hathaway owns 18.8% of **American Express Company**. As part of its decision on how much of American Express to own, Warren Buffett probably considered the effect of being below or above 20% ownership. Suppose Buffett was considering whether to either retain 18.8% ownership or increase it to 21%. Berkshire plans to hold the stock indefinitely. What difference would it make if Berkshire continues to own 18.8% of the stock rather than increasing its ownership to 21%?

Answer

The accounting for the investment would be different under these two options. If Berkshire continues to own just 18.8% (or any percentage less than 20%), it uses the market-value method. Because Berkshire plans to hold the stock indefinitely, it classifies the stock as an available-for-sale investment and includes changes in market value in other comprehensive income. This means that Berkshire's balance sheet includes the market value of the investment as an asset and changes in the market value as other comprehensive income, and its income statement includes only the dividends received from American Express.

In contrast, if Berkshire increases its ownership to 21% (or any percentage of 20% or more, but less than 50%), it will use the equity method. The investment account on the balance sheet will grow with the net income of American Express less dividends received. The balance sheet amount will not fluctuate with market values. In addition, Berkshire's income statement will include its portion of American Express's net income, regardless of dividend payments or changes in market prices.

If Berkshire expects American Express to have increasing earnings but to pay few dividends, Berkshire would recognize more income from the investment under the equity method. Further, wide swings in the market value of American Express will not affect Berkshire's books under the equity method. However, because of this, Berkshire's books would get no immediate benefit from large increases in the American Express's market value.

The choice of the amount of investment can have a significant impact on Berkshire's future financial statements. Depending on what Berkshire wants to accomplish, it might prefer either the market-value or the equity method, which in turn affects Berkshire's decision about the percentage of American Express that it wants to acquire.

Consolidated Financial Statements

Now let's consider a company that has effective control over another company. Usually this means that it owns more than 50% of the company's stock. We call the controlling company a **parent company** and the controlled company a **subsidiary**. Although parent and subsidiary companies typically are separate legal entities, in many regards they function as one unit.

Why have subsidiaries? Why isn't every company a single legal entity? Subsidiaries often limit risk, save income taxes, help conform to government regulations, and allow the parent to do business in a foreign country. For example, when Berkshire purchases a company, it buys the stock of the company, not the individual assets and liabilities, and Berkshire's risk is limited to the amount of their investment. As another example, there are often tax advantages in acquiring the capital stock of a going concern rather than buying its individual assets.

The parent–subsidiary relationship requires special accounting treatment. Parent companies issue consolidated financial statements that combine the financial statements of the parent company with those of its subsidiaries. That is, we account for the parent and subsidiary companies as if they were a single entity. Why? Because consolidated statements give investors a more accurate picture of the whole organization's health. Let's look at the issues that arise when consolidating financial statements.

The Acquisition

When consolidating parent and subsidiary financial statements, accountants must avoid double-counting of assets, liabilities, and stockholders' equities. Accomplishing this is a complex process in real companies, but we can see the basic principles in a simple example. Suppose company P (parent) acquired 100% of the common stock of S (subsidiary) for \$210 million cash at

Objective 2

Explain the basic ideas and methods used to prepare consolidated financial statements.

parent company

A company that has effective control over another company. Usually this means owning more than 50% of the company's stock.

subsidiary

A company controlled by a parent company that generally owns more than 50% of its stock.

the beginning of the year.¹ The following table analyzes the balance sheet accounts of both companies, and the last line is a consolidated balance sheet for P after accounting for its acquisition of S. (Investment in S appears in the first column because it is a focal point in this chapter, not because it comes first in actual balance sheets.) Figures in this and subsequent tables are in millions of dollars:

	Assets		=	Liabilities	+	Stockholders' Equity
	Investment in S	+ Cash and Other Assets	=	Accounts Payable, Etc.	+	Stockholders' Equity
P's accounts, January 1						
Before acquisition		650	=	200	+	450
Acquisition of S	+210	-210	=			
S's accounts, January 1	—	400	=	190	+	210
Totals before eliminating entries	210	840	=	390	+	660
Intercompany eliminations for a consolidated balance sheet	-210		=			-210
Consolidated, January 1	<u>0</u>	+ <u>840</u>	=	<u>390</u>	+	<u>450</u>

Note that P purchases the common stock of S by paying the \$210 million to the former owners of S as private investors, not to S itself. That is, P's purchase of stock in S does not affect S's books. S does not disappear, but it lives on as a separate legal entity but with a different owner. Each legal entity has its individual set of books.

The consolidated entity does not keep a separate set of books. Rather, it relies on the accounting records of P and S. The consolidated statement combines all assets and liabilities of both the parent and the subsidiary but eliminates instances of double counting:

Entity	Types of Records
P	Parent books
+ S	Subsidiary books
= Preliminary consolidated report	No separate books for the consolidated entity, but periodically P and S assets and liabilities are added together via work sheets
- E	"Eliminating entries" to remove double-counting
= Consolidated report to investors	

Look again at the example in the preceding table. The Investment in S account on P's books is the evidence of P's ownership interest in all the assets and liabilities of S. The consolidated statements cannot show both the evidence of ownership interest from P's books *and* the detailed underlying assets and liabilities from S's books. That would be double-counting the assets and liabilities. Similarly, the Stockholders' Equity accounts on P's books record the total ownership interest of P's shareholders, including their ownership of S, while the Stockholders' Equity accounts on S's books also record the ownership interest of P's shareholders in S (remember that P is the sole shareholder of S). We make eliminating entries in two places to avoid double-counting: we subtract (1) the Investment in S on P's books and (2) the Stockholders' Equity on S's books. In summary, if the \$210 million elimination of the reciprocal accounts did not occur, there would be double-counting in the consolidated balance sheet.

Recognizing Income after Acquisition

Now let's look at how we combine the income of a parent and its subsidiary. A parent company carries its investment in subsidiaries, such as this investment in S, on its balance sheet by the equity method, described earlier in this chapter. Suppose S has a net income of \$50 million for the year. If P were reporting alone, it would account for the net income of its subsidiary

¹In this example, the purchase price equals the stockholders' equity of the acquired company. On pp. 743–744, we discuss the preparation of consolidated statements in situations in which these two amounts differ.

by increasing its Investment in S account and its Stockholders' Equity account (in the form of Retained Earnings) by its share (100%) of the \$50 million income. P's parent-company-only income statement for the year is in the first column below (numbers in millions):

	P	S	Consolidated
Sales	\$900	\$300	\$1,200
Expenses	<u>800</u>	<u>250</u>	<u>1,050</u>
Operating income	\$100	\$ 50	\$ 150
Pro rata share (100%) of subsidiary net income	<u>50</u>	<u>—</u>	
Net income	<u>\$150</u>	<u>\$ 50</u>	

P's statement shows its own sales and expenses plus its share of S's net income (as the equity method requires). The consolidated statement (the last column) adds together all the revenues and expenses of the parent (first column) and the subsidiary (second column).

Reflect on the changes in P's accounts, S's accounts, and the consolidated accounts in the following table (in millions of dollars):

	Assets			=	Liabilities	+	Stockholders' Equity
	Investment in S	+	Cash and Other Assets	=	Accounts Payable, Etc.	+	Stockholders' Equity
P's accounts							
Beginning of year	210	+	440	=	200	+	450
Operating income			+100	=			+100*
Share of S income	<u>+ 50</u>		<u>—</u>	=	<u>—</u>		<u>+ 50*</u>
End of year	260	+	<u>540</u>	=	<u>200</u>	+	<u>600</u>
S's accounts							
Beginning of year			400	=	190	+	210
Net income			<u>+ 50</u>	=			<u>+ 50*</u>
End of year	<u>—</u>		<u>450</u>	=	<u>190</u>	+	<u>260</u>
Totals before eliminating entries	260		990	=	390	+	860
Intercompany eliminations	<u>-260</u>		<u>—</u>	=	<u>—</u>		<u>-260</u>
Consolidated, end of year	<u>0</u>	+	<u>990</u>	=	<u>390</u>	+	<u>600</u>

*Changes in the retained earnings portion of stockholders' equity.

Note that consolidated statements summarize the individual accounts of two or more separate legal entities, eliminating double-counting.² The income statement for P shows a \$150 million net income; for S, a \$50 million net income; for P and S consolidated, a \$150 million net income. The consolidated net income will always be the same as P's net income. Why? Because P has already recognized its share of S's income in its own income statement.

Noncontrolling Interests

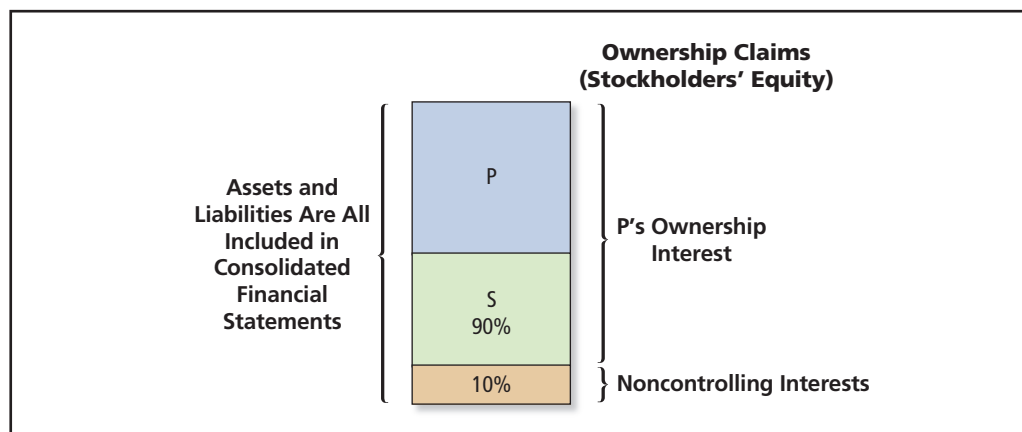
In the preceding example, P owned 100% of S. What happens when a parent holds less than 100% (but more than 50%) of the stock of a subsidiary? In such a case, a consolidated balance sheet includes an account on the equities side called noncontrolling interests in subsidiaries, or simply **noncontrolling interests**. The account summarizes the outside stockholders' interest, as opposed to the parent's interest, in a subsidiary corporation. It arises because the consolidated balance sheet

noncontrolling interests

An account that summarizes the outside stockholders' interest, as opposed to the parent's interest, in a subsidiary corporation.

² Another example of double-counting is sales by P to S or by S to P. For the sake of simplicity, our example does not include any sales between P and S. However, remember that we need to avoid double-counting in situations where there are sales among consolidated companies. For example, suppose P bought an item for \$1,000 and sold it to S for \$1,200. P recognized revenue of \$1,200, cost of goods sold of \$1,000, and income of \$200. S recorded an inventory item of \$1,200. From a consolidated point of view, the item has not yet been sold to an external party but has only been transferred within the consolidated entity. Therefore, after adding together the individual accounts of P and S, the company must deduct \$1,200 from revenue, \$1,000 from cost of goods sold, and \$200 from inventory. This eliminates the \$200 of income that P recognized and reduces inventory to the original \$1,000 that P paid for the item.

includes 100% of the assets and liabilities of a subsidiary even when the parent owns less than 100%. Suppose the parent owns 90% of the subsidiary's stock, and outsiders to the consolidated group own the other 10%. The Noncontrolling Interests account is a measure of the outside stockholders' interest. The diagram that follows provides an overview of the role of the noncontrolling interests account in the consolidated statements. The consolidated balance sheet includes all the subsidiary's assets and liabilities, item by item. However, because of the outsiders' interests, P does not have an ownership claim on all the assets and liabilities listed. The Noncontrolling Interests account, in effect, summarizes the outside stockholders' ownership interest and the remainder, after deducting noncontrolling interests, is P's total ownership interest:



The next table continues the basic assumptions of the previous example but now assumes P bought 90% of the stock of S for a cost of $0.90 \times \$210$, or \$189 million. This leaves a 10% noncontrolling interest with a value of $0.10 \times \$210$, or \$21 million, which represents the value of the interest that has not been purchased by, and is not owned by, P.

	Assets		=	Liabilities	+	Stockholders' Equity	
	Investment in S	Cash and Other Assets	=	Accounts Payable, Etc.	+	Noncontrolling Interest	P's Stockholders' Equity
P's accounts, January 1							
Before acquisition		650	=	200			450
Acquisition of 90% of S	+189	-189	=				
S's accounts, January 1	—	400	=	190			210
Totals before eliminating entries	189	+ 861	=	390			660
Intercompany eliminations	-189		=			+21	-210
Consolidated, January 1	<u>0</u>	+ <u>861</u>	=	<u>390</u>	+	<u>21</u>	+ <u>450</u>

Again, suppose S has a net income of \$50 million for the year. P and S follow the same basic procedures in preparing their separate financial statements, regardless of whether P owns 100% or 90% of S. However, the presence of the 10% noncontrolling interest changes the consolidated income statement as follows:

	P	S	Consolidated
Sales	\$900	\$300	\$1,200
Expenses	<u>800</u>	<u>250</u>	<u>1,050</u>
Operating income	\$100	\$50	\$ 150
Pro rata share (90%) of subsidiary net income	<u>45</u>	—	
Net income	<u>\$145</u>	<u>\$ 50</u>	
Noncontrolling interest (10%) in subsidiaries' net income			<u>5</u>
Net income to consolidated entity			<u>\$ 145</u>

The noncontrolling interest also changes the consolidated balance sheets at the end of the year, as follows:

	Assets		=	Liabilities	+	Stockholders' Equity	
	Investment in S	Cash and Other Assets	=	Accounts Payable, Etc.	+	Noncontrolling Interest	P's Stockholders' Equity
P's accounts							
Beginning of year, before acquisition		650	=	200		+	450
Acquisition	189	-189	=				
Operating income		+100	=				+100
Share of S income	+ 45		=				+ 45
End of year	<u>234</u>	+ <u>561</u>	=	<u>200</u>		+	<u>595</u>
S's accounts							
Beginning of year		400	=	190		+	210
Net income		+ 50	=				+ 50
End of year		+ <u>450</u>	=	<u>190</u>		+	<u>260</u>
Total before eliminating entries	234	+ 1,011	=	390		+	855
Intercompany eliminations	-234		=			+26*	-260
Consolidated, end of year	<u>0</u>	+ <u>1,011</u>	=	<u>390</u>	+	<u>26</u>	+ <u>595</u>

*Beginning noncontrolling interest plus noncontrolling interest in net income: $21 + (0.10 \times 50) = 21 + 5 = 26$.

Notice that the entry to consolidate the statements eliminates \$260 million of stockholders' equity (on S's books) and \$234 million of investment in S (on P's books). The \$26 million difference is the noncontrolling interest (on consolidated statements), which includes the original \$21 million at acquisition and the noncontrolling shareholders' \$5 million interest in S's net income. The \$26 million represents the interest of those shareholders who own the 10% of the subsidiary's stockholders' equity.

Income statements and balance sheets would show the noncontrolling interests as follows, where we include only the pertinent part of each statement:

Company P Consolidated Income Statement

Net income before noncontrolling interests	\$150
Noncontrolling interests	<u>5</u>
Net income attributable to Company P stockholders	<u>\$145</u>

Company P Consolidated Balance Sheet

Shareholders' equity:	
Total Company P stockholders' equity	\$595
Noncontrolling interests	<u>26</u>
Total stockholders' equity	<u>\$621</u>

Perspective on Consolidated Statements

To get a clear idea of how investments in other companies affect income statements and balance sheets, consider Exhibits 17-2 and 17-3, the 2020 balance sheet and income statement of **Starbucks Company**. We have simplified the statements and highlighted the items of interest by showing them in italics. However, we have used Starbucks' terminology for all the items we will discuss in this section.

Exhibit 17-2

Starbucks Corporation
Consolidated Balance Sheet
September 27, 2020 (in millions)

Cash and cash equivalents	\$ 4,350.9
Short-term investments—available-for-sale debt securities	216.3
Short-term investments—marketable equity securities	64.9
Accounts receivable, net	883.4
Inventories	1,551.4
Prepaid expenses and other current assets	<u>739.5</u>
Total current assets	7,806.4
Long-term investments—available-for-sale debt securities	206.1
Equity method investments	478.7
Property, plant and equipment, net	6,241.4
All other assets	<u>14,641.9</u>
TOTAL ASSETS	<u>\$ 29,374.5</u>
Total liabilities	37,173.9
Shareholders' equity:	
Paid-in capital	375.1
Retained earnings	(7,815.6)
Accumulated other comprehensive income*	<u>(364.6)</u>
Total shareholders' equity	(7,805.1)
Noncontrolling interests	<u>5.7</u>
Total equity	<u>(7,799.4)</u>
TOTAL LIABILITIES AND EQUITY	<u>\$ 29,374.5</u>

*Includes unrealized gain on available-for-sale securities.

Exhibit 17-3

Starbucks Company
Consolidated Income
Statement Year Ended
September 27, 2020 (in millions)

Net revenues	\$23,518.0
Total operating expenses	(22,278.8)
Income from equity investees	<u>322.5</u>
Operating income	1,561.7
Interest income and other, net	39.7
Interest expenses	<u>437.0</u>
Earnings before income taxes	1,164.4
Income taxes	<u>(239.7)</u>
Net earnings including noncontrolling interests	924.7
Net earnings (loss) attributable to noncontrolling interests	<u>(3.6)</u>
Net earnings attributable to Starbucks	<u>\$ 928.3</u>

First look at the headings of both exhibits. Starbucks highlights the fact that the statements are consolidated. This means that the accounts listed include both Starbucks' parent company amounts and those of its subsidiaries. Starbucks has added the assets, liabilities, revenues, and expenses of these subsidiaries to their own and eliminated double counting to produce the consolidated statements.

Now look at the balance sheet (Exhibit 17-2). Starbucks shows four assets related to investments in other companies: "Short-term investments—available-for-sale securities," "Short-term investments—marketable equity securities," "Long-term investments—available-for-sale securities," and "Equity method investments." Starbucks has short-term marketable equity securities and both short-term and long-term available-for-sale securities. These are all securities over which Starbucks has no influence or control. The equity method investments account means that Starbucks owns between 20% and 50% of some companies. These companies are primarily

international companies such as **Starbucks Coffee Korea Co., Ltd.** and Tata Starbucks Limited (India). The \$478.7 million shown is the original price Starbucks paid for these affiliates plus Starbucks's proportional interest in their net income since acquisition less dividends paid to Starbucks.

Starbucks's liabilities and stockholders' equity includes two items to discuss: "Accumulated other comprehensive income" and "Noncontrolling interests." The accumulated other comprehensive income contains Starbucks's net unrealized gain (or loss) on its available-for-sale securities as well as other items. The net unrealized gain arose because of increases in the market value of the securities since Starbucks purchased them.

Noncontrolling interests is the part of the equity in consolidated subsidiaries—subsidiaries over which Starbucks has control—that Starbucks does not own. It belongs to shareholders who own a noncontrolling (or minority) interest in the subsidiaries' stock. Starbucks consolidates all the subsidiaries' assets and liabilities, but a proportion of those assets and liabilities does not belong to the shareholders of Starbucks. The total stockholders' equity includes the equity of the Starbucks shareholders and the noncontrolling interests of the minority or noncontrolling shareholders.

Next, we will examine the income statement (Exhibit 17-3). As part of its revenues, Starbucks has a line for "Income from equity investees." This is Starbucks's portion of the net income of companies that are not consolidated but accounted for by the equity method. Another item is "Net earnings attributable to noncontrolling interests"—the portion of Starbucks's income from consolidated investments that belongs to noncontrolling shareholders. Starbucks includes the entire revenues and expenses of consolidated subsidiaries in its income statement, but then adds \$3.6 million, the loss from these subsidiaries that belongs to the noncontrolling shareholders.

Exhibit 17-4 summarizes all the relationships depicted in Exhibits 17-2 and 17-3. Take a few moments to review all three exhibits. In particular, note that noncontrolling interests arise only when a parent company consolidates its statements with those of subsidiaries. Why? Because consolidated balance sheets and income statements aggregate 100% of the detailed assets, liabilities, sales, and expenses of the subsidiary companies. Thus, if Starbucks did not recognize the amount owned by noncontrolling investors, the financial statements would overstate the stockholders' equity and net income belonging to Starbucks' shareholders. In contrast, noncontrolling interests do not arise in connection with the accounting for equity-method investments. Why? Because we record investments in these companies on a pro rata basis only—the consolidated statements do not include all the assets, liabilities, revenues, and expenses of the equity investees but instead include a single balance sheet line, equity-method investments, and a single income statement line, income from equity investees, both reflecting only the portion owned by the parent.

Accounting for Goodwill

Now we will consider one more complication that arises when a company purchases more than 50% of another company. Our previous example of companies P and S assumed (1) the acquisition cost of S by P was equal to the amount of the stockholders' equity, or the book value, of S, and (2) the book value was equal to the sum of the fair-market value of the assets and liabilities acquired. In actual acquisitions, the total purchase price paid by P often exceeds the book values of the net assets acquired. In addition, the purchase price also often exceeds the sum of

Objective 3

Describe how goodwill arises and how to account for it.

Percentage of Ownership	Type of Accounting	Balance Sheet Effects	Income Statement Effects
100%	Consolidation	Individual assets, individual liabilities added together	Individual revenues, individual expenses added together
Greater than 50% and less than 100%	Consolidation	Same as 100% ownership, but recognition given to noncontrolling interest in stockholders' equity section	Same as 100% ownership, but recognition given to noncontrolling interest near bottom of statement when consolidated income is computed
20% to and including 50%	Equity method	Investment carried at cost plus pro rata share of subsidiary earnings less dividends received	Equity in earnings of affiliated or associated companies shown on one line as addition to income

Exhibit 17-4

Summary of Equity Method and Consolidations

the fair-market values (current values) of the identifiable individual assets less the liabilities. For example, when **Philip Morris** paid \$13 billion for **Kraft** several years ago, it assigned only \$2 billion to identifiable individual assets. It assigned the remainder to goodwill. Recall from Chapter 16 that goodwill is the excess of the cost of an acquired company over the sum of the fair (market) values of identifiable assets less liabilities.

Companies record goodwill as an asset only when one company purchases another and pays more than the sum of the fair values of the assets and liabilities acquired. A purchaser may be willing to pay more than the sum of the fair values because the acquired company is able to generate abnormally high earnings. For example, a purchaser may be willing to pay extra because it expects excess earnings from

1. potential efficiencies gained by combination, rearrangement, or elimination of duplicate facilities and administration,
2. excellent general management skills present in the purchased company,
3. a unique product line, and/or
4. an established brand name and reputation.

To see the impact of goodwill on the consolidated statements, refer to our example where P acquired a 100% interest in S for \$210 million. Suppose P paid \$40 million more, or a total of \$250 million cash. For simplicity, assume that the fair values of the individual assets and liabilities of S are equal to their book values. The balance sheets immediately after the acquisition are as follows:

	Assets				=	Liabilities	+	Stockholders' Equity	
	Investment in S	+	Goodwill	+	Cash and Other Assets	=	Accounts Payable, Etc.	+	Stockholders' Equity
P's accounts									
Before acquisition					650	=	200	+	450
Acquisition	+250				-250	=			
S's accounts					<u>400</u>	=	<u>190</u>	+	<u>210</u>
Totals before eliminating entries	250	+			800	=	390	+	660
Intercompany eliminations	<u>-250</u>	+	<u>40</u>			=			<u>-210</u>
Consolidated	<u><u>0</u></u>	+	<u>40*</u>	+	<u>800</u>	=	<u>390</u>	+	<u>450</u>

*The \$40 million "goodwill" would appear in the consolidated balance sheet as a separate intangible asset account.

What if the book values of the individual assets of S are not equal to their fair values? The usual procedures are as follows:

1. S continues as a going concern and keeps its accounts on the same basis as before.
2. P records its investment at its acquisition cost (the agreed purchase price).
3. For consolidated reporting purposes, we first assign part of the excess of the acquisition cost over the book value of S to the individual assets, item by item, to adjust each to its fair value at the time of the acquisition.
4. Assign the remaining excess of the acquisition cost over the fair value of the assets less liabilities to goodwill.

Suppose the fair value of S's equipment exceeded its book value by \$30 million in our example. With this change, the balance sheets immediately after acquisition would be the same as previously, with only two exceptions. The additional \$30 million would appear in the consolidated balance sheet as an integral part of the equipment account (part of Other Assets in the example), and the goodwill that had previously been \$40 million would now be only \$10 million. Because the consolidated statement would show S's equipment at \$30 million higher than the carrying amount on S's books, the depreciation expense on the consolidated income statement would be higher. For instance, if the equipment had 5 years of useful life remaining, the straight-line depreciation would be $\$30 \text{ million} \div 5 = \$6 \text{ million}$ higher per year for the next 5 years.

As in the preceding tabulation, the \$10 million "goodwill" appears in the consolidated balance sheet as a separate intangible asset account. Goodwill balances remain on the balance sheet until management judges that its value is impaired—that is, until it is evident that the advantages that created the goodwill are no longer present.

Summary Problem for Your Review

PROBLEM

1. Review the section on noncontrolling interests, pp. 739–741. Suppose P purchases 60% of the stock of S for a cost of $0.60 \times \$210$, or \$126 million cash. Assume that the assets, liabilities, and shareholders' equity of S are unchanged from the amounts given in the example on noncontrolling interests. Also, return to our original assumption that the fair value of the net assets of S and the book value of the net assets of S are both equal to \$210 million, which is also equal to the value of the total firm implied by the \$126 million price for 60% of the firm.

The total assets of P consist of this \$126 million investment plus \$524 million of other assets, a total of \$650 million. The assets, liabilities, and shareholders' equity of S are unchanged from the amounts given in the example on noncontrolling interests. Prepare an analysis showing what amounts would appear in a consolidated balance sheet immediately after the acquisition.

2. Suppose S has a net income of \$50 million for the year, and P has an operating income of \$100 million. Other details are described in the example on pp. 740–741. Prepare an analysis showing what amounts would appear in a consolidated income statement and year-end balance sheet.

SOLUTION

1.

	Assets		=	Liabilities	+	Stockholders' Equity	
	Investment in S	+ Cash and Other Assets	=	Accounts Payable, Etc.	+ Noncontrolling Interest	+ Stockholders' Equity	
P's accounts, January 1:							
Before acquisition		650	=	200		+	450
Acquisition of 60% of S	+126	−126	=				
S's accounts, January 1	—	400	=	190		+	210
Totals before eliminating entries	126	+ 924	=	390		+	660
Intercompany eliminations	−126		=		+84	+	−210
Consolidated, January 1	<u>0</u>	+ <u>924</u>	=	<u>390</u>	+ <u>84</u>	+ <u>450</u>	

2.

	P	S	Consolidated
Sales	\$900	\$300	\$1,200
Expenses	<u>800</u>	<u>250</u>	<u>1,050</u>
Operating income	\$100	\$ 50	\$ 150
Pro rata share (60%) of unconsolidated subsidiary net income	<u>30</u>	<u>—</u>	
Net income	<u>\$130</u>	<u>\$ 50</u>	
Noncontrolling interest (40%) in consolidated subsidiary net income			20
Net income to consolidated entity			<u>\$ 130</u>

	Assets		=	Liabilities		+	Stockholders' Equity
	Investment in S	+ Cash and Other Assets	=	Accounts Payable, Etc.	+ Noncontrolling Interest	+	Stockholders' Equity
P's accounts							
Beginning of year, before acquisition		650	=	200		+	450
Acquisition	126	− 126	=				
Operating income		+ 100					+100
Share of S income	+ 30		=				+ 30
End of year	<u>156</u>	+ <u>624</u>	=	<u>200</u>		+	<u>580</u>
S's accounts							
Beginning of year		400	=	190		+	210
Net income		+ 50	=				+ 50
End of year		<u>450</u>	=	<u>190</u>		+	<u>260</u>
Totals before eliminating entries	156	+ 1,074	=	390		+	840
Intercompany eliminations	<u>−156</u>	<u>—</u>	=	<u>—</u>	+104*		<u>−260</u>
Consolidated, end of year	<u>0</u>	+ <u>1,074</u>	=	<u>390</u>	+ <u>104</u>	+	<u>580</u>

*84 beginning of year + (0.40 × 50) = 84 + 20 = 104.

Objective 4

Use financial statement analysis to evaluate an organization's performance.

Part Two: Analysis of Financial Statements

For financial statements to be useful, managers and investors need to be able to analyze and interpret the statements. Careful analysis of financial statements can help decision makers evaluate an organization's past performance and predict its future performance. Such evaluations help managers, investors, and others make intelligent, informed financial decisions. We use the 2020 and 2021 financial statements of **Nike** in Exhibits 17-5 and 17-6 to focus on financial statement analysis.

Many decisions are based on comparisons of financial statements. For example, investors use them to decide whether to buy, sell, or hold common stock. Managers and the financial community (such as bank officers and stockholders) use them to help evaluate the operating and financial outlook for an organization. Budgets or pro forma statements—carefully formulated expressions of predicted results—are helpful to extenders of credit, who want assurance of being paid in full and on time. For example, a set of budgeted financial statements is one of the first things a banker will request from an entrepreneur proposing a new business. Even well-established companies usually need to provide pro forma statements to assure creditors that the company will pay back the amounts borrowed. Let's look at some ways that users analyze financial statements.

May 31		
ASSETS	2021	2020
Current assets		
Cash and equivalents	\$ 9,889	\$ 8,348
Short-term investments	3,587	439
Accounts receivable, net	4,463	2,749
Inventories	6,854	7,367
Prepaid expenses and other current assets	<u>1,498</u>	<u>1,653</u>
Total current assets	<u>26,291</u>	<u>20,556</u>
Noncurrent assets		
Net property, plant, and equipment	4,904	4,866
Operating lease right-of-use assets, net	3,113	3,097
Identifiable intangible assets, net	269	274
Goodwill	242	223
Deferred income taxes and other assets	<u>2,921</u>	<u>2,326</u>
Total noncurrent assets	<u>11,449</u>	<u>10,786</u>
Total assets	<u>\$37,740</u>	<u>\$31,342</u>
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current liabilities		
Current portion of long-term debt	\$ ---	\$ 3
Notes payable	2	248
Accounts payable	2,836	2,248
Current portion of operating lease	467	445
Accrued liabilities	6,063	5,184
Income taxes payable	<u>306</u>	<u>156</u>
Total current liabilities	<u>9,674</u>	<u>8,284</u>
Noncurrent liabilities		
Long-term debt	9,413	9,406
Operating lease liabilities	2,931	2,913
Deferred income taxes and other liabilities	<u>2,955</u>	<u>2,684</u>
Total noncurrent liabilities	<u>15,299</u>	<u>15,003</u>
Total liabilities	<u>24,973</u>	<u>23,287</u>
Shareholders' equity		
Common stock at stated value:		
Class A convertible—305 and 315 shares outstanding	—	—
Class B—1,273 and 1,243 shares outstanding	3	3
Capital in excess of stated value	9,965	8,299
Accumulated other comprehensive income	(380)	(56)
Retained earnings	<u>3,179</u>	<u>191</u>
Total shareholders' equity	<u>12,767</u>	<u>8,055</u>
Total liabilities and shareholders' equity	<u>\$37,740</u>	<u>\$31,342</u>

Exhibit 17-5

Nike, Inc.
Balance Sheet (in millions)

Exhibit 17-6

Nike, Inc.

Statement of Income (in millions except per share data)

	Year Ended May 31	
	2021	2020
Revenues	\$44,538	\$37,403
Cost of sales*	<u>24,576</u>	<u>21,162</u>
Gross margin	<u>19,962</u>	<u>16,241</u>
Demand creation expense	3,114	3,592
Operating overhead expense	<u>9,911</u>	<u>9,534</u>
Total selling and administrative expense	<u>13,025</u>	<u>13,126</u>
Income from operations	6,937	3,115
Interest expense (income), net	262	89
Other expense (income), net	<u>14</u>	<u>139</u>
Income before income taxes	6,661	2,887
Income taxes	<u>934</u>	<u>348</u>
Net income	<u>\$ 5,727</u>	<u>\$ 2,539</u>
Basic earnings per common share†	<u>\$ 3.64</u>	<u>\$ 1.63</u>
Diluted earnings per common share	<u>\$ 3.56</u>	<u>\$ 1.60</u>
Dividends declared per common share‡	<u>\$ 1.07</u>	<u>\$ 0.955</u>

*Also called cost of goods sold.
†Average shares outstanding for computation of basic EPS are approximately 1,573.0 million in 2021 and 1558.8 million in 2020.
‡Publicly held companies must show earnings per share on the face of the income statement, but it is not necessary to show dividends per share.

Component Percentages

component percentages

Analysis and presentation of financial statements in percentage form to aid comparability, frequently used when companies differ in size.

common-size statements

Financial statements expressed in component percentages.

When comparing companies that differ in size, analysts often apply percentage relationships, called **component percentages**, to income statements and balance sheets (see Exhibit 17-7). We call the resulting statements **common-size statements**. For example, it is difficult to compare Nike's \$26,291 million of current assets with the \$1,819 million of **Columbia Sportswear Company**, a smaller Oregon-based designer and manufacturer of active outdoor apparel. It's much easier to compare Nike's 70% current asset percentage (shown in Exhibit 17-7) with Columbia Sportswear's \$1,819 million ÷ \$2,863 million = 64%.

Balance sheet percentages are usually based on total assets = 100%. Note in Exhibit 17-7 that Nike's current asset percentage increased in 2021 while the current liabilities percentage remained unaltered. Other note-worthy changes in percentages were the decrease in property, plant, and equipment and the increase in stockholders' equity.

Income statement amounts are expressed as percentages of sales so that, by definition, sales = 100%. Nike's gross margin rate of 45% and net income percentage of 13% both show significant profitability. However, averages for these items vary greatly by industry. Comparison with other similar firms or industry averages is necessary to interpret the rates fully. Changes between one year and the next can also reveal important information. Nike's gross margin percentage changed from 7% in 2020 to 13% in 2021, reflecting significant improvement in profitability, which had been down in fiscal 2020 due to the adverse impacts of COVID-19.

Corporate annual reports to the public and 10-K filings with the SEC must contain a section called **management's discussion and analysis** (or **MD&A**). This section explains the major changes in the income statement, changes in liquidity and capital resources, and the impact of inflation. The focus is on a comparison with the prior year or years. For example, Nike's annual report had several pages of detailed discussions, including the following relating to some of the issues just discussed:

Income (loss) before income taxes increased 131% for fiscal 2021, primarily due to higher revenues, gross margin expansion, and selling and administrative expense leverage. The gross margin of Nike, Inc. increased 140 basis points primarily due to annualizing the impacts of COVID-19, including lower factory cancellation charges, lower inventory obsolescence reserves as well as the favorable rate impact of fixed supply chain costs on a higher volume of wholesale shipments. The increase in gross margin also reflects higher full-price product margins across wholesale and Nike Direct. Selling and administrative expense decreased due to lower demand creation expense, partially offset by higher operating overhead expense. Demand creation expense decreased primarily due to lower marketing

management's discussion and analysis (MD&A)

A section of annual reports and 10-K filings that concentrates on explaining the major changes in the income statement, changes in liquidity and capital resources, and the impact of inflation from one year to the next.

For the Year Ended May 31				
Statement of Income	2021		2020	
Revenues	\$44,538*	100%	\$37,403	100%
Cost of sales	24,576	55	21,162	57
Gross margin	\$19,962	45%	\$16,241	43%
Total selling and administrative expense	\$13,025	29%	\$13,126	35%
Operating income	\$ 6,937	16%	\$ 3,115	8%
Interest (expense) income, net	262	1%	89	0%
Other expense (income), net	14	0%	139	0%
Income before income taxes	\$ 6,661	15%	\$ 2,887	8%
Income taxes	934	2	348	1
Net income	\$ 5,727	13%**	\$ 2,539	7%
Balance sheet				
Current assets	\$26,291	70%	\$20,556	65%
Plant, property, and equipment, net	4,904	13	4,866	16
Other assets	6,545	17	5,920	19
Total assets	\$37,740	100%	\$31,342	100%
Current liabilities	\$ 9,674	26%	\$ 8,284	26%
Total noncurrent liabilities	15,299	40	15,003	48
Shareholders' equity	12,767	34	8,055	26
Total liabilities and shareholders' equity	\$37,740	100%	\$31,342	100%

*Note the use of dollar signs in columns of numbers. Frequently, companies use them at the top and bottom only and not for every subtotal.
 **Percentages do not add up because of rounding errors.

Exhibit 17-7

Nike, Inc.
 Common-Size Statements
 (in millions, except percentages)

and advertising expenses for our brand events and retail operations as well as lower sports marketing expenses as sporting events were postponed due to COVID-19. These decreases were partially offset by higher digital marketing investments. Operating overhead expense increased primarily due to an increase in strategic technology investments, higher Nike Direct variable costs and \$255 million in restructuring-related costs, partially offset by lower bad debt expense and travel and related expenses . . . Our effective tax rate was 14.0% for fiscal 2021, compared to 12.1% for fiscal 2020, due to a change in the proportion of earnings taxed in the United States related to the recovery from the impact of the COVID-19 pandemic and less favorable impacts from discrete items such as stock-based compensation.

Uses of Ratios

Comparing component percentages across time or to those of other companies is one way of analyzing financial statements, but another way is to use ratios. To illustrate how useful ratios can be, we calculate some ratios for **Nike** in Exhibit 17-8.

Data for computing ratios are available from many sources. One is the 10-K report that each company files annually with the Securities and Exchange Commission (SEC). The SEC makes these available online in its EDGAR database (www.sec.gov/edgar.shtml). The SEC now requires all companies to report using XBRL (see Chapter 1, p. 34), which makes comparisons across companies easier. XBRL and other technology allow analysts to use an expanded set of information about companies, as indicated in the Business First box on p. 751.

Comparisons

Evaluations of financial ratios require comparisons. There are three main types of comparisons: (1) **time-series comparisons** with a company's own historical ratios, (2) **benchmark comparisons** with general rules of thumb, and (3) **cross-sectional comparisons** with ratios of similar companies or with industry averages or "best-practices" ratios for the same period.

Objective 5

Explain and use a variety of popular financial ratios.

time-series comparisons

Comparison of a company's financial ratios with its own historical ratios.

benchmark comparisons

Comparison of a company's financial ratios with general rules of thumb.

Appropriate Nike Numbers Applied to May 31 of Year

Typical Name of Ratio	Numerator	Denominator	2011	2010
Short-term ratios				
Current ratio	Current assets	Current liabilities	$11,297 \div 3,958 = 2.9$	$10,959 \div 3,364 = 3.3$
Average collection period in days	Average accounts receivable [†] $\times 365$	Sales on account	$[1/2(3,138 + 2,650) \times 365] \div 20,862 = 51 \text{ days}^*$	$[1/2(2,650 + 2,884) \times 365] \div 19,014 = 53 \text{ days}$
Debt-to-equity ratio				
Total debt to equity	Total liabilities	Stockholders' equity	$5,155 \div 9,843 = 52.4\%$	$4,665 \div 9,754 = 47.8\%$
Profitability ratios				
Gross profit rate or percentage	Gross profit or gross margin	Sales	$9,508 \div 20,862 = 45.6\%$	$8,800 \div 19,014 = 46.3\%$
Return on sales	Net income	Sales	$2,133 \div 20,862 = 10.2\%$	$1,907 \div 19,014 = 10.0\%$
Return on stockholders' equity	Net income	Average stockholders' equity [†]	$2,133 \div 1/2(9,843 + 9,754) = 21.8\%$	$1,907 \div 1/2(9,754 + 8,693) = 20.7\%$
Basic earnings per share	Net income less dividends on preferred stock, if any	Average common shares outstanding	$2,133 \div 475.5 = \$4.48^{**}$	$1,907 \div 485.5 = \$3.93$
Price earnings	Market price per share of common stock [‡]	Earnings per share	$84 \div 4.48 = 18.8$	$72 \div 3.93 = 18.3$
Dividend ratios				
Dividend yield	Dividends per common share [‡]	Market price per common share	$1.20 \div 84 = 1.4\%$	$1.06 \div 72 = 1.5\%$
Dividend payout	Dividends per common share	Earnings per share	$1.20 \div 4.48 = 26.8\%$	$1.06 \div 3.93 = 27.0\%$

*This may be easier to see as follows:

Average receivables = $1/2(3,138 + 2,650) = 2,894$

Average receivables as a percentage of annual sales = $2,894 \div 20,862 = 13.87\%$

Average collection period = $13.87\% \times 365 \text{ days} = 51 \text{ days}$

[†]Relevant 2009 amounts: accounts receivable, \$2,884 million; stockholders' equity, \$8,693 million

**Nike reported this as \$4.48, which differs from $2,133 \div 475.5$ because of rounding errors in the 2,133 and 475.5.

[‡]Market price: May 31, 2011, \$84; May 31, 2010, \$72.

Exhibit 17-8

Some Typical Financial Ratios

Technology Changes Financial Statement Analysis

The key to financial analysis is the availability of data. Companies can accumulate, categorize, and summarize basic financial data in many ways. In the past, investors and analysts had access only to the summary data in quarterly and annual financial statements. Analysts then used the methods discussed in this chapter, along with many others, to try to predict the future financial performance of a company. Enter technology. By making more data available on a more timely basis and making mathematical analysis easier and faster, technology is enabling investors and analysts to obtain and analyze more information about a company than ever before.

Many companies, for example **Microsoft**, are making interactive annual reports available online. Instead of paging through a long document to find what they need, users can find any section of the annual report with a single click of the mouse. The SEC also has a table of contents on their 10-K filings to allow quick access to any particular section of a company's 10-K. It also has a quick-reference interactive data section for annual and quarterly financial filings.

The SEC's ability to provide its interactive data section came about when it required eXtensible Business Reporting Language (XBRL) for company filings. Under the leadership of the AICPA, a group of technology firms and consultants

formed XBRL International to create a common XML-based computer language for the reporting of business information. Today, it is an international non-profit consortium of approximately 600 member organizations, companies, and government agencies around the world. Its taxonomy is being used by more than 50 countries worldwide.

XBRL provides "an XML-based framework that the global business information supply chain will use to create, exchange, and analyze financial reporting information including, but not limited to, regulatory filings such as annual and quarterly financial statements, general ledger information, and audit schedules." Instead of treating financial information as a block of text—as in a standard Internet page or a printed document—XBRL "provides an identifying tag for each individual item of data. This tag is computer readable. For example, company net profit has its own unique tag." XBRL is the language of the future for exchanging financial information. It has the potential to make vast sums of data available in an easily accessible format.

Sources: XBRL International Web site (www.xbrl.org); and C. Babcock, "SEC Requires XBRL Financial Reporting By Large Public Firms," *Information Week*, May 14, 2008 (www.informationweek.com/news/management/compliance/showArticle.jhtml?articleID=207800147).

First let's consider time-series comparisons. Because analysts rely heavily on the trend of a company's ratios, annual reports typically contain a table of comparative statistics for 5 or 10 years. For example, consider the trends in three of Nike's profitability ratios:

	2016	2017	2018	2019	2021
Return on sales	12.3%	5.3%	10.3%	6.8%	12.9%
Return on stockholders' equity	34.4%	17.4%	42.7%	29.7%	55%
Earnings per share	\$2.56	\$1.19	\$2.55	\$1.63	\$3.64

Except for 2018 and 2020, each year return on sales has been more than 10% and return on stockholders' equity has exceeded 30%. In addition, earnings per share have been in the range of \$2.55 to \$3.64 except for 2018 and 2020. This is because the net income was severely impacted by the Tax Act in 2018 and by COVID-19 pandemic in 2020.

The second type of comparison uses benchmarks. One type of benchmark is a general consensus on appropriate levels for ratios, or rules of thumb. For instance, the most quoted rule-of-thumb is a current ratio of 2 to 1. Others are described in *Key Business Ratios* by **Dun & Bradstreet** (D&B), a financial services firm. For example,

Total debt to equity. In general, total liabilities shouldn't exceed net worth [equity] (100%) since in such cases creditors have more at stake than owners.

Return on equity. Generally, a relationship of at least 10% is regarded as a desirable objective.

Many analysts prefer to use the third type of comparison, examining ratios of similar companies, industry averages, or "best-practices" ratios, often identified by industry associations or other professional organizations. Analysts often look to D&B, which informs its subscribers of the credit-worthiness of thousands of individual companies. D&B regularly compiles and publishes statistics on many ratios of the companies it monitors in a book called *Industry Norms and Key Business Ratios*. Using these data, we can compare each ratio in Exhibit 17-8 with industry

cross-sectional comparisons

Comparisons of a company's financial ratios with ratios of similar companies, with industry averages, or "best-practices" ratios for the same period.

statistics. For example, some of the D&B ratios for 60 Sporting and Recreational Goods companies showed the following:

	Current Ratio (times)	Collection Period (days)	Total Debt to Equity (percent)	Return on Sales (percent)	Return on Stockholders' Equity (percent)
84 companies					
Upper quartile*	3.6	15	36.2	3.5	23.5
Median	2.4	26	63.0	2.0	8.9
Lower quartile	1.6	44	155.5	0.5	2.7
Nike†	2.9	51	52.4	10.2	21.8

*The individual ratios are ranked from best to worst. The figure ranked in the middle of the distribution is the median. The figure ranked halfway between the median and the highest ranked figure is the upper quartile. Similarly, the figure ranked halfway between the median and the worst is the lower quartile.

†Ratios are from Exhibit 17-8 for 2011. Please consult that exhibit for an explanation of the components of each ratio.

Our illustration focuses on one company and 1 or 2 years. This is sufficient as a start, but analysts also examine other firms in the industry, industry averages, and a series of years to get a better perspective. Above all, recognize that a ratio by itself is of limited use. There must be a standard for comparison—a history, a similar entity, an industry average, a benchmark, or a budget.

Discussion of Specific Ratios

Consider again the ratios in Exhibit 17-8. First is the current ratio. Other things being equal, the higher the current ratio, the more assurance short-term creditors have about being paid in full and on time. Nike's current ratio of 2.9 is down from the 3.3 in 2010, but it is still well into the top half in the industry.

Nike's average collection period in 2011 of 51 days places it in the lower quartile of sporting and recreational goods firms. A long collection period might indicate acceptance of poor credit risks or lax collection efforts.

The third column of the D&B tabulation shows the total debt-to-equity ratio. Both creditors and shareholders watch this ratio to judge the risk of insolvency and stability of profits. Typically, companies with heavy debt in relationship to ownership capital are in greater danger of suffering net losses or even bankruptcy when business conditions sour. Why? Because revenues and many expenses decline during economic downturns, but interest expenses and maturity dates do not change. Nike's ratio of 52.4% is below the industry median of 63.0%. It reflects low levels of risk or uncertainty concerning the company's ability to pay its debts on time.

Investors find profitability ratios especially helpful. Examine the gross profit rate and the return on sales. Nike's gross profit rate decreased from 46.3% in 2010 to 45.6% in 2011, yet its return on sales increased from 10.0% to 10.2%. These are both measures of operating success. D&B does not report gross profit rates, but Nike's return on sales is high enough to put the firm high in the top quartile of sporting and athletic goods companies.

More important to shareholders is the rate of return on their invested capital, a measure of overall accomplishment. Nike's 2011 rate of 21.8% is higher than the 20.7% of 2010. It is near the top quartile for the industry.

The final four ratios in Exhibit 17-8 are based on earnings and dividends. The first, earnings per share of common stock (EPS), is perhaps the most widely used of all ratios. Companies must present basic EPS on the face of the income statement. Most companies calculate it as in Exhibit 17-8: net income less dividends on preferred stock divided by average common shares outstanding. Companies holding securities that can be exchanged for or converted to common shares also report a diluted EPS; its calculations are more complex and are beyond the scope of this discussion. Nike's 2011 EPS is \$4.48, up 14% over 2010.

Exhibit 17-8 shows three other ratios, price earnings (P/E), dividend yield, and dividend payout. These ratios are especially useful to investors. They use the P/E ratio to help determine if the market price of a share of stock is reasonable based on the company's earnings. Nike's 2011 P/E ratio of 18.8 is higher than its 2010 ratio of 18.3 but still below Nike's historical average. Fast growing companies tend to have high P/E ratios, and, since Nike's P/E is above average,

investors apparently believe that Nike's above-average growth will continue into the future. The dividend yield gives the percentage return an investor receives in dividends on investments in a company's stock. If dividends do not change, Nike shareholders who buy the stock at the May 31, 2011, market price of \$84 will receive annual dividends equal to 1.4% of their investment. Nike's payout ratio shows that for each \$1 of earnings, Nike returns nearly \$.27 to shareholders. This means that it retains more than 73% of its profits for reinvestment in the business.

Operating Performance Ratios

In addition to the more focused ratios just cited, investors often look at the rate of return on invested capital as an important measure of overall accomplishment:

$$\text{rate of return on invested capital} = \frac{\text{income}}{\text{invested capital}} \quad (1)$$

On the surface, this measure is straightforward, but its ingredients may differ according to the purpose it is to serve. What is invested capital, the denominator of the ratio? What income figure is appropriate? The measurement of operating performance (how profitably managers employ assets) can be separated from the influence of management's financial decisions (i.e., how they obtain and finance assets). The best measure of operating performance is pretax operating rate of return on average total assets:

$$\text{pretax operating rate of return on average total assets} = \frac{\text{operating income}}{\text{average total assets}} \quad (2)$$

For Nike, this ratio is $\$2,815 \div [1/2 \times (\$14,998 + \$14,419)] = 19.14\%$

We can express the right-hand side of equation (2) as the product of two important ratios:

$$\frac{\text{operating income}}{\text{average total assets}} = \frac{\text{operating income}}{\text{sales}} \times \frac{\text{sales}}{\text{average total assets}} \quad (3)$$

The right-hand terms in equation (3) are the operating return on sales and total asset turnover, respectively. Therefore, we can show Nike's operating performance as

$$\begin{aligned} \text{pretax operating rate of return on average total assets} &= \frac{\text{operating return on sales}}{\text{on sales}} \times \frac{\text{total asset turnover}}{\text{turnover}} \\ &= (\$2,815 \div \$20,862) \times [\$20,862 \div (1/2) \times (\$14,998 + \$14,419)] \\ &= 13.493\% \times 1.4184 = 19.14\% \end{aligned} \quad (4)$$

By studying equation (4), you will see that there are two basic factors in profit making: operating margin percentages and asset turnover. An improvement in either will, by itself, increase the rate of return on total assets.

Efficient Markets and Investor Decisions

How investors use accounting information, such as ratios, depends on whether they believe stock markets are efficient. An **efficient capital market** is one in which market prices fully reflect all information available to the public. Therefore, searching for underpriced securities in such a market would be fruitless unless an investor has information that is not generally available. If real-world markets are indeed efficient, a relatively inactive portfolio approach would be an appropriate investment strategy for most investors. The hallmarks of the approach are risk control, high diversification, and low turnover of securities. The role of accounting information would mainly be to help investors identify the different degrees of risk among various stocks so they can maintain desired levels of risk and diversification.

Objective 6

Identify the major implications that efficient stock markets have for accounting.

efficient capital market

A market in which market prices fully reflect all information available to the public.

Making Managerial Decisions

Which is better, an investment in **Costco**, an operator of membership warehouse stores, or one in **V.F. Corporation**, apparel, footwear, and accessories company? How might one use financial ratios to better understand the different ways that Costco and **V.F. Corporation** create value for investors? Would you expect Costco and V.F. Corporation to have different pretax operating rate of return on average total assets? Would you expect them to have different operating return on sales and total asset turnover?

Answers

Investors have many different alternative investments. If either Costco or V.F. Corporation offered lower returns to investors, they would not find many people willing to invest. (This assumes that the riskiness of investing in the two companies is about the same.) However, even if the two companies seek the same total return on assets, they pursue this return quite

differently. For example, in fiscal 2020 Costco had a high total asset turnover and a low operating return on sales, while V.F. Corporation had the opposite (dollar amounts are in millions):

Costco: Operating return on sales = $\$5,435 \div \$163,220 = 3.33\%$

Total asset turnover = $\$163,220 \div [1/2 \times (\$55,556 + \$45,400)] = 3.23$

Return on assets = $3.33\% \times 3.23 = 10.8\%$

Nordstrom: Operating return on sales = $\$928 \div \$10,489 = 8.85\%$

Total asset turnover = $10,489 \div [1/2 \times (\$11,133 + \$10,357)] = 0.98$

Return on assets = $8.85\% \times 0.98 = 8.7\%$

In 2020, Costco had a higher return on assets than V.F. Corporation. Costco had a lower operating return on sales, but it more than made up for it with a much higher total asset turnover.

Research has shown that financial ratios and other data, such as reported earnings, help predict such economic phenomena as financial failure or earnings growth. To make these predictions, analysts use many ratios simultaneously rather than one at a time. Above all, the research shows that accounting reports are only one source of information and that in the aggregate the market is not fooled by companies that choose the least-conservative accounting policies. In sum, the market as a whole generally sees through any attempts by companies to gain favor through the choice of accounting policies that tend to boost immediate income. Thus, there is evidence that the stock markets may indeed be reasonably “efficient,” at least in their reflection of most accounting data. This does not mean that there are no irrational swings in stock prices, only that exploiting accounting data for an advantage in the market is difficult.

Suppose you are the CEO of a company with reported earnings of \$4 per share and a stock price of \$40. You are contemplating changing your method of depreciation for investor-reporting purposes from accelerated to straight line. Your competitors use straight line. You think your company’s stock price unjustifiably suffers in comparison with other companies in the same industry.

If you adopt straight-line depreciation, your company’s reported earnings will be \$5 instead of \$4 per share. Would the stock price rise accordingly from \$40 to \$50? No, the research on these issues indicates that the stock price would remain at \$40 (all other things equal). Because the information on the depreciation method is publicly available, investors have already adjusted for the difference between your company and competitors.

It is important to recognize that the market is efficient only with respect to information that is already publicly available. Therefore, accounting issues that deal with the disclosure of new information are more important than those that simply change the format for reporting already available data.

Be aware also that accounting statements are not the only source of financial information about companies. Some alternative sources are the following: company press releases (e.g., capital expenditure announcements), trade association publications (e.g., reports with industry statistics), brokerage house analyses (e.g., company or industry studies), and government economic reports (e.g., gross national product and unemployment figures). For accounting reports to be useful, they must have some advantage over alternative sources in disclosing new information. Financial statement information may be more directly related to the item of interest, and it may be more reliable, less costly, or more timely than information from alternative sources.

In the end, investors have two basic choices: (1) trust their investment decisions to experts, such as investment advisers or mutual fund portfolio managers, or (2) carefully analyze information from a variety of sources, including companies’ financial statements, and make their own investment decisions. Those who try the latter will soon learn that they cannot undertake intelligent analysis without understanding how to analyze financial statements, including appreciation of the assumptions and limitations of the statements.

Summary Problem for Your Review

PROBLEM

Examine Exhibits 17-5 and 17-6, p. 747 and p. 748. Assume some new data in place of certain old data for the May 31, 2011, balance sheet (in millions):

	Old Data	New Data
Accounts receivable	\$ 4,463	\$ 4,963
Total current assets	26,291	26,791
Capital in excess of stated value	9,965	10,165
Total stockholders' equity	12,767	12,967

Compute the following ratios applicable to May 31, 2011, or to the fiscal year 2011, as appropriate: current ratio, average collection period, and return on stockholders' equity. Compare this new set of ratios with the old set of ratios. Are the new ratios more desirable? Explain.

SOLUTION

All the ratios would be affected.

$$\begin{aligned}\text{current ratio} &= \frac{\text{current assets}}{\text{current liabilities}} \\ &= \$26,791 \div \$9,674 = 2.8 \text{ instead of } 2.7\end{aligned}$$

$$\begin{aligned}\text{average collection period} &= \frac{\text{average accounts receivable} \times 365}{\text{sales on account}} \\ &= [1/2 \times (\$4,963 + \$2,749) \times 365] \div \$44,538 \\ &= 31.6 \text{ days instead of } 30 \text{ days}\end{aligned}$$

$$\begin{aligned}\text{return on stockholders' equity} &= \frac{\text{net income}}{\text{average stockholders' equity}} \\ &= \$5,727 \div [1/2 \times (12,967 + 8055)] \\ &= 54.5\% \text{ instead of } 55\%\end{aligned}$$

The new set of ratios has good news and bad news. The good news is that the company appears to be slightly more liquid (a current ratio of 2.8 instead of 2.7). The bad news is that the average collection period (31.6 days instead of 30) and the rate of return on stockholders' equity (54.5% instead of 55%) are less attractive.

Highlights to Remember

- Contrast accounting for investments using the equity method and the market-value method.** Companies often invest in the equity securities of another company. If they have neither control nor influence over the other company, which generally means owning less than 20% of the company, they use the market-value method to account for the investment. Under the market-value method, the balance sheet shows the current market value of the securities. If a company expects to sell the securities shortly, it calls them trading securities, and changes in market value are part of income. If there is no intention to sell the securities in the near future, they are available-for-sale securities, and the company places changes in market value in a separate account in stockholders' equity called other comprehensive income. If a company has influence but not control over another company, which generally means owning between 20% and 50% of the company, it uses the equity method to account for the investment. Under the equity method the balance sheet shows the investment at the acquisition cost adjusted for dividends received and the investor's share of earnings or losses of the investee after the date of investment. The income statement includes a pro rata share of the investee's net income.

2. **Explain the basic ideas and methods used to prepare consolidated financial statements.** When a parent company owns more than 50% of another company, the owned company is a subsidiary and the companies must prepare consolidated financial statements. Each company continues to keep its own books, but the consolidated statements prepared for reporting to the public combine their assets and liabilities and eliminate double-counting. If the parent owns less than 100% of a subsidiary, the statements will show a noncontrolling interest.
3. **Describe how goodwill arises and how to account for it.** If a parent pays more than the fair-market value of the net assets when acquiring a subsidiary, it must record the difference as goodwill. Goodwill is an intangible asset that remains on the company's books until its value is impaired.
4. **Use financial statement analysis to evaluate an organization's performance.** Decision makers use financial statement analysis to evaluate past performance and predict future performance. Budgets or pro forma statement are especially useful. To compare companies that differ in size, analysts use component percentages. Much analysis is contained in the management's discussion and analysis (MD&A) section of annual reports and 10-K filings.
5. **Explain and use a variety of popular financial ratios.** Financial ratios aid the intelligent analysis of financial statements. Analysts prepare a variety of ratios and compare them with the company's own historical ratios, with general rules of thumb and with ratios of other companies or industry averages. They use short-term ratios, debt-to-equity ratios, profitability ratios, and dividend ratios. An especially important ratio for assessing operating performance is the rate of return on invested capital.
6. **Identify the major implications that efficient stock markets have for accounting.** Financial statements are only one among many sources of information used by investors. Evidence indicates that stock prices fully reflect most publicly available information, including accounting numbers. The format of the information apparently does not fool investors. Therefore, accounting regulators should focus on disclosure issues more than format.

Accounting Vocabulary

For various financial ratios, see Exhibit 17-8, p. 750. Also become familiar with the following terms.

available-for-sale securities, p. 735	cross-sectional comparisons, p. 749	noncontrolling interests, p. 739
benchmark comparisons, p. 749	efficient capital market, p. 753	parent company, p. 737
common-size statements, p. 748	equity method, p. 736	subsidiary, p. 737
component percentages, p. 748	management's discussion and analysis (MD&A), p. 748	time-series comparisons, p. 749
consolidated financial statements, p. 734	market-value method, p. 735	trading securities, p. 735

MyLab Accounting

Fundamental Assignment Material

Special Note: Problems relating to Part One of the chapter are presented first in each subgrouping of the assignment material.

GENERAL EXERCISES AND PROBLEMS

17-A1 Market-Value or Equity Method

Star Electronics, Inc., acquired 25% of the voting stock of Mobile Media for \$75 million cash. In year 1, Mobile Media had a net income of \$48 million and paid a cash dividend of \$28 million. The investment had a market value of \$81 million at the end of the year.

1. Using the equity method, show the effects of the three transactions—acquisition and Mobile Media's net income and cash dividend—on the accounts of Star Electronics. Use the balance-sheet-equation format.
2. Assume that Star Electronics could use the market-value method for this investment and that it classified the investment as an available-for-sale security. Show the effects of the three transactions on the accounts of Star Electronics. Use the balance-sheet-equation format.

17-A2 Consolidated Financial Statements

Suppose Poseidon Publishing Company acquired all the common shares of Neptune Book Company for \$80 million cash at the start of the year. Immediately before the business combination, each company had the following condensed balance sheet accounts (in millions):

	Poseidon	Neptune
Cash and other assets	\$350	\$100
Accounts payable, etc.	\$110	\$ 20
Stockholders' equity	240	80
Total equities	\$350	\$100

1. Prepare a tabulation of the consolidated balance sheet accounts immediately after the acquisition. Use the balance-sheet-equation format.
2. Suppose Poseidon and Neptune have the following results for the year:

	Poseidon	Neptune
Sales	\$330	\$110
Expenses	245	90

Prepare income statements for the year for Poseidon, Neptune, and the consolidated entity. Assume that neither Poseidon nor Neptune sells items to the other.

3. Present the effects of the operations for the year on Poseidon's accounts and on Neptune's accounts, using the balance sheet equation. Also tabulate the consolidated balance sheet accounts at the end of the year. Assume that liabilities are unchanged.
4. Suppose Neptune paid a cash dividend of \$10 million. What accounts in requirement 3 would this affect and by how much?

17-A3 Noncontrolling Interests

This modifies and extends the preceding problem. However, this problem is self-contained because all the facts are reproduced here. Poseidon Publishing Company acquired 80% of the common shares of Neptune Book Company for \$64 million cash at the start of the year. Immediately before the business combination each company had the following condensed balance sheet accounts (in millions):

	Poseidon	Neptune
Cash and other assets	\$350	\$100
Accounts payable, etc.	\$110	\$ 20
Stockholders' equity	240	80
Total equities	\$350	\$100

1. Prepare a tabulation of the consolidated balance sheet accounts immediately after the acquisition. Use the balance sheet equation format.
2. Suppose Poseidon and Neptune have the following results for the year:

	Poseidon	Neptune
Sales	\$330	\$110
Expenses	245	90

Prepare income statements for the year for Poseidon, Neptune, and the consolidated entity.

3. Using the balance-sheet-equation format, present the effects of the operations for the year on Poseidon's accounts and Neptune's accounts. Also tabulate consolidated balance sheet accounts at the end of the year. Assume that liabilities are unchanged.
4. Suppose Neptune paid a cash dividend of \$10 million. What accounts in number 3 would be affected and by how much?

17-A4 Goodwill and Consolidation

This modifies and extends Problem 17-A2. However, this problem is self-contained because all the facts are reproduced. Poseidon Publishing Company acquired all the common shares of Neptune Book Company for \$105 million cash at the start of the year. Immediately before the business combination, each company had the following condensed balance sheet accounts (in millions):

	Poseidon	Neptune
Cash and other assets	<u>\$350</u>	<u>\$100</u>
Accounts payable, etc.	\$110	\$ 20
Stockholders' equity	<u>240</u>	<u>80</u>
Total equities	<u>\$350</u>	<u>\$100</u>

Assume that the fair values of Neptune's individual assets and liabilities were equal to their book values.

1. Prepare a tabulation of the consolidated balance sheet accounts immediately after the acquisition. Use the balance-sheet-equation format.
2. Suppose the book values of Neptune's individual assets are equal to their fair-market values except for equipment. The net book value of equipment is \$15 million and its fair-market value is \$27 million. The equipment has a remaining useful life of 4 years. Straight-line depreciation is used.
 - a. Describe how the consolidated balance sheet accounts immediately after the acquisition would differ from those in number 1. Be specific as to accounts and amounts.
 - b. By how much will consolidated income differ in comparison with the consolidated income that would be reported when the entire excess of purchase cost over book value of net assets was assigned to goodwill? Assume no impairment of goodwill.

17-A5 Rate-of-Return Computations

1. Wellington Woolens Company reported a 6% operating margin on sales, a 12% pretax operating return on total assets, and \$500 million of average total assets. Compute the (a) operating income, (b) total sales, and (c) total asset turnover.
2. Osaka Electronics Corporation reported ¥200 million of sales, ¥20 million of operating income, and a total asset turnover of four times. (¥ is Japanese yen.) Compute the (a) total assets, (b) operating return on sales, and (c) pretax operating return on total assets.

UNDERSTANDING PUBLISHED FINANCIAL REPORTS**17-B1 Equity and Market-Value Methods**

Suppose **Google** acquired one-third of the common shares of Chang Web Design for \$50 million cash. In year 1, Chang had a net income of \$30 million and paid cash dividends of \$9 million. At the end of the year, the market value of the investment had fallen to \$39 million. Prepare a tabulation that compares the equity method and the market-value method of accounting for Google's investment in Chang. Show the effects on the balance sheet equation under each method. (Assume that under the market-value method this investment is a trading security.) What is the year-end balance in the Investment in Chang account under the equity method? Under the market-value method? Which method should Google use for reporting its investment in Chang?

17-B2 Consolidated Financial Statements

Consider the actual purchase several years ago of boat maker **Bayliner** by **Brunswick Corporation**, modified slightly to simplify the numbers. The purchase price was \$400 million for a 100% interest. Assume that the book value and the fair-market value of Bayliner's net assets were \$400 million. The balance sheet accounts immediately after the transaction were approximately (in millions):

	Brunswick	Bayliner
Investment in Bayliner	\$ 400	\$ —
Cash and other assets	<u>1,000</u>	<u>600</u>
Total assets	<u>\$1,400</u>	<u>\$600</u>
Liabilities	\$ 800	\$200
Stockholders' equity	<u>600</u>	<u>400</u>
Total equities	<u>\$1,400</u>	<u>\$600</u>

1. Using the balance-sheet-equation format, prepare a tabulation of the consolidated balance sheet accounts immediately after the acquisition.
2. Suppose Bayliner had sales of \$500 million and expenses of \$350 million for the year, and Brunswick had sales of \$1,800 million and expenses of \$1,400 million. Prepare income statements for Brunswick, for Bayliner, and for the consolidated company. Assume that neither Brunswick nor Bayliner sold items to the other.
3. Using the balance sheet equation, present the effects of the operations for the year on the accounts of Bayliner and Brunswick. Also tabulate the consolidated balance sheet accounts at the end of the year. Assume that liabilities are unchanged.
4. Suppose Bayliner paid a cash dividend of \$12 million. What accounts in number 3 would be affected and by how much?

17-B3 Investment in Equity Securities: Equity Method and Market-Value Method

Berkshire Hathaway, the Omaha company run by Warren Buffett, owns 18.8% of the stock of **American Express Company**. In 2020, American Express reported a net income of \$3,135 million and declared cash dividends on common stock of \$1,358 million. For parts 1 and 2 assume Berkshire Hathaway accounted for its investment in American Express using the equity method (even though this is not allowed for investments of less than 20%).

1. Compute the amount of income Berkshire Hathaway would recognize in 2020 from its investment in American Express.
2. Suppose Berkshire Hathaway had a balance of \$6,200 million in its “Investment in American Express” account at the beginning of 2020. Compute the balance in the account at the end of 2020.
3. Because its investment in American Express is less than 20%, Berkshire Hathaway actually used the market-value method to account for its investment in American Express and classified this investment as an available-for-sale security. The market value of Berkshire Hathaway’s investment in American Express securities was \$18,874 million at the end of 2019 and \$18,331 million at the end of 2020.
 - a. Compute the amount of income recognized by Berkshire Hathaway in 2020 from its investment in American Express.
 - b. Under the market-value method, Berkshire Hathaway had a balance of \$18,874 million in its Investment in American Express account at the beginning of 2020. Compute the balance in the account at the end of 2020.
 - c. Explain how Berkshire Hathaway would account for the \$543 million decrease in market value.
4. Indicate briefly how the following three classes of investments should be accounted for: (a) greater than 50% interest, (b) 20% through 50% interest, and (c) less than 20% interest.

17-B4 Income Ratios and Asset Turnover

Burberry plc, the British luxury fashion house that manufactures clothing, fragrance, and fashion accessories, had net income of £375.9 million on sales of £2,343.9 million in 2011. (£ is the British currency, the pound.) The company’s operating statistics for 2011 included the following:

Operating return on sales	16.037%
Operating return on average total assets	11.065%
Total asset turnover	0.69
Return on shareholders’ equity	27.058%

1. Compute the following 2021 amounts for Burberry:
 - a. Operating income
 - b. Average total assets
 - c. Average shareholders’ equity
2. Which return is more important to shareholders, return on sales or return on shareholders’ equity? Why?

17-B5 Financial Ratios

Gap, Inc. is a leading global specialty apparel company with 3,100 company-operated and franchise store locations in 2020. The company was established in 1969 and has several well-known brand names such as Gap, Banana Republic, and Old Navy. Excerpts from the company’s annual report for the fiscal year ended February 1, 2020, are in Exhibit 17-9. Gap paid cash dividends of \$ 0.97 per common share in fiscal 2012, and an average of 376 million shares were outstanding during the year. Assume that Gap

has no stock options or convertible securities. The company's market price on February 1, 2020, was \$17.41 per share. Compute the following financial ratios for fiscal ended February 1, 2020:

1. Current ratio
2. Total debt to equity
3. Gross profit rate
4. Return on sales
5. Return on stockholders' equity
6. Earnings per share
7. Price earnings
8. Dividend yield
9. Dividend payout

Income statement for the year ended February 1, 2020		
Net sales	\$16,383	
Cost of sales	<u>10,250</u>	
Gross profit	\$ 6,133	
Operating expenses	<u>5,559</u>	
Operating income	<u>574</u>	
Interest expenses, net	<u>46</u>	
Income before income taxes	\$ 528	
Income taxes	<u>177</u>	
Net income	<u><u>\$ 351</u></u>	
Balance sheet	February 1, 2020	February 2, 2019
Assets		
Cash and cash equivalents	\$ 1,364	\$1,081
Inventories	2,156	2,131
Other current assets (summarized)	<u>996</u>	<u>1,039</u>
Total current assets	\$ 4,516	\$4,251
Property and equipment (net)	3,122	2,912
Other assets	<u>6,041</u>	<u>886</u>
Total assets	<u><u>\$13,679</u></u>	<u><u>\$8,049</u></u>
Liabilities and stockholders' equity		
Current liabilities (summarized)	\$ 3,209	\$2,174
Long-term liabilities (summarized)	<u>7,154</u>	<u>2,322</u>
Total liabilities	\$10,363	\$4,496
Stockholders' equity (summarized)	<u>3,316</u>	<u>3,553</u>
Total liabilities and stockholders' equity	<u><u>\$13,679</u></u>	<u><u>\$8,049</u></u>

Exhibit 17-9

Gap, Inc.

Income Statement and Balance Sheet (in millions)

Additional Assignment Material

MyLab Accounting

QUESTIONS

17-1 Distinguish between trading securities and available-for-sale securities.

17-2 “An increase in the market value of available-for-sale securities is added to other comprehensive income, which in turn is added to income after taxes to get net income.” Do you agree? Explain.

17-3 What is the equity method?

17-4 When should a company follow the market-value method for accounting investments?

17-5 “The equity method is usually used for long-term investments.” Do you think this is appropriate? Explain.

17-6 What criterion is used to determine whether a parent–subsidiary relationship exists?

17-7 What are the benefits to a parent company of keeping subsidiaries rather than merging them with itself?

17-8 “A consolidated financial statement simply adds together the separate accounts of a parent company and its subsidiaries.” Do you agree? Explain.

17-9 “Consolidated income statements show more income than parent-company-only statements if the subsidiary has a positive net income.” Do you agree? Explain.

17-10 What is a noncontrolling interest?

17-11 “Goodwill is the excess of purchase price over the book values of the individual assets acquired.” Do you agree? Explain.

17-12 When the fair value of assets is higher than the book value, how would you recognize goodwill in the books of the acquirer?

17-13 When will goodwill on a balance sheet be reduced?

17-14 How are pro forma statements different from the formal financial statements?

17-15 Why is it useful to analyze income statements and balance sheets by component percentages?

17-16 What does MD&A mean? Why might an investor want to read the MD&A section of an annual report or 10-K?

17-17 Name the three types of comparisons made with ratios.

17-18 Name two short-term ratios and five profitability ratios.

17-19 What two ratios are multiplied together to give the pretax operating rate of return on average total assets?

17-20 “Ratios are mechanical and incomplete.” Explain.

17-21 “An efficient capital market is one where securities are traded through stockbrokers.” Do you agree? Explain.

17-22 Give three sources of information for investors besides accounting information.

17-23 Evaluate the following quotation from The Economic Times: “If Sun Pharma had been forced to expense [the drug development costs] ₹628 million, its earnings would have been cut by ₹5.76 a share. With Sun Pharma selling at 14 times earnings, expensing the costs might have knocked over ₹80 off Sun Pharma’s share price.”

17-24 In the recent meeting with the senior management team, the CEO of your company has proposed changing the method of depreciation from straight-line method to reducing-balance method. In his opinion, this will increase the income by 10%. As a result, the share price, which is down by 10% from its previous peak, will be restored to the same level. What would be your response to his proposal?

CRITICAL THINKING EXERCISES

17-25 Market-Value Method, Equity Method, and Total Assets

Suppose **Novartis AG** plans to buy about 20% of the common shares of a small biotechnology company that recently went public. The management of Novartis believes that patents developed by the biotech company will make the company very valuable in a year or two. Near-term profits may not be very high, but large increases in the share price are likely. No dividends are expected. How would the choice of accounting method, the market-value method or the equity method, affect Novartis’s total assets reported on its balance sheet in the next couple years if its expectations about the biotech company come true? How would Novartis achieve its preferred accounting method? Explain.

17-26 Depreciation in Consolidated Financial Statements

Suppose Company P buys 100% of the common stock of Company S for more than the book value of S. After 1 year, the consolidated entity prepares financial statements. Two expense items appear on the consolidated income statement that are not on the individual statements of P and S:

1. Depreciation on equipment in excess of that in the individual statements
2. Write-off of goodwill

Explain why these two accounts exist. That is, what was there about the acquisition that generated the need for these two accounts?

17-27 Just-in-Time (JIT) Inventory and Current Ratio

Many companies have adopted JIT inventory methods to reduce the size of their inventories. What would you expect to happen to the current ratios of such companies? Would you interpret the current ratio differently for JIT companies compared to other companies? Explain.

17-28 Market Efficiency

Suppose you are the secretary of your club (a nonprofit organization). You have been entrusted with investing the organization's small endowment. If you believe that capital markets are efficient, what does that imply about how you will invest the endowment funds?

GENERAL EXERCISES AND PROBLEMS

17-29 Equity Method

Alpha Company acquired 20% of the voting stock of Beta Company for €80 million cash. In year 1, Beta had a net income of €40 million and paid cash dividends of €20 million. At the end of the year, the total market value of Beta was €480 million. Prepare a tabulation that compares the equity method and the market-value method of accounting for Alpha's investment in Beta. Show the effects on the balance sheet equation under each method. What is the year-end balance in the Investment in Beta account under the equity method? Under the market-value method? What difference in accounting would there be if the investment were a trading security instead of an available-for-sale security?

17-30 Consolidated Financial Statements

Ace Mining Company (the parent) acquired 100% of the common stock of Alberta Development (the subsidiary) for \$300,000 on January 2, 20X1. Their financial statements follow:

	Ace Mining (Parent)	Alberta Development (Subsidiary)
Balance sheets, December 31, 20X0		
Assets	<u>\$1,000,000</u>	<u>\$ 550,000</u>
Liabilities to creditors	<u>\$ 400,000</u>	<u>\$ 250,000</u>
Stockholders' equity	<u>600,000</u>	<u>300,000</u>
Total liabilities and stockholders' equity	<u>\$1,000,000</u>	<u>\$ 550,000</u>
Income statement for 20X1		
Revenue and "other income"	\$5,500,000	\$1,100,000
Expenses	<u>5,050,000</u>	<u>900,000</u>
Net income	<u>\$ 450,000</u>	<u>\$ 200,000</u>

1. What would be Ace Mining's net income for 20X1 if it had not purchased the Alberta Development stock?
2. After acquiring the Alberta Development stock, Ace Mining prepared its income statement by showing its claim to Alberta's income as part of "other income." Prepare a consolidated income statement for 20X1 and a consolidated balance sheet as of December 31, 20X1. Use the balance-sheet-equation format for the latter.
3. Suppose Ace Mining Company bought only 60% of Alberta Development Company for \$180,000. Therefore, Ace Mining's revenue and other income for 20X1 is \$5,420,000, not \$5,500,000. Prepare a consolidated income statement and a consolidated balance sheet. Use the balance-sheet-equation format for the latter.

17-31 Determination of Goodwill

Refer to the preceding problem, number 2. Suppose the investment in Alberta Development was \$350,000 instead of the \$300,000 as stated. The fair-market values of Alberta's assets and liabilities were equal to their book values. Would the consolidated income differ? How? Be as specific as possible. Would the consolidated balance sheet differ? How? Be as specific as possible.

17-32 Purchased Goodwill

Consider the following balance sheets (in millions):

	Cloud Software Company	Tron Gaming
Cash	\$ 850	\$ 80
Inventories	350	70
Plant assets, net	390	60
Total assets	<u>\$1,590</u>	<u>\$210</u>
Common stock and paid-in capital	\$ 620	\$120
Retained income	970	90
Total liabilities and stockholders' equity	<u>\$1,590</u>	<u>\$210</u>

Cloud Software paid \$300 million to Tron stockholders for all their stock. The fair value of the plant assets of Tron is \$150 million. The fair value of cash and inventories is equal to their carrying amounts. Cloud and Tron still keep separate books.

1. Prepare a tabulation showing the balance sheets of Cloud, of Tron, Intercompany Eliminations, and Consolidated Balances immediately after the acquisition.
2. Suppose only \$100 million rather than \$150 million of the total purchase price of \$300 million could be logically assigned to the plant assets. How would the consolidated accounts be affected?
3. Refer to the facts in number 1. Suppose Cloud had paid \$340 million rather than \$300 million. State how your tabulation in number 1 would change.

17-33 Amortization and Depreciation

Refer to the preceding problem, number 3. Suppose a year passes, and Cloud and Tron generate individual net incomes of \$105 million and \$35 million, respectively. The latter is after a deduction by Tron of \$12 million of straight-line depreciation. Compute the consolidated net income if (1) goodwill is not impaired and (2) half of the goodwill is written off at the end of the year. Ignore income taxes.

17-34 Allocating Total Purchase Price to Assets

Two Bollywood companies had the following balance sheet accounts as of December 31, 2019, and net income for 2019 (in millions):

	Gemini Pictures	New Theatres Company
Cash and receivables	₹ 2,400	₹1,760
Inventories	9,600	240
Plant assets, net	12,000	7,600
Total assets	<u>₹24,000</u>	<u>₹9,600</u>
Net income	<u>₹ 1,520</u>	<u>₹ 320</u>
Current liabilities	₹ 4,000	₹1,600
Common stock	8,000	800
Retained income	12,000	7,200
Total liabilities and stakeholders' equity	<u>₹24,000</u>	<u>₹9,600</u>

On January 4, 2020, these firms merged. Gemini Pictures issued ₹14,400 million of its shares (at market value) in exchange for all the shares of New Theatres. The inventory of films acquired through the combination had been fully amortized on New Theatres's books. During 2020, New Theatres received revenue of ₹1,280 from the rental of films from its inventory. Gemini Pictures earned ₹1,600 million on its other operations (i.e., excluding New Theatres) during 2020. New Theatres broke even on its other operations (i.e., excluding the film rental contracts) during 2020.

1. Prepare a consolidated balance sheet for the combined company immediately after the combination. Assume that ₹6,400 million of the purchase price was assigned to the inventory of films.
2. Prepare a comparison of Gemini's net income between 2019 and 2020 where the cost of the film inventories would be amortized on a straight-line basis over 4 years. What would be the net income for 2020 if the ₹6,400 million were assigned to goodwill rather than to the inventory of films and the value of goodwill was maintained?

17-35 Preparation of Consolidated Financial Statements

The Cypress Tool & Die Company's fiscal year ends on December 31. The company had the following items on its 20X1 income statement and balance sheet (in millions):

Net sales and other operating revenue	\$900
Investments in affiliated companies	100
Common stock, 11,000,000, \$1 par	11
Depreciation and amortization	20
Accounts payable	210
Cash	20
Paid-in capital in excess of par	101
Interest expense	25
Retained earnings	188
Accrued income taxes payable	20
Cost of goods sold and operating expenses, exclusive of depreciation and amortization	660
Subordinated debentures, 11% interest, due December 31, 20X8	100
Noncontrolling interest in consolidated subsidiaries' net income	20
Goodwill	95
First-mortgage bonds, 10% interest, due December 31, 20X9	80
Property, plant, and equipment, net	125
Preferred stock, 2,000,000 shares, \$50 par, dividend rate is \$3.5 per share	100
Short-term investments at market value	45
Income tax expense	90
Accounts receivable, net	175
Noncontrolling interest in subsidiaries	90
Inventories at average cost	340
Dividends declared and paid on preferred stock	7
Equity in earnings of affiliated companies	20

Prepare Cypress's consolidated 20X1 income statement and its consolidated balance sheet for December 31, 20X1.

17-36 Intercorporate Investments and Ethics

Bud Conn and Salvador Cruz were best friends at a small college, and they fought side-by-side in Iraq. After their military service, they went their separate ways to pursue MBA degrees, Bud to a prestigious East Coast business school and Salvador to an equally prestigious West Coast school. Nearly 20 years later, their paths crossed again.

By 2006, Salvador had become president and CEO of Quantum Electronics after 13 years with the firm. Bud had started out working for **Delta Airlines**, but left after 7 years to start his own firm, Conn Transport. In April 2009, Conn Transport was near bankruptcy when Bud approached his old friend for help. Salvador answered his friend's call, and Quantum Electronics bought 19% of Conn Transport. In 2012, Conn was financially stable, and Quantum was struggling. Salvador Cruz thought his job as CEO might be in jeopardy if Quantum did not report income up to expectations. Late in 2012, Salvador approached Bud with a request—quadruple Conn's dividends so that Quantum could recognize \$760,000 of investment income. Quantum had listed its investment in Conn as an available-for-sale security, so changes in the market value of Conn were recorded directly in stockholders' equity. However, dividends received were recognized in Quantum's income statement. Although Conn had never paid dividends of more than 25% of net income, and it had plenty of uses for excess cash, Bud felt a deep obligation to Salvador. Thus, he agreed to a \$4 million dividend on net income of \$4.17 million.

1. Why does the dividend policy of Conn Transport affect the income of Quantum Electronics? Is this consistent with the intent of the accounting principles relating to the market value and equity methods for intercorporate investments? Explain.
2. Comment on the ethical issues in the arrangements between Bud Conn and Salvador Cruz.

17-37 Profitability Ratios

Pathfinder Company had the following income statements for 2019 and 2020:

	2020	2019
Sales	£3,200	£3,000
Cost of goods sold	<u>1,900</u>	<u>1,940</u>
Gross margin	1,300	1,160
Operating expenses	<u>448</u>	<u>420</u>
Operating income	852	740
Income taxes	<u>332</u>	<u>296</u>
Net income	<u>520</u>	<u>444</u>

Pathfinder Company generally paid dividends approximately equal to its net income. This resulted in the company's stockholders' equity totaling £2,960 at the end of both 2018 and 2019. However, at the end of 2020, the company's total stockholders' equity was £4,160 primarily because of large issuance of common stock in mid-2020.

1. Compute Pathfinder's gross margin percentage, the return on sales, and the return on stockholders' equity for 2019 and 2020.
2. As a stockholder, would you have been pleased about the change in performance between 2019 and 2020? Explain why or why not?

17-38 Financial Ratios

The annual reports of Milano SpA, an Italian clothing chain, included the following selected data (in millions):

	20X2	20X1	20X0
Annual amounts:			
Net income	€ 90*	€ 60	€ 25
Gross margin on sales	520	380	200
Cost of goods sold	980	620	300
Operating expenses	380	295	165
Income tax expense	50	25	10
Dividends declared and paid	35	15	5
End-of-year amounts:			
Long-term assets	€240	€220	€180
Long-term debt	85	65	40
Current liabilities	65	55	35
Cash	20	5	10
Accounts receivable	85	70	40
Merchandise inventory	120	85	60
Paid-in capital	205	205	205
Retained income	110	55	10

*€ is the European euro.

During each of the three years, 10 million shares of common stock were outstanding.

Assume that all sales were on account and that the applicable market prices per share of stock were € 90 for 20X1 and € 117 for 20X2.

1. Compute each of the following for each of the last two years, 20X1 and 20X2:
 - a. Rate of return on sales
 - b. Rate of return on stockholders' equity
 - c. Current ratio
 - d. Ratio of total debt to stockholders' equity
 - e. Ratio of current debt to stockholders' equity
 - f. Gross profit rate

- g. Average collection period for accounts receivable
 - h. P/E ratio
 - i. Dividend-payout percentage
 - j. Dividend yield
2. Answer yes or no to each of these questions and indicate which of the computations in number 1 support your answer:
 - a. Have business operations improved?
 - b. Has gross profit rate improved?
 - c. Has the rate of return on sales deteriorated?
 - d. Has the rate of return on owners' investment increased?
 - e. Is there a decrease in the effectiveness of collection efforts?
 - f. Are dividends relatively more generous?
 - g. Have the risks of insolvency changed significantly?
 - h. Has the market price of the stock become cheaper relative to earnings?
 - i. Has there been a worsening of the company's ability to pay current debts on time?
 - j. Has there been a decline in the cash return on the market value of the capital stock?
 - k. Did the collectibility of the receivables improve?
 3. Basing your observations on only the available data and the ratios you computed, prepare some brief comments on the company's operations and financial changes during the three years.

UNDERSTANDING PUBLISHED FINANCIAL REPORTS

17-39 Meaning of Account Descriptions

The following account descriptions are found in the 2019 annual report of the **Unilever Group** (in millions):

• Net income attributable to noncontrolling interests	€401 million
• Noncontrolling interests	€694 million
• Investment in associates	€653 million
• Equity in earnings (share of net profit) of associates	€176 million

In your own words, explain what each type of account represents. Indicate whether the item appears on the balance sheet or the income statement.

17-40 Classification on Balance Sheet

The following accounts appeared in the 2019 financial statements of **EDF Energy**, one among the Big Six in the United Kingdom's energy sector. EDF reports using IFRS.

1. Merger reserve
2. Share of profit of associates.
3. Post-employment benefits provision
4. Trade and other receivables
5. Obligation under leases
6. Impairment on non-current assets

Four of the items are on the balance sheet. Indicate in detail in which section of the balance sheet each account should appear. Two of the items are on the income statement. Indicate in detail in which section of the income statement each account should appear.

17-41 Effect of Transactions Under the Equity Method

Siemens AG is a global technology company based in Germany. The company accounts for its investments in affiliated companies by the equity method. The following balances were reported (in million):

	September 30	
	2018	2019
Investments in equity affiliates	€47,061	€63,654

Siemens's equity in the earnings of affiliated companies in 2019 was €3,064 million. Assume that there was no additional investment in affiliates during 2019. The company had pretax income in 2019 of €12,596 million.

1. How much did the company receive in dividends from the equity affiliates in 2019?
2. What pretax income would the company have reported if it did not have an interest in the affiliated companies? What proportion of company's pretax income came from the affiliated companies?
3. Suppose that, instead of the number you calculated in number 1, the company received €6,000 million in dividends from its affiliated companies in 2019. What income would the company recognize from its affiliated companies in 2019?

17-42 Noncontrolling Interests

Toyota Motor Company has 507 consolidated subsidiaries both inside and outside of Japan. It owns 100% of many of these companies and percentages ranging from 50% to 99% in the others. Toyota's 2011 income statement showed the following (in billions of yen):

Income (loss) before income taxes and equity in earnings of affiliated companies	¥563
Provision for income taxes	(313)
Equity in earnings of affiliated companies	<u>215</u>
Net income	465
Less: Net income attributable to the noncontrolling interests	<u>(57)</u>
Net income attributable to Toyota Motor Corporation	<u>¥408</u>

Toyota's 2011 balance sheet included an amount of ¥588 billion for "Noncontrolling Interest" and ¥1,827 billion in "Affiliated Companies."

1. What net income would be attributable to stockholders in Toyota have been if Toyota had owned 100% of all its subsidiaries?
2. Suppose Toyota's average ownership percentage of these consolidated subsidiaries is 90%. What was the total 2011 net income of the subsidiaries?
3. Toyota has 56 affiliated companies with a total net income of ¥642 billion. What was Toyota's average percentage ownership of these affiliated companies? What is Toyota's maximum percentage ownership of these companies?

17-43 General Electric and GECS

The consolidated financial statements of **General Electric** (GE) include the results of **General Electric Capital Services (GECS)**, its 100%-owned financial services subsidiary.

Some investors think the business of a financial services subsidiary is so different from that of its parent that the two should not be consolidated. In 2011, GE reported consolidated net income of \$14,443 million, and GECS reported net income of \$6,637 million.

1. What would be the 2011 net income of GE if it did not consolidate GECS but accounted for it on an equity basis?
2. What would GE's 2011 net income be if it did not own GECS but all other results were as reported? What percentage of GE's net income comes from GECS?
3. What advantages does the consolidated statement have? What advantages does the unconsolidated statement that accounts for GECS on an equity basis have?

17-44 Goodwill

In 2005 **Procter & Gamble** (P&G) bought the **Gillette Company** for \$53.4 billion. The purchase added \$10.0 billion of tangible assets and \$21.2 billion of liabilities to P&G's balance sheet. In addition, P&G identified \$29.7 billion of specific intangible assets acquired. These intangible assets had lives ranging from 5 years to more than 40 years. However, assume that all had useful lives of 10 years.

1. How much goodwill did P&G record as a result of the acquisition of Gillette? How much of this goodwill was still on P&G's balance sheet in 2011, assuming P&G did not identify any impairment of the goodwill?
2. Suppose P&G had not identified the \$29.7 billion of specific intangible assets but instead had recorded an extra \$29.7 billion worth of goodwill. How would this affect P&G's income in 2006?
3. Why might a manager want this \$29.7 billion to be recorded as goodwill rather than as part of the value of identifiable intangible assets?

17-45 Accounting for Goodwill

On April 18, 2019, **Newmont Mining**, a Colorado-based mining company, bought 100% of **Goldcorp Inc.**, a gold production company headquartered in Vancouver, Canada, to become the largest gold producer in the world. The purchase price was \$10 billion. Suppose that Newmont acquired

no tangible assets, \$8.4 billion intangible assets with a useful life of 10 years, and \$1.9 billion tangible liabilities.

1. Compute the amount of goodwill recognized at the time of purchase.
2. Newmont had pretax earnings of \$2.88 billion in fiscal 2019. Assume that these exclude earnings or losses from Goldcorp. Suppose that Newmont's on-going operations (that is, excluding the results of Goldcorp) had the same results for fiscal 2020 as for fiscal 2019 and that Goldcorp had a pretax loss for fiscal 2020 of \$515 million. What consolidated net income would Newmont report for fiscal 2020? Assume that neither Newmont nor Goldcorp had sales to other.
3. How would the consolidated net income computed in number 2 change if the entire excess of the purchase price over the value of tangible assets less liabilities had been assigned to goodwill?

17-46 Income Ratios and Asset Turnover

Briggs & Stratton is the world's largest producer of air-cooled gasoline engines for outdoor power equipment. Its 2011 annual report to stockholders included the following data (in millions):

Net income	\$ 24,355
Total assets	
Beginning of year	1,690,057
End of year	1,666,218
Net income as a percent of total revenue	1.15427%
Average stockholders' equity	3.50805%

Using only the data given, compute the (1) net income percent of average assets, (2) total revenues, (3) average stockholders' equity, and (4) asset turnover (using two different approaches).

17-47 Financial Ratios

Honda Motor Company is a Japanese company with sales equivalent to more than \$100 billion. The company's income statement and balance sheet for the year ended March 31, 2011, are shown in Exhibit 17-10 and 17-11. Monetary amounts are in Japanese yen (¥).

Net sales	¥8,937
Cost of sales	<u>6,497</u>
Gross profit	¥2,440
Selling and administrative	1,383
Research and development	<u>487</u>
Operating income	¥ 570
Other income (expense):	
Interest income	23
Interest expense	(9)
Equity in income of affiliates	140
Other, net	<u>46</u>
Income before income taxes	¥ 770
Income tax expense	<u>207</u>
Net income	<u>¥ 563</u>
Amounts per share	
Net income (EPS)	<u>¥ 296</u>
Cash dividends	<u>¥ 54</u>

Exhibit 17-10

Honda Motor Company, Ltd.

Income Statement for the Year Ended March 31, 2011 (in billions, except per-share amounts)

Assets	
Current Assets	
Cash and cash equivalents	¥ 1,279
Receivables	1,919
Inventories	900
Other	<u>592</u>
Total current assets	¥ 4,690
Property, plant, and equipment, net	3,297
Investments	640
Other assets	<u>2,944</u>
Total assets	<u>¥11,571</u>
Liabilities and Stockholders' Equity	
Current liabilities	
Short-term debt	¥ 1,095
Payables	717
Accrued expenses	525
Current portion of long-term debt	962
Other	<u>269</u>
Total current liabilities	¥ 3,568
Long-term liabilities	
Long-term debt	¥ 2,043
Other	<u>1,377</u>
Total long-term liabilities	¥ 3,420
Stockholders' equity	
Common Stock	¥ 86
Additional paid-in capital	173
Retained earnings	5,667
Other	<u>(1,476)</u>
Total honda motor company shareholders' equity	4,450
Noncontrolling interests	133
Total stockholders' equity	¥ 4,583
Total liabilities and stockholders' equity	<u>¥11,571</u>

Exhibit 17-11

Honda Motor Company, Ltd.

Balance Sheet March 31, 2011 (in billions)

1. Prepare a common-size income statement, that is, one showing component percentages.
2. Compute the following ratios:
 - a. Current ratio
 - b. Total debt to equity
 - c. Gross profit rate
 - d. Return on stockholders' equity (March 31, 2010 stockholders' equity was ¥4,456 billion)
 - e. P/E ratio (the market price on March 31, 2011, was approximately ¥2,207 per share)
 - f. Dividend-payout ratio
3. What additional information would help you interpret the percentages and ratios you calculated?

NIKE 10-K PROBLEM

17-48 Using Consolidated Financial Statements

Examine **Nike's** Form 10-K report in Appendix C, focusing on the income statement and balance sheet. Answer the following questions:

1. Nike used the term *consolidated* to describe its financial statements. What does this mean? Does Nike have any consolidated subsidiaries in which it has less than 100% ownership? How do you know?
2. Suppose Nike's retail stores buy shoes from **Converse**, a wholly owned subsidiary of Nike, to resell in its stores. Suppose that at the end of fiscal 2022, Converse had recorded \$10 million of such sales and all the shoes were still in Nike stores' inventories. Converse's inventory value for the shoes was \$6 million. How do such sales of Converse affect the consolidated income statement and balance sheet of Nike? Ignore tax effects.
3. In Exhibit 17-8 on p. 750 you will find 10 ratios for Nike for fiscal 2020 and 2021. For each ratio, explain whether the 2021 ratio is an improvement over the 2020 value.

EXCEL APPLICATION EXERCISE

17-49 Calculating Financial Ratios

Goal: Create an Excel spreadsheet to calculate financial ratios. Use the results to answer questions about your findings.

Scenario: **Gap, Inc.** has asked you to calculate financial ratios for the company based on income statement and balance sheet data presented in Exhibit 17-9 on p. 760.

Additional background information for your calculations appears in problem 17-B5. The formulas for the financial ratios can be found in Exhibit 17-8.

When you have completed your spreadsheet, answer the following questions:

1. Discuss Gap's current ratio calculations and their meaning. Compare the results to the rule of thumb presented in the chapter on p. 751 for this calculation.
2. Discuss Gap's total debt-to-equity calculations and their meaning. Compare the results to the rule of thumb presented in the chapter on p. 751 for this calculation.
3. Discuss the results of the dividend payout calculation and your opinion regarding its percentage.

Step-by-Step:

1. Open a new Excel spreadsheet.
2. In column A, create a bold-faced heading that contains the following:
Row 1: Chapter 17 Decision Guideline
Row 2: Gap, Inc.
Row 3: Financial Ratio Analysis
Row 4: Today's Date
3. Merge and center the four heading rows across columns A–C.
4. In row 7, create the following bold-faced column headings:
Column A: Financial Data (in millions):
Column B: January 28, 2012
Column C: February 3, 2011

Note: Adjust column widths as necessary.

5. Modify the format of the date headings in columns B and C as follows:

Number tab:

Category:

Date

Type:

March 14, 2012

6. In column A, create the following row headings:
Row 8: Current Assets
Row 9: Current Liabilities
Row 10: Total Liabilities
Row 11: Stockholders' Equity
Row 12: Net Sales
Row 13: Gross Profit

Row 14: Net Earnings
 Row 15: Market Price of Stock
 Row 16: Dividends Paid
 Row 17: Avg. Common Shares Outstanding

Note: Adjust the column width as necessary.

7. Use data from Exhibit 17-9 and Problem 17-B5 to enter the amounts for rows 8–17 in columns B and C.
8. Skip a row.
9. In row 19, create the following bold-faced column heading:

Column A: Financial Ratios:

10. In column A, create the following row headings:
 - Row 20: Current ratio
 - Row 21: Total debt to equity
 - Row 22: Gross profit percentage
 - Row 23: Return on sales
 - Row 24: Return on stockholders' equity
 - Row 25: Earnings per share
 - Row 26: Price earnings
 - Row 27: Dividend yield
 - Row 28: Dividend payout
11. Use cell-referenced formulas to calculate the amounts in columns B and C for rows 20–28.

Hint: By using cell-referenced formulas, the data in rows 8–17 can be changed without invalidating the Excel formulas coded in rows 20–28.

Example: The Excel formula for the current ratio in cell B20 would be =B8/B9.

Note: The ratio formulas can be found in Exhibit 17-8.

12. Format amounts in column B, rows 8–15 and column C, rows 8–11 as Number tab: Category: Accounting

Decimal: 0
Symbol: \$

13. Format the amount in column B, row 16 as Number tab: Category: Accounting

Decimal: 2
Symbol: \$

14. Format the amount in column B, row 25 as Number tab: Category: Currency

Decimal: 2
Symbol: \$
Negative numbers: Black with parentheses

15. Format amounts in columns B and C, row 20 and column B, row 26 as

Number tab: Category: Number
Decimal: 2
Negative numbers: Black with parentheses

16. Format amounts in column B, rows 21–24 and 27–28, and column C, row 21 as follows:

Number tab: Category: Percentage
Decimal: 2

17. Save your work and print a copy for your files

COLLABORATIVE LEARNING EXERCISE

17-50 Financial Ratios

Form groups of four to six persons each. Each member of the group should pick a different company and find the most recent annual report for that company. (If you do not have printed annual reports, try searching the Internet for one.)

1. Each member should compute the following ratios for his or her company:
 - a. EPS
 - b. P/E ratio
 - c. Dividend-yield ratio
 - d. Dividend-payout ratio
2. As a group, list two possible reasons that each ratio differs across the selected companies. Focus on comparing the companies with the highest and lowest values for each ratio, and explain how the nature of the company might be the reason for the differences in ratios.

INTERNET EXERCISE

17-51 General Electric's Annual Report

Go to www.ge.com and follow the link to Investor Relations, and then to Financial Reporting to see **General Electric's** (GE) most recent annual report.

Answer the following questions about GE:

1. Look at GE's income statement, which it calls a statement of earnings. Does GE consolidate parent and subsidiary accounts in the statement? Does GE hold less than 100% interest in any of its subsidiaries? How do you know?
2. Turn to GE's balance sheet. What does GE call this statement? GE omits some subtotals that most companies include on their balance sheets. What are these subtotals? How much "Noncontrolling interest [in equity of consolidated affiliates]" does GE show? What does this mean?
3. Does GE pay cash dividends? If so, what was the payout ratio in the most recent year?
4. Compute GE's return on shareholders' equity for the GE shareholders for the last two years. Is the change in a positive or negative direction?

Appendix A Recommended Readings

The following readings will aid readers who want to pursue some topics in more depth than is possible in this book. There is a hazard in compiling a group of recommended readings. Inevitably, we will omit some worthwhile books or periodicals. Moreover, such a list cannot include books published subsequently to the compilation date. Although this list is not comprehensive, it includes many excellent readings.

Periodicals

Professional Journals

The following professional journals are typically available in university libraries and include articles on the application of management accounting:

- ***Accounting Horizons***. Published by the American Accounting Association; stresses current practice-oriented articles in all areas of accounting
- ***CMA Magazine***. Published by CMA Canada; includes much practice-oriented research in management accounting
- ***Cost Management***. Published by Thompson Reuters; stresses cost management tools
- ***Financial Executive***. Published by Financial Executives International; emphasizes general policy issues for accounting and finance executives
- ***The Journal of Corporate Accounting & Finance***. Published by Wiley; directed to corporate accounting and finance executives and outside auditors and accountants working for the corporation
- ***Harvard Business Review***. Published by Harvard Business School; directed to general managers but contains excellent articles on applications of management accounting
- ***Journal of Accountancy***. Published by the American Institute of CPAs; emphasizes financial accounting and is directed at the practicing CPA
- ***Management Accounting Quarterly***. An online journal published by the Institute of Management Accountants; practical articles with an academic focus
- ***Strategic Finance***. Published by the Institute of Management Accountants; many articles on actual applications by individual organizations
- ***BusinessWeek, Forbes, Fortune, the Economist, and the Wall Street Journal***. Popular publications that cover a variety of business and economics topics; often their articles relate to management accounting

Academic Journals

The academic journal that focuses most directly on current management and cost accounting research is the *Journal of Management Accounting Research*, published by the Management Accounting section of the American Accounting Association. *The Accounting Review*, the general research publication of the American Accounting Association; *Journal of Accounting Research*, published at the University of Chicago; and *Contemporary Accounting Research*, published by the Canadian Academic Association, cover all accounting topics at a more theoretical level. *Accounting, Organizations and Society*, a British journal, publishes research on behavioral aspects of management accounting. The *Journal of Accounting and Economics* covers economics-based accounting research. *Journal of Accounting, Ethics and Public Policy* and *Research on Professional Responsibility and Ethics in Accounting* are journals devoted to ethical issues.

Books in Management Accounting

Most of the topics in this text are covered in more detail in the many books on cost accounting, including *Cost Accounting: A Managerial Emphasis*, 14th edition, by C. T. Horngren, S. Datar, and M. Rajan (Prentice Hall, 2012). You can find more advanced coverage in *Advanced Management Accounting*, 3rd edition, by R. S. Kaplan and A. A. Atkinson (Prentice Hall, 1998). Current management accounting issues are discussed in *Issues in Management Accounting* by Trevor Hopper, Robert W. Scapens, and Deryl Northcott (Prentice Hall, 2007).

Financial Executives International, 1250 Headquarters Plaza, West Tower, 7th Floor, Morristown, NJ, 07960, and the IMA, 10 Paragon Drive, Suite 1, Montvale, NJ 07645-1760, have long lists of accounting research publications.

Handbooks, General Texts, and Case Books

The books in this list have wide application to management accounting issues. The handbooks are basic references. The textbooks are designed for classroom use but may be useful for self-study. The case books present applications from real companies.

- Adkins, T. C., *Case Studies in Performance Management: A Guide from the Experts*, Hoboken, NJ: John Wiley & Sons, 2006.
- Allen, B. R., E. R. Brownlee, M. E. Haskins, L. J. Lynch, and J. W. Rotch, *Cases in Management Accounting and Control Systems*, 4th ed. Upper Saddle River, NJ: Prentice Hall, 2004.
- Bahnbub, B., *Activity-Based Management for Financial Institutions: Driving Bottom-Line Results*, New York: Wiley, 2010.
- Bierman, H., Jr., and S. Smidt, *The Capital Budgeting Decision: Economic Analysis of Investment Projects*, 9th ed. Routledge, 2006. This text expands the capital budgeting discussion from Chapter 11.
- Bierman, H., Jr., and S. Smidt, *Advanced Capital Budgeting: Refinements in the Economic Analysis of Investment Projects*, Routledge, 2007.
- Groot, T., and K. Lukka (eds.), *Cases in Management Accounting: Current Practices in European Companies*, Harlow: Prentice Hall/Pearson, 2000.
- Kaplan, R., and S. Anderson, *Time-Driven Activity-Based Costing: A Simpler and More Powerful Path to Higher Profits*, Boston: Harvard Business Review Press, 2007.
- Manning, G. A., *Financial Investigation and Forensic Accounting*, 3rd ed. Boca Raton, FL: CRC Press, 2010.
- Pryor, T., et al., *Activity Dictionary: A Comprehensive Reference Tool for ABM and ABC: 2000 Edition*, Arlington, TX: ICMS, Inc., 2000.
- Render, B., R. Stair, and M. Hanna, *Quantitative Analysis for Management*, 11th ed. Prentice Hall, 2011.
- Rogers, J., *Strategy, Value, and Risk: The Real Options Approach*, 2nd Ed., Basingstoke, UK: Palgrave Macmillan, 2009.
- Seitz, N., and M. Ellison, *Capital Budgeting and Long-Term Financing Decisions*, Cincinnati, OH: South-Western, 2004.
- Shank, J., and V. Govindarajan, *Strategic Cost Management: The New Tool for Competitive Advantage*, New York: Free Press, 2008.
- Smith, J., *Handbook of Management Accounting*, 4th ed. London: CIMA, 2007.
- Weil, R., and M. Maher, *Handbook of Cost Management*, New York: Wiley, 2005.
- Young, S. M., *Readings in Management Accounting*, 6th ed. Upper Saddle River, NJ: Prentice Hall, 2012.

Accounting Ethics

Integrity is essential for accountants. An increasing emphasis on ethics has led to a number of books devoted to the subject.

- Brooks, L. J., and P. Dunn, *Business and Professional Ethics for Directors, Executives, & Accountants*, 5th ed., Mason, OH: South-Western, 2009.
- Duska, R. F., and B. S. Duska, *Accounting Ethics*, 2nd ed., Malden, MA: Wiley-Blackwell, 2011.
- Mintz, S. M., and R. E. Morris, *Ethical Obligations and Decision Making in Accounting: Text and Cases*, 2nd ed., New York: McGraw-Hill/Irwin, 2010.
- Pakaluk, M., and M. L. Cheffers, *Accounting Ethics*, Manchaug, MA: Allen David Press, 2011.

The Strategic Nature of Management Accounting

Management accountants realize that cost and performance information is most useful to organizations when it helps define strategic alternatives and helps in the management of resources

to achieve strategic objectives. The books in this list, though not necessarily accounting books, provide a valuable foundation to the interaction of strategy and accounting information.

- Ansari, S., and J. Bell, *Target Costing: The Next Frontier in Strategic Cost Management*, Mountain Valley Publishing, 2009.
- Carr, L., and A. Nanni Jr., *Delivering Results: Managing What Matters*, Springer, 2009.
- Cokins, G., *Performance Management: Integrating Strategy Execution, Methodologies, Risk, and Analytics*, New York: Wiley, 2009.
- Grant, J. L., *Foundations of Economic Value Added*, 2nd ed. New York: Wiley, 2002.
- Kaplan, R., and D. Norton, *The Execution Premium: Linking Strategy to Operations for Competitive Advantage*, Boston: Harvard Business School Press, 2008.
- Magretta, J., *Understanding Michael Porter: The Essential Guide to Competition and Strategy*, Boston: Harvard Business Review Press, 2011.
- Stern, J., J. Shiely, and I. Ross, *The EVA Challenge: Implementing Value-Added Change in an Organization*, New York: Wiley, 2003.

Modern Manufacturing

The following books provide background on the role of accounting in modern manufacturing environments.

- Atkinson, A. A., R. S. Kaplan, E. M. Matsumura, and S. M. Young, *Management Accounting*, 6th ed. Upper Saddle River, NJ: Prentice Hall, 2012.
- Byrne, A., *The Lean Turnaround: How Business Leaders Use Lean Principles to Create Value and Transform Their Company*, New York: McGraw-Hill, 2013.
- Carreira, B., and B. Trudell, *Lean Six Sigma That Works: A Powerful Action Plan for Dramatically Improving Quality, Increasing Speed, and Reducing Waste*, New York: AMACOM, 2006.
- Cooper, R., and R. Kaplan, *Design of Cost Management Systems*, 2nd ed. Upper Saddle River, NJ: Prentice Hall, 1999.
- Cox III, J., and J. Schleier, *Theory of Constraints Handbook*, New York: McGraw-Hill, 2010.
- Goldratt, E. M., *Theory of Constraints*, Croton-on-Hudson, NY: North River Press, Inc., 2000.
- Goldratt, E. M., and J. Cox, *The Goal*, 3rd ed. Croton-on-Hudson, NY: North River Press, 2004. This is a novel illustrating the new manufacturing environment.
- Jacobs, F. R., R. Chase, and N. Aquilano, *Operations and Supply Management*, 12th ed., Homewood, IL: McGraw-Hill/Irwin, 2008.
- Mann, D., *Creating a Lean Culture: Tools to Sustain Lean Conversions*, 2nd ed., London: Productivity Press, 2010.
- Morgan, J., and M. Brenig-Jones, *Lean Six Sigma for Dummies*, 2nd ed., New York: Wiley, 2012.
- Pyzdek, T., and P. Keller, *The Six Sigma Handbook*, 3rd ed. New York: McGraw-Hill, 2009.
- Rubrich, L., and M. Watson, *Implementing World Class Manufacturing*, 2nd ed., Fort Wayne, IN: WCM Associates, 2004.
- Wilson, L., *How to Implement Lean Manufacturing*, New York: McGraw-Hill, 2009.

Management Control Systems

The topics of Chapters 7–10 can be explored further in several books, including the following:

- Anthony, R. N., and V. Govindarajan, *Management Control Systems*, 12th ed. McGraw-Hill/Irwin, 2006.
- Arrow, K. J., *The Limits of Organization*, New York: Norton, 1974. [This is a readable classic by a Nobel laureate.]
- Blocher, E., D. Stout, and G. Cokins, *Cost Management: A Strategic Emphasis*, 5th ed., McGraw-Hill/Irwin, 2009.
- Eckerson, W., *Performance Dashboards: Measuring, Monitoring, and Managing Your Business*, New York: Wiley, 2010.
- Gupta, P., and A. W. Wiggernhorn, *Six Sigma Business Scorecard: Creating a Comprehensive Corporate Performance Measurement System*, 2nd ed. New York: McGraw-Hill, 2006.

- Kaplan, R. S., and D. P. Norton, *The Balanced Scorecard: Measures That Drive Performance*, Boston: Harvard Business School Press, 1996.
- Kaplan, R. S., and D. P. Norton, *Alignment: Using the Balanced Scorecard to Create Corporate Synergies*, Boston: Harvard Business School Press, 2006.
- Merchant K., and W. Van der Stede, *Management Control Systems: Performance Measurement, Evaluation and Incentives*, 3rd ed. Upper Saddle River, NJ: Prentice Hall, 2012.
- Niven, P. R., *Balanced Scorecard Step-by-Step: Maximizing Performance and Maintaining Results*, 2nd ed., Hoboken, NJ: John Wiley & Sons, 2006.
- Parmenter, D., *Key Performance Indicators (KPI): Developing, Implementing, and Using Winning KPIs*, New York: Wiley, 2010.
- Simons, R., *Performance Measurement and Control Systems for Implementing Strategy*, Upper Saddle River, NJ: Prentice Hall, 2000.
- Solomons, D., *Divisional Performance: Measurement and Control*, New York: Markus Wiener, 1983. [This is a reprint of a 1965 classic that is still relevant.]

Management Accounting in Nonprofit Organizations

Many books discuss management accounting in nonprofit organizations, especially in healthcare. Examples are as follows:

- Anthony, R. N., and D. W. Young, *Management Control in Nonprofit Organizations*, 7th ed. Homewood, IL: Irwin, 2003.
- Baker, J. J., and R. W. Baker, *Health Care Finance: Basic Tools for Nonfinancial Managers*, 3rd ed. Sudbury, MA: Jones and Bartlett, 2009.
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Online Resources

The online resources related to management accounting are too extensive to create a comprehensive list. The best way to access them may be to use a good search engine. However, we list a few URLs that can help you get started.

- IFAC: Information for financial accounting and auditing professions, at <https://www.ifac.org/>
- IESBA: Information on issues related to accounting ethics and auditor independence, at <https://www.ethicsboard.org/>
- Balanced Scorecard Institute: Includes a variety of resources related to the balanced scorecard, at <http://www.balancedscorecard.org>
- CMA Canada: Many services, including strategic management accounting practices and management accounting standards, at <http://www.cma-canada.org>
- Consortium for Advanced Manufacturing International (CAM-I): Online library, at <http://www.cam-i.org>
- Financial Executives International: Information for corporate financial officers, at <http://www.fei.org>
- IMA: A variety of services, including an index of research publications, at <http://www.imanet.org/>
- Metrus Group: A variation of the balance scorecard, at <http://www.metrus.com/products/balanced-scorecards.html>
- Stern Stewart & Co.: Information about economic value added by the firm that developed the technique, at <http://www.sternstewart.com/>

Appendix B Fundamentals of Compound Interest and the Use of Present-Value Tables

The Nature of Interest

Interest is the cost of using money. A lender who loans an initial amount to a borrower now and receives repayment from the borrower later expects to receive more than the amount loaned. The difference between the initial amount loaned and the amount repaid later is interest. Interest is the rental fee for money, similar to the rental fees charged for the use of equipment or land.

Suppose you invest \$10,000 in a savings account in a financial institution. In this transaction, you are lending your money to the financial institution. Your initial \$10,000 investment (or loan to the financial institution) is the *principal*. Interest is the amount you earn on the investment each period. In this appendix, we focus on compound interest, where we add each period's interest to the beginning-of-the-period principal to come up with the principal for the start of the next period. For example, suppose the financial institution promised to pay 10% interest per year on your \$10,000 investment. The $10\% \times \$10,000 = \$1,000$ interest the first year would create a principal of $\$10,000 + \$1,000 = \$11,000$ at the start of the second year. If you let the amount accumulate for 3 years before withdrawing the full balance of the deposit, the deposit would accumulate to \$13,310:

	Principal	Compound Interest	Balance, End of Year
Year 1	\$10,000	$\$10,000 \times 0.10 = \$1,000$	\$11,000
Year 2	11,000	$11,000 \times 0.10 = 1,100$	12,100
Year 3	12,100	$12,100 \times 0.10 = 1,210$	13,310

Because compound interest accumulates on both the original principal and the previously accumulated interest that has been added to principal each period, the “force” of compound interest can be staggering. For example, the \$10,000 deposit would accumulate at 10% interest compounded annually as follows:

At End of			
3 Years	10 Years	20 Years	40 Years
\$13,310	\$25,937	\$67,275	\$452,593

Step-by-step calculations of compound interest quickly become burdensome. However, the calculations can be described compactly in the formulas outlined next. These formulas are built into many handheld calculators and computer software programs. Compound interest tables show the results for various combinations of parameters.

This appendix explains how to use the two compound interest tables most commonly used in capital budgeting. Both tables allow us to calculate *present value*, the value today of a future amount. In the previous example, the \$10,000 amount is a present value. The calculations showed what the future value of this amount would be after 3 years, 10 years, and so on. Another way to interpret these same calculations is that \$10,000 is the present value of \$13,310 to be repaid 3 years in the future, or the present value of \$25,937 to be repaid 10 years in the future, or the present value of \$452,593 to be repaid 40 years in the future. The remainder of this chapter explains how to use the tables to find the present value of any set of future payments.

Table B-1: Present Value of \$1

How do you express a future cash inflow or outflow in terms of its equivalent today? Table B-1 provides factors that give the present value at time 0 of a single, lump-sum cash flow that you will receive or pay at the end of n periods.

Suppose you invest \$1.00 today at 6% interest. It will grow to \$1.06 in 1 year; that is, $\$1 \times 1.06 = \$1.06$. At the end of the second year, its value is $(\$1 \times 1.06) \times 1.06 = \$1 \times (1.06)^2 = \$1.124$; and at the end of the third year it is $\$1 \times (1.06)^3 = 1.191$. In n years at i percent interest, \$1.00 grows to $\$1 \times (1 + i)^n$.

To determine the present value, you invert this accumulation process. If you will receive \$1.00 in 1 year, it is worth $\$1 \div 1.06 = \$0.9434$ today at an interest rate of 6%. Stated differently, if you invest \$0.9434 today, in 1 year you will have $\$0.9434 \times 1.06 = \$1.00$. Thus, \$0.9434 is the present value of \$1.00 a year hence at 6%.

Suppose you will receive the \$1 in 2 years instead of in 1 year. Its present value is then $\$1.00 \div (1.06)^2 = \$0.8900$. The general formula for the present value (PV) of \$1 is the inverse of the previous formula for the future value of \$1, i.e., $\$1 \div (1 + i)^n$. If you will receive or pay an amount S in n periods at an interest rate of $i\%$ per period, the formula for present value is:

$$PV = S \frac{1}{(1 + i)^n}$$

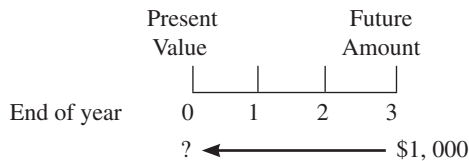
TABLE B-1 Present Value of \$1

Period	3%	4%	5%	6%	7%	8%	10%	12%	14%	16%	18%	20%	22%	24%	25%	26%	28%	30%	40%
1	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9091	0.8929	0.8772	0.8621	0.8475	0.8333	0.8197	0.8065	0.8000	0.7937	0.7813	0.7692	0.7143
2	0.9426	0.9246	0.9070	0.8900	0.8734	0.8573	0.8264	0.7972	0.7695	0.7432	0.7182	0.6944	0.6719	0.6504	0.6400	0.6299	0.6104	0.5917	0.5102
3	0.9151	0.8890	0.8638	0.8396	0.8163	0.7938	0.7513	0.7118	0.6750	0.6407	0.6086	0.5787	0.5507	0.5245	0.5120	0.4999	0.4768	0.4552	0.3644
4	0.8885	0.8548	0.8227	0.7921	0.7629	0.7350	0.6830	0.6355	0.5921	0.5523	0.5158	0.4823	0.4514	0.4230	0.4096	0.3968	0.3725	0.3501	0.2603
5	0.8626	0.8219	0.7835	0.7473	0.7130	0.6806	0.6209	0.5674	0.5194	0.4761	0.4371	0.4019	0.3700	0.3411	0.3277	0.3149	0.2910	0.2693	0.1859
6	0.8375	0.7903	0.7462	0.7050	0.6663	0.6302	0.5645	0.5066	0.4556	0.4104	0.3704	0.3349	0.3033	0.2751	0.2621	0.2499	0.2274	0.2072	0.1328
7	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835	0.5132	0.4523	0.3996	0.3538	0.3139	0.2791	0.2486	0.2218	0.2097	0.1983	0.1776	0.1594	0.0949
8	0.7894	0.7307	0.6768	0.6274	0.5820	0.5403	0.4665	0.4039	0.3506	0.3050	0.2660	0.2326	0.2038	0.1789	0.1678	0.1574	0.1388	0.1226	0.0678
9	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002	0.4241	0.3606	0.3075	0.2630	0.2255	0.1938	0.1670	0.1443	0.1342	0.1249	0.1084	0.0943	0.0484
10	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632	0.3855	0.3220	0.2697	0.2267	0.1911	0.1615	0.1369	0.1164	0.1074	0.0992	0.0847	0.0725	0.0346
11	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289	0.3505	0.2875	0.2366	0.1954	0.1619	0.1346	0.1122	0.0938	0.0859	0.0787	0.0662	0.0558	0.0247
12	0.7014	0.6246	0.5568	0.4970	0.4440	0.3971	0.3186	0.2567	0.2076	0.1685	0.1372	0.1122	0.0920	0.0757	0.0687	0.0625	0.0517	0.0429	0.0176
13	0.6810	0.6006	0.5303	0.4688	0.4150	0.3677	0.2897	0.2292	0.1821	0.1452	0.1163	0.0935	0.0754	0.0610	0.0550	0.0496	0.0404	0.0330	0.0126
14	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405	0.2633	0.2046	0.1597	0.1252	0.0985	0.0779	0.0618	0.0492	0.0440	0.0393	0.0316	0.0254	0.0090
15	0.6419	0.5553	0.4810	0.4173	0.3624	0.3152	0.2394	0.1827	0.1401	0.1079	0.0835	0.0649	0.0507	0.0397	0.0352	0.0312	0.0247	0.0195	0.0064
16	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919	0.2176	0.1631	0.1229	0.0930	0.0708	0.0541	0.0415	0.0320	0.0281	0.0248	0.0193	0.0150	0.0046
17	0.6050	0.5134	0.4363	0.3714	0.3166	0.2703	0.1978	0.1456	0.1078	0.0802	0.0600	0.0451	0.0340	0.0258	0.0225	0.0197	0.0150	0.0116	0.0033
18	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502	0.1799	0.1300	0.0946	0.0691	0.0508	0.0376	0.0279	0.0208	0.0180	0.0156	0.0118	0.0089	0.0023
19	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317	0.1635	0.1161	0.0829	0.0596	0.0431	0.0313	0.0229	0.0168	0.0144	0.0124	0.0092	0.0068	0.0017
20	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145	0.1486	0.1037	0.0728	0.0514	0.0365	0.0261	0.0187	0.0135	0.0115	0.0098	0.0072	0.0053	0.0012
21	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987	0.1351	0.0926	0.0638	0.0443	0.0309	0.0217	0.0154	0.0109	0.0092	0.0078	0.0056	0.0040	0.0009
22	0.5219	0.4220	0.3418	0.2775	0.2257	0.1839	0.1228	0.0826	0.0560	0.0382	0.0262	0.0181	0.0126	0.0088	0.0074	0.0062	0.0044	0.0031	0.0006
23	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703	0.1117	0.0738	0.0491	0.0329	0.0222	0.0151	0.0103	0.0071	0.0059	0.0049	0.0034	0.0024	0.0004
24	0.4919	0.3901	0.3101	0.2470	0.1971	0.1577	0.1015	0.0659	0.0431	0.0284	0.0188	0.0126	0.0085	0.0057	0.0047	0.0039	0.0027	0.0018	0.0003
25	0.4776	0.3751	0.2953	0.2330	0.1842	0.1460	0.0923	0.0588	0.0378	0.0245	0.0160	0.0105	0.0069	0.0046	0.0038	0.0031	0.0021	0.0014	0.0002
26	0.4637	0.3607	0.2812	0.2198	0.1722	0.1352	0.0839	0.0525	0.0331	0.0211	0.0135	0.0087	0.0057	0.0037	0.0030	0.0025	0.0016	0.0011	0.0002
27	0.4502	0.3468	0.2678	0.2074	0.1609	0.1252	0.0763	0.0469	0.0291	0.0182	0.0115	0.0073	0.0047	0.0030	0.0024	0.0019	0.0013	0.0008	0.0001
28	0.4371	0.3335	0.2551	0.1956	0.1504	0.1159	0.0693	0.0419	0.0255	0.0157	0.0097	0.0061	0.0038	0.0024	0.0019	0.0015	0.0010	0.0006	0.0001
29	0.4243	0.3207	0.2429	0.1846	0.1406	0.1073	0.0630	0.0374	0.0224	0.0135	0.0082	0.0051	0.0031	0.0020	0.0015	0.0012	0.0008	0.0005	0.0001
30	0.4120	0.3083	0.2314	0.1741	0.1314	0.0994	0.0573	0.0334	0.0196	0.0116	0.0070	0.0042	0.0026	0.0016	0.0012	0.0010	0.0006	0.0004	0.0000
40	0.3066	0.2083	0.1420	0.0972	0.0668	0.0460	0.0221	0.0107	0.0053	0.0026	0.0013	0.0007	0.0004	0.0002	0.0001	0.0001	0.0001	0.0000	0.0000

Table B-1 on p. 778 provides factors computed using this formula for various combinations of n and i . Each factor shows the present value of a single, lump-sum cash flow of \$1 at the end of n future periods at interest rate i .

Present values are also called *discounted values*, and the process of finding the present value is called *discounting*. You can think of this as discounting (decreasing) the value of a future cash inflow or outflow. Why is the value discounted? Because you will receive or pay the cash in the future, its value today is reduced or discounted from the future amount to be received.

Assume that a municipality issues a 3-year non-interest-bearing note payable that promises to pay you a lump sum of \$1,000 exactly 3 years from the issue date. You desire a rate of return of 6%, compounded annually. How much would you be willing to pay now for the 3-year note? The situation is sketched as follows:



The factor in the period 3 row and 6% column of Table B-1 is 0.8396. The present value of the \$1,000 payment is $\$1,000 \times 0.8396 = \$839.60$. You would therefore be willing to pay \$839.60 today for the \$1,000 that you will receive in 3 years; \$839.60 is the discounted value of the \$1,000 future amount.

Compounding can occur more frequently than once per year. Suppose interest is compounded semiannually rather than annually. In our previous example, the 3 years become six semi-annual interest compounding periods. How much would you be willing to pay, assuming the rate of return you demand per semiannual period is half the annual rate, or $6\% \div 2 = 3\%$? The factor in the period 6 row and 3% column of Table B-1 is 0.8375. You would be willing to pay $\$1,000 \times 0.8375$, or only \$837.50.

Why is the present value lower when compounding occurs more frequently? Because money grows more quickly with more frequent compounding. Consider \$1,000 invested at 6% interest compounded annually versus semi-annually:

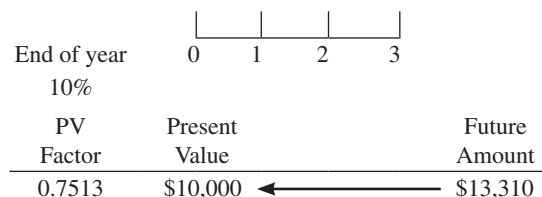
	Annual Compounding	Semi-Annual Compounding
Year 0	\$1,000.00	\$1,000.00
½ year		$\$1,000.00 \times 1.03 = \$1,030.00$
1 year	$\$1,000.00 \times 1.06 = \$1,060.00$	$\$1,030.00 \times 1.03 = \$1,060.90$
1 ½ years		$\$1,060.90 \times 1.03 = \$1,092.73$
2 years	$\$1,060.00 \times 1.06 = \$1,123.60$	$\$1,092.73 \times 1.03 = \$1,125.51$
2 ½ years		$\$1,125.51 \times 1.03 = \$1,159.27$
3 years	$\$1,123.60 \times 1.06 = \$1,190.16$	$\$1,159.27 \times 1.03 = \$1,194.05$

Notice that during the second half of year one, interest is paid on \$1,000 with annual compounding, but interest is paid on \$1,030 with semi-annual compounding. Compounding implies that interest is paid on interest, and with more frequent compounding, interest paid on interest starts sooner. Because money grows faster with semi-annual compounding, it doesn't require as many current dollars (present value) to grow to a given final value. This explains why a present value of \$837.50 grows to \$1,000 in 3 years at 6% compounded semi-annually, but if compounding occurs only annually, it requires a present value of \$839.60 to grow to \$1,000 in 3 years.

As a further check on your understanding, review the earlier example of your \$10,000 investment. Suppose the financial institution promised to pay \$13,310 at the end of 3 years. How much would you be willing to deposit at time zero if you required a 10% rate of return compounded annually? The period 3 row and 10% column factor is 0.7513 so the present value is this factor multiplied by the future amount of \$13,310:

$$PV = 0.7513 \times \$13,310 = \$10,000$$

A diagram of this computation follows:



Pause for a moment. Use Table B-1 to obtain the present values of

1. \$1,700 at 20% at the end of 20 years.
2. \$8,300 at 10% at the end of 12 years.
3. \$8,000 at 4% at the end of 4 years.

Answers:

1. $\$1,700 \times 0.0261 = \$44.37$
2. $\$8,300 \times 0.3186 = \$2,644.38$
3. $\$8,000 \times 0.8548 = \$6,838.40$

Table B-2: Present Value of an Ordinary Annuity of \$1

An annuity is a series of equal-sized cash flows spaced equally in time. An ordinary annuity has the equally spaced payments occurring at the end of each period. (We will not discuss the other type of annuity, an annuity due, which has payments at the beginning of each year.) Assume that you buy a note from a municipality that promises to pay \$1,000 at the end of each of the next 3 years. How much should you be willing to pay if you desire a rate of return of 6%, compounded annually? This series of payments is a 3-year ordinary annuity. You denote the present value of an ordinary annuity as PV_A .

Before we introduce a computational method to deal with an annuity, note that you can always find the present value of the series of annuity payments by adding together the present values of the individual payments. That is, you can simply treat the annuity as a series of individual amounts, find the present values of each of the individual amounts using Table B-1, and then add the present values to find the present value of the entire series. For our example, you would be willing to pay \$943.40 for the first payment, \$890.00 for the second, and \$839.60 for the third, so for the series of three payments, you are willing to pay a total of \$2,673.00:

	End of Year	0	1	2	3
Payment	Table 1 Factor	Present Value			
1	$\frac{1}{1.06} = 0.9434$	\$ 943.40	\$1,000		
2	$\frac{1}{(1.06)^2} = 0.8900$	890.00		1,000	
3	$\frac{1}{(1.06)^3} = 0.8396$	<u>839.60</u>			\$1,000
Total		<u>\$2,673.00</u>			

Although you can always treat an annuity as a series of individual amounts, this approach is computationally inconvenient for a long annuity. Instead, the factors in Table B-2 on p. 781 provide a computational shortcut. Let's examine the conceptual basis for Table B-2 using our 3-year annuity. The three present value factors corresponding to the three annuity payments are the first three numbers from the 6% column of Table B-1. Because you multiply each of these factors by the \$1,000 annuity payment, you can sum the factors and then multiply by \$1,000 instead of multiplying each factor by \$1,000 and then summing. For this example, the sum of the factors is $0.9434 + 0.8900 + 0.8396 = 2.6730$, and this is the value that you find in Table B-2 for a three-period annuity with an interest rate of 6%. The present value of the annuity is simply the value from Table B-2, 2.6730, multiplied by \$1,000: $2.6730 \times \$1,000 = \$2,673.00$. This shortcut is especially valuable if the cash payments or receipts extend over many periods. Consider an annual cash payment of \$1,000 for 20 years at 6%. The present value, calculated from Table B-2, is $\$1,000 \times 11.4699 = \$11,469.90$. To use Table B-1 for this calculation, you would have to perform 20 multiplications and then add the 20 products.

The factors in Table B-2 could be calculated by summing the factors in Table B-1, but they can instead be calculated using the following general formula:

$$PV_A = \frac{1}{i} \left[1 - \frac{1}{(1+i)^n} \right]$$

Applied to our illustration,

$$PV_A = \frac{1}{0.06} \left[1 - \frac{1}{(1.06)^3} \right] = \frac{1}{0.06} (1 - 0.8396) = \frac{0.1604}{0.06} = 2.6730$$

There is also a potential accuracy advantage to using annuity Table B-2 rather than summing the factors from Table B-1 for individual amounts. If you round the individual numbers before summing them, you

TABLE B-2 Present Value of Ordinary Annuity of \$1

Period	3%	4%	5%	6%	7%	8%	10%	12%	14%	16%	18%	20%	22%	24%	25%	26%	28%	30%	40%
1	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9091	0.8929	0.8772	0.8621	0.8475	0.8333	0.8197	0.8065	0.8000	0.7937	0.7813	0.7692	0.7143
2	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7355	1.6901	1.6467	1.6052	1.5656	1.5278	1.4915	1.4568	1.4400	1.4235	1.3916	1.3609	1.2245
3	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.4869	2.4018	2.3216	2.2459	2.1743	2.1065	2.0422	1.9813	1.9520	1.9234	1.8684	1.8161	1.5889
4	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.1699	3.0373	2.9137	2.7982	2.6901	2.5887	2.4936	2.4043	2.3616	2.3202	2.2410	2.1662	1.8492
5	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.7908	3.6048	3.4331	3.2743	3.1272	2.9906	2.8636	2.7454	2.6893	2.6351	2.5320	2.4356	2.0352
6	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.3553	4.1114	3.8887	3.6847	3.4976	3.3255	3.1669	3.0205	2.9514	2.8850	2.7594	2.6427	2.1680
7	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	4.8684	4.5638	4.2883	4.0386	3.8115	3.6046	3.4155	3.2423	3.1611	3.0833	2.9370	2.8021	2.2628
8	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.3349	4.9676	4.6389	4.3436	4.0776	3.8372	3.6193	3.4212	3.3289	3.2407	3.0758	2.9247	2.3306
9	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.7590	5.3282	4.9464	4.6065	4.3030	4.0310	3.7863	3.5655	3.4631	3.3657	3.1842	3.0190	2.3790
10	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.1446	5.6502	5.2161	4.8332	4.4941	4.1925	3.9232	3.6819	3.5705	3.4648	3.2689	3.0915	2.4136
11	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.4951	5.9377	5.4527	5.0286	4.6560	4.3271	4.0354	3.7757	3.6564	3.5435	3.3351	3.1473	2.4383
12	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	6.8137	6.1944	5.6603	5.1971	4.7932	4.4392	4.1274	3.8514	3.7251	3.6059	3.3868	3.1903	2.4559
13	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.1034	6.4235	5.8424	5.3423	4.9095	4.5327	4.2028	3.9124	3.7801	3.6555	3.4272	3.2233	2.4685
14	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.3667	6.6282	6.0021	5.4675	5.0081	4.6106	4.2646	3.9616	3.8241	3.6949	3.4587	3.2487	2.4775
15	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	7.6061	6.8109	6.1422	5.5755	5.0916	4.6755	4.3152	4.0013	3.8593	3.7261	3.4834	3.2682	2.4839
16	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	7.8237	6.9740	6.2651	5.6685	5.1624	4.7296	4.3567	4.0333	3.8874	3.7509	3.5026	3.2832	2.4885
17	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.0216	7.1196	6.3729	5.7487	5.2223	4.7746	4.3908	4.0591	3.9099	3.7705	3.5177	3.2948	2.4918
18	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.2014	7.2497	6.4674	5.8178	5.2732	4.8122	4.4187	4.0799	3.9279	3.7861	3.5294	3.3037	2.4941
19	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.3649	7.3658	6.5504	5.8775	5.3162	4.8435	4.4415	4.0967	3.9424	3.7985	3.5386	3.3105	2.4958
20	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	8.5136	7.4694	6.6231	5.9288	5.3527	4.8696	4.4603	4.1103	3.9539	3.8083	3.5458	3.3158	2.4970
21	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	8.6487	7.5620	6.6870	5.9731	5.3837	4.8913	4.4756	4.1212	3.9631	3.8161	3.5514	3.3198	2.4979
22	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	8.7715	7.6446	6.7429	6.0113	5.4099	4.9094	4.4882	4.1300	3.9705	3.8223	3.5558	3.3230	2.4985
23	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	8.8832	7.7184	6.7921	6.0442	5.4321	4.9245	4.4985	4.1371	3.9764	3.8273	3.5592	3.3254	2.4989
24	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	8.9847	7.7843	6.8351	6.0726	5.4509	4.9371	4.5070	4.1428	3.9811	3.8312	3.5619	3.3272	2.4992
25	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.0770	7.8431	6.8729	6.0971	5.4669	4.9476	4.5139	4.1474	3.9849	3.8342	3.5640	3.3286	2.4994
26	17.8768	15.9828	14.3752	13.0032	11.8258	10.8100	9.1609	7.8957	6.9061	6.1182	5.4804	4.9563	4.5196	4.1511	3.9879	3.8367	3.5656	3.3297	2.4996
27	18.3270	16.3296	14.6430	13.2105	11.9867	10.9352	9.2372	7.9426	6.9352	6.1364	5.4919	4.9636	4.5243	4.1542	3.9903	3.8387	3.5669	3.3305	2.4997
28	18.7641	16.6631	14.8981	13.4062	12.1371	11.0511	9.3066	7.9844	6.9607	6.1520	5.5016	4.9697	4.5281	4.1566	3.9923	3.8402	3.5679	3.3312	2.4998
29	19.1885	16.9837	15.1411	13.5907	12.2777	11.1584	9.3696	8.0218	6.9830	6.1656	5.5098	4.9747	4.5312	4.1585	3.9938	3.8414	3.5687	3.3317	2.4999
30	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	9.4269	8.0552	7.0027	6.1772	5.5168	4.9789	4.5338	4.1601	3.9950	3.8424	3.5693	3.3321	2.4999
40	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	9.7791	8.2438	7.1050	6.2335	5.5482	4.9966	4.5439	4.1659	3.9995	3.8458	3.5712	3.3332	2.5000

run the risk of introducing more rounding error than you would by using Table B-2, where rounding occurs only after the numbers are summed. Therefore, computations are more accurate using the annuity factors in Table B-2.

Now, use Table B-2 to obtain the present values of the following ordinary annuities:

1. \$1,600 at 20% for 20 years
2. \$8,300 at 10% for 12 years
3. \$8,000 at 4% for 4 years

Answers:

1. $\$1,600 \times 4.8696 = \$7,791.36$
2. $\$8,300 \times 6.8137 = \$56,553.71$
3. $\$8,000 \times 3.6299 = \$29,039.20$

Note that the higher the interest rate, the lower the present value.

Appendix C Excerpts from Form 10-K of NIKE, Inc.

UNITED STATES SECURITIES AND EXCHANGE COMMISSION Washington, D.C. 20549

Form 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended May 31, 2011

or

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934**

For the transition period from _____ to _____.

Commission File No. 1-10635

NIKE, Inc.

(Exact name of Registrant as specified in its charter)

Oregon

*(State or other jurisdiction
of incorporation)*

93-0584541

*(IRS Employer
Identification No.)*

**One Bowerman Drive
Beaverton, Oregon 97005-6453**

(Address of principal executive offices) (Zip Code)

(503) 671-6453

(Registrant's Telephone Number, Including Area Code)

Securities registered pursuant to Section 12(b) of the Act:

Class B Common Stock
(Title of Each Class)

NKE
(Trading symbol)

New York Stock Exchange
(Name of Each Exchange on Which Registered)

Securities registered pursuant to Section 12(g) of the Act:

None

DOCUMENTS INCORPORATED BY REFERENCE:

Parts of Registrant's Proxy Statement for the Annual Meeting of Shareholders to be held on October 6, 2021 are incorporated by reference into Part III of this Report.

Part I

Item 1. Business

GENERAL NIKE, Inc. was incorporated in 1967 under the laws of the state of Oregon. As used in this report, the terms "we", "us", "NIKE" and the "Company" refer to NIKE, Inc. and its predecessors, subsidiaries and affiliates, collectively, unless the context indicates otherwise. Our NIKE digital commerce website is located at www.nike.com. On our NIKE Corporate web site, located at investors.nike.com, we post the

following filings as soon as reasonably practicable after they are electronically filed with or furnished to the United States Securities and Exchange Commission (the SEC): our annual report on Form 10-K, our quarterly reports on Form 10-Q, our current reports on Form 8-K and any amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities and Exchange Act of 1934, as amended. Our definitive Proxy Statements are also posted on our corporate website. All such filings on our NIKE Corporate web site are available free of charge. Copies of these filings are also available on the SEC's website (www.sec.gov). Also available on the NIKE Corporate web site are the charters of the committees of our board of directors, as well as our corporate governance guidelines and code of ethics; copies of any of these documents will be provided in print to any shareholder who submits a request in writing to NIKE Investor Relations, One Bowerman Drive, Beaverton, Oregon 97005-6453.

Our principal business activity is the design, development and worldwide marketing and selling of footwear, apparel, equipment, and accessory products. NIKE is the largest seller of athletic footwear and apparel in the world. We sell our products directly to consumers through NIKE-owned retail stores and digital platforms (which we refer to collectively as our "NIKE Direct" operations) and to retail accounts and a mix of independent distributors, licensees and sales representatives in virtually all countries around the world. We also offer interactive consumer services and experiences through our digital platforms. Virtually all of our products are manufactured by independent contractors. Nearly all footwear and apparel products are produced outside the United States, while equipment products are produced both in the United States and abroad.

PRODUCTS We focus our NIKE Brand product offerings in six key categories: Running, NIKE Basketball, the Jordan Brand, Football (Soccer), Training and Sportswear (our sports-inspired lifestyle products). We also market products designed for kids, as well as for other athletic and recreational uses, such as American football, baseball, cricket, golf, lacrosse, skateboarding, tennis, volleyball, walking, wrestling and other outdoor activities. In June 2020, we announced that we will align our product creation and category organizations around a new consumer construct focused on Men's, Women's and Kids'. This approach is intended to allow us to create product that better meets individual consumer needs, including more specialization of our category approach, while re-aligning and simplifying our business to accelerate our largest growth opportunities.

NIKE's athletic footwear products are designed primarily for specific athletic use, although a large percentage of the products are worn for casual or leisure purposes. We place considerable emphasis on innovation and high-quality construction in the development and manufacturing of our products. Sportswear, the Jordan Brand and Running are currently our top-selling footwear categories, and we expect them to continue to lead in footwear sales.

We also sell sports apparel covering the above-mentioned categories, which feature the same trademarks and are sold predominantly through the same marketing and distribution channels as athletic footwear. Our sports apparel, similar to our athletic footwear products, is designed primarily for athletic use, although many of the products are worn for casual or leisure purposes, and demonstrates our commitment to innovation and high-quality construction. Sportswear, Training, Football (Soccer) and Running are currently our top-selling apparel categories, and we expect them to continue to lead in apparel sales. We often market footwear, apparel and accessories in "collections" of similar use or by category. We also market apparel with licensed college and professional team and league logos.

We sell a line of performance equipment and accessories under the NIKE Brand name, including bags, socks, sport balls, eyewear, timepieces, digital devices, bats, gloves, protective equipment and other equipment designed for sports activities. We also sell small amounts of various plastic products to other manufacturers through our whollyowned subsidiary, NIKE IHM, Inc., doing business as Air Manufacturing Innovation.

Our Jordan Brand designs, distributes and licenses athletic and casual footwear, apparel and accessories predominantly focused on basketball using the Jumpman trademark. Sales and

operating results for Jordan Brand products are reported within the respective NIKE Brand geographic operating segments.

Our wholly-owned subsidiary brand, Converse, headquartered in Boston, Massachusetts, designs, distributes and licenses casual sneakers, apparel and accessories under the Converse, Chuck Taylor, All Star, One Star, Star Chevron and Jack Purcell trademarks. Operating results of the Converse brand are reported on a stand-alone basis.

In addition to the products we sell to our wholesale customers and directly to consumers through our NIKE Direct operations, we have also entered into license agreements that permit unaffiliated parties to manufacture and sell, using NIKE-owned trademarks, certain apparel, digital devices and applications and other equipment designed for sports activities.

We also offer interactive consumer services and experiences through our digital platforms, including fitness and activity apps; sport, fitness and wellness content; and digital services and features in retail stores that enhance the consumer experience.

SALES AND MARKETING We experience moderate fluctuations in aggregate sales volume during the year. Historically, revenues in the first and fourth fiscal quarters have slightly exceeded those in the second and third quarters. However, the mix of product sales may vary considerably as a result of changes in seasonal and geographic demand for particular types of footwear, apparel and equipment as well as other macroeconomic, strategic, operating, and logistics-related factors, as evidenced by the impact of the COVID-19 pandemic.

Because NIKE is a consumer products company, the relative popularity and availability of various sports and fitness activities, as well as changing design trends, affect the demand for our products. We must therefore respond to trends and shifts in consumer preferences by adjusting the mix of existing product offerings, developing new products, styles and categories, and influencing sports and fitness preferences through extensive marketing. Failure to respond in a timely and adequate manner could have a material adverse effect on our sales and profitability. This is a continuing risk.

We report our NIKE Brand operations based on our internal geographic organization. Each NIKE Brand geographic segment operates predominantly in one industry: the design, development, marketing and selling of athletic footwear, apparel, and equipment. The Company's reportable operating segments for the NIKE Brand are: North America; Europe, Middle East & Africa (EMEA); Greater China; and Asia Pacific & Latin America (APLA), and include results for the NIKE and Jordan brands. The Hurley brand results, prior to its divestiture in fiscal 2020, were included in North America. Sales through our NIKE Direct operations are managed within each geographic operating segment.

UNITED STATES MARKET For fiscal 2021, NIKE Brand and Converse sales in the United States accounted for approximately 39% of total revenues, compared to 39% and 41% for fiscal 2020 and fiscal 2019, respectively. We sell our NIKE Brand, Jordan Brand and Converse products to thousands of retail accounts in the United States, including a mix of footwear stores, sporting goods stores, athletic specialty stores, department stores, skate, tennis and golf shops and other retail accounts. In the United States, we utilize NIKE sales offices to solicit such sales. During fiscal 2021, our three largest United States customers accounted for approximately 24% of sales in the United States.

Our NIKE Direct and Converse Direct to Consumer operations sell NIKE Brand, Jordan Brand and Converse products to consumers through various digital platforms. In addition, our NIKE Direct and Converse Direct to Consumer operations sell products through the following number of retail stores in the United States:

U.S. Retail Stores	Number
NIKE Brand factory stores	204
NIKE Brand in-line stores (including employee-only stores)	30
Converse stores (including factory stores)	91
Total	<u>325</u>

In the United States, NIKE has seven significant distribution centers. Four are located in Memphis, Tennessee, two of which are owned and two of which are leased. Two other distribution centers, one located in Indianapolis, Indiana and one located in Dayton, Tennessee, are leased and operated by third-party logistics providers. One distribution center for Converse is located in Ontario, California, which is leased. There are other smaller distribution facilities located in various parts of the United States, some of which are leased or operated by third-parties.

INTERNATIONAL MARKETS For fiscal 2021, non-U.S. NIKE Brand and Converse sales accounted for approximately 61% of total revenues, compared to 61% and 59% for fiscal 2020 and fiscal 2019, respectively. We sell our products to retail accounts through our own NIKE Direct operations and through a mix of independent distributors, licensees and sales representatives around the world. We sell to thousands of retail accounts and ship products from 70 distribution centers outside of the United States. During fiscal 2021, NIKE's three largest customers outside of the United States accounted for approximately 15% of total non-U.S. sales.

In addition to NIKE-owned and Converse-owned digital commerce platforms in over 45 countries, our NIKE Direct and Converse Direct to Consumer businesses operate the following number of retail stores outside the United States:

Non-U.S. Retail Stores	Number
NIKE Brand factory stores	618
NIKE Brand in-line stores (including employee-only stores)	46
Converse stores (including factory stores)	<u>59</u>
Total	<u><u>723</u></u>

International branch offices and subsidiaries of NIKE are located in Argentina, Australia, Austria, Belgium, Bermuda, Brazil, Canada, Chile, China, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, Indonesia, India, Israel, Italy, Japan, Korea, Lebanon, Macau, Malaysia, Mexico, New Zealand, the Netherlands, Norway, the Philippines, Poland, Portugal, Russia, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the United Arab Emirates, the United Kingdom, Uruguay and Vietnam.

SIGNIFICANT CUSTOMER No customer accounted for 10% or more of our consolidated net revenues during fiscal 2021.

PRODUCT RESEARCH, DESIGN, AND DEVELOPMENT We believe our research, design and development efforts are key factors in our success. Technical innovation in the design and manufacturing process of footwear, apparel and athletic equipment receives continued emphasis as we strive to produce products that help to enhance athletic performance, reduce injury and maximize comfort, while reducing waste.

In addition to our own staff of specialists in the areas of biomechanics, chemistry, exercise physiology, engineering, digital technologies, industrial design, sustainability and related fields, we also utilize research committees and advisory boards made up of athletes, coaches, trainers, equipment managers, orthopedists, podiatrists, physicians and other experts who consult with us and review certain designs, materials and concepts for product and manufacturing process improvements and compliance with product safety regulations around the world. Employee athletes, athletes engaged under sports marketing contracts and other athletes wear-test and evaluate products during the design and development process.

As we continue to develop new technologies, we are simultaneously focused on the design of innovative products and experiences incorporating such technologies throughout our product categories and consumer applications. Using market intelligence and research, our various design teams identify opportunities to leverage new technologies in existing categories to respond to consumer preferences. The proliferation of NIKE Air, Zoom, Free, Flywire, Dri-Fit, Flyknit, Flyweave, FlyEase, ZoomX, Air Max, React and Adapt technologies, among others, typifies our dedication to designing innovative products.

MANUFACTURING We are supplied by 191 footwear factories located in 14 countries. Virtually all of our footwear is manufactured outside of the United States by over 15 independent

contract manufacturers, which often operate multiple factories. The largest single footwear factory accounted for approximately 9% of total fiscal 2021 NIKE Brand footwear production. For fiscal 2021, contract factories in Vietnam, Indonesia and China manufactured approximately 51%, 24% and 21% of total NIKE Brand footwear, respectively. We also have manufacturing agreements with independent contract manufacturers in Argentina and India to manufacture footwear for sale primarily within those countries. For fiscal 2021, four footwear contract manufacturers each accounted for greater than 10% of footwear production and in the aggregate accounted for approximately 61% of NIKE Brand footwear production.

We are supplied by 344 apparel factories located in 33 countries. The largest single apparel factory accounted for approximately 8% of total fiscal 2021 NIKE Brand apparel production. Virtually all of our apparel is manufactured outside of the United States by independent contract manufacturers, which often operate multiple factories. For fiscal 2021, contract factories in Vietnam, China and Cambodia produced approximately 30%, 19% and 12% of total NIKE Brand apparel, respectively. For fiscal 2021, two apparel contract manufacturers each accounted for more than 10% of apparel production, and the top five contract manufacturers in the aggregate accounted for approximately 51% of NIKE Brand apparel production.

The principal materials used in our footwear products are natural and synthetic rubber, plastic compounds, foam cushioning materials, natural and synthetic leather, nylon, polyester and canvas, as well as polyurethane films used to make NIKE Air-Sole cushioning components. During fiscal 2021, Air Manufacturing Innovation, a wholly-owned subsidiary, with facilities near Beaverton, Oregon, in Dong Nai Province, Vietnam, and St. Charles, Missouri, as well as independent contractors in China and Vietnam, were our suppliers of materials and cushioning components used in footwear. Air Manufacturing Innovation also manufactures and sells small amounts of various other plastic products to other manufacturers. The principal materials used in our apparel products are natural and synthetic fabrics, yarns and threads (both virgin and recycled); specialized performance fabrics designed to efficiently wick moisture away from the body, retain heat and repel rain and/or snow; and plastic and metal hardware. NIKE's independent contractors and suppliers buy raw materials for the manufacturing of our footwear, apparel and equipment products. Most raw materials are available and purchased by those independent contractors and suppliers in the countries where manufacturing takes place. NIKE's independent contractors and suppliers have thus far experienced little difficulty in satisfying raw material requirements for the production of our products.

Since 1972, Sojitz Corporation of America ("Sojitz America"), a large Japanese trading company and the sole owner of our redeemable preferred stock, has performed import-export financing services for us.

INTERNATIONAL OPERATIONS AND TRADE Our international operations and sources of supply are subject to the usual risks of doing business abroad, such as the implementation of, or potential changes in, foreign and domestic trade policies, increases in import duties, anti-dumping measures, quotas, safeguard measures, trade restrictions, restrictions on the transfer of funds and, in certain parts of the world, political tensions, instability, conflicts, nationalism and terrorism. We have not, to date, been materially affected by any such risk but cannot predict the likelihood of such material effects occurring in the future.

In recent years, uncertain global and regional economic and political conditions have affected international trade and increased protectionist actions around the world. These trends are affecting many global manufacturing and service sectors, and the footwear and apparel industries, as a whole, are not immune. Companies in our industry are facing trade protectionism in many different regions, and, in nearly all cases, we are working together with industry groups to address trade issues and reduce the impact to the industry, while observing applicable competition laws. Notwithstanding our efforts, protectionist measures have resulted in increases in the cost of our products, and additional measures, if implemented, could adversely affect sales and/or profitability for NIKE, as well as the imported footwear and apparel industry as a whole. We monitor protectionist trends and developments throughout the world that may materially impact our industry, and we engage in administrative and judicial processes to mitigate trade restrictions. We are actively monitoring actions that may result in additional anti-dumping measures and could affect our industry. We are also monitoring for and advocating against other impediments that may limit or delay customs clearance for imports of footwear, apparel and equipment. NIKE also advocates for trade liberalization for footwear and apparel in a number of regional and bilateral free trade agreements.

Changes in, and responses to, U.S. trade policies, including the imposition of tariffs or penalties on imported goods or retaliatory measures by other countries, could negatively affect U.S. corporations, including NIKE, with business operations and/or consumer markets in those countries, which could also make it necessary for us to change the way we conduct business, either of which may have an adverse effect on our business, financial condition or our results of operations. In addition, with respect to proposed trade restrictions, we work with a broad coalition of global businesses and trade associations representing a wide variety of sectors to help ensure that any legislation enacted and implemented (i) addresses legitimate and core concerns, (ii) is consistent with international trade rules and (iii) reflects and considers domestic economies and the important role they may play in the global economic community.

Where trade protection measures are implemented, we believe we have the ability to develop, over a period of time, adequate alternative sources of supply for the products obtained from our present suppliers. If events prevented us from acquiring products from our suppliers in a particular country, our operations could be temporarily disrupted and we could experience an adverse financial impact. However, we believe we could abate any such disruption, and that much of the adverse impact on supply would, therefore, be of a short-term nature, although alternate sources of supply might not be as cost-effective and could have an ongoing adverse impact on profitability.

Our international operations are also subject to compliance with the U.S. Foreign Corrupt Practices Act, or “FCPA”, and other anti-bribery laws applicable to our operations. We source a significant portion of our products from, and have important consumer markets, outside of the United States, and we have an ethics and compliance program to address compliance with the FCPA and similar laws by us, our employees, agents, suppliers and other partners.

COMPETITION The athletic footwear, apparel and equipment industry is highly competitive on a worldwide basis. We compete internationally with a significant number of athletic and leisure footwear companies, athletic and leisure apparel companies, sports equipment companies and large companies having diversified lines of athletic and leisure footwear, apparel and equipment, including adidas, Anta, ASICS, Li Ning, lululemon athletica, Puma, Under Armour and V.F. Corporation, among others. The intense competition and the rapid changes in technology and consumer preferences in the markets for athletic and leisure footwear and apparel and athletic equipment constitute significant risk factors in our operations. Refer to Item 1A. Risk Factors for additional information.

NIKE is the largest seller of athletic footwear and apparel in the world. Important aspects of competition in this industry are:

- Product attributes such as quality; performance and reliability; new product style, design, innovation and development; as well as consumer price/value.
- Consumer connection, engagement and affinity for brands and products, developed through marketing, promotion and digital experiences; social media interaction; customer support and service; identification with prominent and influential athletes, influencers, public figures, coaches, teams, colleges and sports leagues who endorse our brands and use our products and active engagement through sponsored sporting events and clinics.
- Effective sourcing and distribution of products, with attractive merchandising and presentation at retail, both in-store and on digital platforms.

We believe that we are competitive in all of these areas.

TRADEMARKS AND PATENTS We believe that our intellectual property rights are important to our brand, our success and our competitive position. We strategically pursue available protections of these rights and vigorously protect them against third-party theft and infringement.

We use trademarks on nearly all of our products and believe having distinctive marks that are readily identifiable is an important factor in creating a market for our goods, in identifying our brands and the Company, and in distinguishing our goods from the goods of others. We consider our NIKE and Swoosh Design trademarks to be among our most valuable assets and we have registered these trademarks in almost 170 jurisdictions worldwide. In addition, we own many other trademarks that we use in marketing our products. We own common law rights in the trade dress of several significant shoe designs and elements. For certain trade dress, we have sought and obtained trademark registrations.

We have copyright protection in our design, graphics and other original works. When appropriate, we also obtain registered copyrights.

We file for, own and maintain many U.S. and foreign utility and design patents protecting components, technologies, materials, manufacturing techniques, features, functionality, and industrial designs used in and for the manufacture of various athletic and leisure footwear and apparel, athletic equipment and digital devices and related software applications. These patents expire at various times.

We believe our success depends upon our capabilities in areas such as design, research and development, production and marketing and is supported by our intellectual property rights, such as trademarks, patents and trade secrets, among others.

We have followed a policy of applying for and registering intellectual property rights in the United States and select foreign countries on trademarks, inventions, innovations and designs that we deem valuable. We also continue to vigorously protect our intellectual property, including trademarks, patents and trade secrets against third-party infringement.

HUMAN CAPITAL RESOURCES At NIKE, we consider the strength and effective management of our workforce to be essential to the ongoing success of our business. We believe that it is important to attract, develop and retain a diverse and engaged workforce at all levels of our business and that such a workforce fosters creativity and accelerates innovation. We are focused on building an increasingly diverse talent pipeline that reflects our consumers, athletes and the communities we serve.

CULTURE Each employee shapes NIKE's culture through behaviors and practices. This starts with our Maxims, which represent our core values and, along with our Code of Conduct, feature the fundamental behaviors that help anchor, inform and guide us and apply to all employees. Our mission is to bring inspiration and innovation to every athlete in the world, which includes the belief that if you have a body, you are an athlete. We aim to do this by creating groundbreaking sport innovations, making our products more sustainably, building a creative and diverse global team and making a positive impact in communities where we live and work. Our mission is aligned with our deep commitment to maintaining an environment where all NIKE employees have the opportunity to reach their full potential, to connect to our brands and to shape the culture in which they work. We believe providing for growth and retention of our employees is essential in fostering such a culture and are dedicated to giving access to training programs and career development opportunities, including trainings on NIKE's values, history and business, trainings on developing leadership skills at all levels, tools and resources for managers and qualified tuition reimbursement opportunities.

As part of our commitment to empowering our employees to help shape our culture, we source employee feedback through our Engagement Survey program. The program provides every employee throughout the globe an opportunity to provide confidential feedback on key areas known to drive employee engagement, including their satisfaction with their managers, their work and the Company generally. The program also measures our employees' emotional commitment to NIKE as well as NIKE's culture of diversity, equity and inclusion. NIKE also provides multiple points of contact for employees to speak up if they experience something that does not align with our values or otherwise violates our workplace policies, even if they are uncertain what they observed or heard is a violation of company policy.

As part of our commitment to make a positive impact on our communities, we have maintained a goal of investing 1.5% of our prior fiscal year's pre-tax income into global communities, with an emphasis on inspiring kids to be active through play and sport. We increased that annual goal to 2% for fiscal 2022 forward. Our community investments are an important part of our culture in that we also support employees in giving back to community organizations through donations and volunteering, which are matched by the NIKE Foundation where eligible.

EMPLOYEE BASE As of May 31, 2021, we had approximately 73,300 employees worldwide, including retail and part-time employees. We also utilize independent contractors and temporary personnel to supplement our workforce.

None of our employees are represented by a union, except for certain employees in the APLA geography, where local law requires those employees to be represented by a trade union. Also, in some countries outside of the United States, local laws require employee representation by works councils (which may be entitled to information and consultation on certain

Company decisions) or by organizations similar to a union. In certain European countries, we are required by local law to enter into, and/or comply with, industry-wide or national collective bargaining agreements. NIKE has never experienced a material interruption of operations due to labor disagreements.

DIVERSITY, EQUITY, AND INCLUSION (DE&I) DE&I is a strategic priority for NIKE and we are committed to having an increasingly diverse team and culture. We aim to foster an inclusive workplace through recruitment, development and retention of diverse talent with the goal of expanding representation across all dimensions of diversity over the long term. In fiscal 2021, we elevated our DE&I team to sit at the heart of NIKE's People and Culture Strategy and combined our Talent and Diversity & Inclusion teams under a single leader. We also announced certain targets for the Company to work toward by fiscal 2025, including increasing representation of women in our global corporate workforce and leadership positions, as well as increasing representation of U.S. racial and ethnic minorities in our U.S. corporate workforce and at the Director level and above.

We have enhanced our efforts to recruit diverse talent through our traditional channels and launched new initiatives, such as partnerships with athletes and sports-related organizations to create apprenticeship programs and new partnerships with organizations, colleges and universities that serve diverse populations. Additionally, we are prioritizing DE&I education so that all NIKE employees and leaders have the cultural awareness and understanding to build diverse and inclusive teams. We also have Employee Networks, collectively known as NikeUNITED, representing various employee groups.

Our DE&I focus extends beyond our workforce and includes our communities, which we support in a number of ways. We have committed to investments through both the NIKE and Jordan Brands that aim to address racial inequality and improve diversity and representation in our communities. We also are leveraging our global scale to accelerate business diversity, including investing in business training programs for women and increasing the proportion of services supplied by minority-owned businesses.

COMPENSATION AND BENEFITS NIKE's total rewards are intended to be competitive and equitable, meet the diverse needs of our global teammates and reinforce our values. We are committed to providing comprehensive, competitive and equitable pay and benefits to our employees, and we have invested, and aim to continue to invest, in our employees through growth and development and well-being initiatives. Our initiatives in this area include:

- We are committed to competitive pay and to reviewing our pay and promotion practices annually.
- We have an annual company bonus plan and a retail-focused bonus plan applicable to all eligible employees. Both programs are focused on rewarding employees for company performance, which we believe reinforces our culture and rewards behaviors that support collaboration and teamwork.
- We provide comprehensive family care benefits in the U.S. and globally where practicable.
- Our Military Leave benefit provides up to 12 weeks of paid time off every 12 months, and we enhanced our Military Leave benefit for employees called up to serve as part of the U.S. COVID-19 response.
- We offer free access to our Sport Centers at our World Headquarters (WHQ) for our full-time employees and North America store employees.
- We provide employees free access to mindfulness and meditation resources, including membership to Headspace as well as live classes through our Sport Centers.
- Our global Employee Assistance Program (EAP) provides free and confidential counseling to all global employees and their families.
- As part of our continued commitment to support our teammates through pay and benefits, we introduced the following new and enhanced employee programs in fiscal 2021:
 - (a) We enhanced our family care program through additional leaves, backup care and child/elder care assistance, and we introduced an income-based childcare subsidy, expanding childcare support to employees beyond those at WHQ.
 - (b) We enhanced U.S. mental healthcare coverage.
 - (c) We updated our transgender healthcare coverage to provide employees covered on the U.S. Health Plan access to both restorative services and personalized care.

COVID-19 RESPONSE Since the start of the COVID-19 pandemic, NIKE has been, and continues to be, committed to supporting our employees and communities. Some of the ways NIKE responded during the pandemic to support employees include:

- Throughout the pandemic NIKE has provided pay continuity for our retail, Air Manufacturing Innovation and distribution center employees—employees who were particularly affected by closures and reduced hours in fiscal 2020 and fiscal 2021. We have also taken precautions to provide a safe working environment, encouraging and supporting work-from-home whenever possible and instituting protective policies and procedures for when remote work is not possible.
- We provided a two-to-one match for all employee donations to community organizations providing COVID relief and support anywhere in the world.
- We offer two weeks of paid COVID-19 sick leave for all employees, in addition to existing paid time off benefits and legally mandated sick leave programs, which covers physical health as well as mental and emotional well-being and care for a family member. We also provide the option for employees to utilize up to two weeks of paid time off in advance of accrued balances, if needed.
- As part of our holistic approach to support our employees in their wellness journey during quarantine mandates, we offered NTC Premium, the NIKE Training Club's subscription-based service, for free to our employees globally.
- In addition to our existing EAP, we enhanced mental healthcare to include virtual care, access to insomnia and anxiety apps and increased EAP support.
- We also supported certain eligible employees who work from home due to COVID-19 health and safety measures by providing them with select technology and ergonomic products through a NIKE-exclusive portal.

Additional information related to our human capital strategy can be found in our FY20 NIKE, Inc. Impact Report, which is available on the Purpose section of our website. Information contained on or accessible through our websites is not incorporated into, and does not form a part of, this Annual Report or any other report or document we file with the SEC, and any references to our websites are intended to be inactive textual references only.

INFORMATION ABOUT OUR EXECUTIVE OFFICERS The executive officers of NIKE, Inc. as of July 20, 2021, are as follows:

Mark G. Parker, Executive Chairman—Mr. Parker, 65, is Executive Chairman of the Board of Directors and served as President and Chief Executive Officer from 2006 – January 2020. He has been employed by NIKE since 1979 with primary responsibilities in product research, design and development, marketing and brand management. Mr. Parker was appointed divisional Vice President in charge of product development in 1987, corporate Vice President in 1989, General Manager in 1993, Vice President of Global Footwear in 1998 and President of the NIKE Brand in 2001.

John J. Donahoe II, President and Chief Executive Officer—Mr. Donahoe, 61, was appointed President and Chief Executive Officer in January 2020 and has been a director since 2014. He brings expertise in digital commerce, technology and global strategy. He previously served as President and Chief Executive Officer at ServiceNow, Inc. Prior to joining ServiceNow, Inc., he served as President and Chief Executive Officer of eBay, Inc. He also held leadership roles at Bain & Company for two decades.

Andrew Campion, Chief Operating Officer—Mr. Campion, 49, joined NIKE in 2007 as Vice President of Global Planning and Development, leading strategic and financial planning. He was appointed Chief Financial Officer of the NIKE Brand in 2010, responsible for leading all aspects of financial management for the Company's flagship brand. In 2014, he was appointed Senior Vice President, Strategy, Finance and Investor Relations. Mr. Campion assumed the role of Executive Vice President and Chief Financial Officer in August 2015. In April 2020, he was appointed Chief Operating Officer and leads NIKE's global technology and digital transformation, demand and supply management, manufacturing, distribution and logistics, sustainability, workplace design and connectivity, and procurement. Prior to joining NIKE, he held leadership roles in strategic planning, mergers and acquisitions, financial planning and analysis, operations and planning, investor relations and tax at The Walt Disney Company.

Matthew Friend, Executive Vice President and Chief Financial Officer—Mr. Friend, 43, joined NIKE in 2009 as Senior Director of Corporate Strategy and Development, and was appointed

Chief Financial Officer of Emerging Markets in 2011. In 2014, Mr. Friend was appointed Chief Financial Officer of Global Categories, Product and Functions, and was subsequently appointed Chief Financial Officer of the NIKE Brand in 2016. He was also appointed Vice President of Investor Relations in 2019. Mr. Friend was appointed as Executive Vice President and Chief Financial Officer of NIKE, Inc. in April 2020. Prior to joining NIKE, he worked in the financial industry including roles as VP of investment banking and mergers and acquisitions at Goldman Sachs and Morgan Stanley.

Hilary K. Krane, Executive Vice President, Chief Administrative Officer and General Counsel—Ms. Krane, 57, joined NIKE as Vice President and General Counsel in 2010. In 2011, her responsibilities expanded, and she became Vice President, General Counsel and Corporate Affairs. Ms. Krane was appointed Executive Vice President, Chief Administrative Officer and General Counsel in 2013. Prior to joining NIKE, Ms. Krane was General Counsel and Senior Vice President for Corporate Affairs at Levi Strauss & Co. from 2006 to 2010. From 1996 to 2006, she was a Partner and Assistant General Counsel at PricewaterhouseCoopers LLP.

Monique S. Matheson, Executive Vice President, Global Human Resources—Ms. Matheson, 54, joined NIKE in 1998, with primary responsibilities in the human resources function. She was appointed as Vice President and Senior Business Partner in 2011 and Vice President, Chief Talent and Diversity Officer in 2012. Ms. Matheson was appointed Executive Vice President, Global Human Resources in 2017.

Heidi O'Neill, President of Consumer and Marketplace—Ms. O'Neill, 56, joined NIKE in 1998, and held a variety of leadership roles, including President of NIKE Direct, where she was responsible for NIKE's connection to its consumer globally through the Company's retail and digital-commerce business. She also led NIKE's women's business for seven years, growing it into a multi-billion dollar business, and leading the Company's North America apparel business as VP/GM. Ms. O'Neill was appointed as President of Consumer and Marketplace in April 2020 and is responsible for NIKE's Direct business, including all stores, e-commerce and apps globally.

Item 1A. Risk Factors

The risks included here are not exhaustive. Other sections of this report may include additional factors which could adversely affect NIKE's business and financial performance. Moreover, NIKE operates in a very competitive and rapidly changing environment. New risks emerge from time to time and it is not possible for management to predict all such risks, nor can it assess the impact of all such risks on NIKE's business or the extent to which any risk, or combination of risks, may cause actual results to differ materially from those contained in any forward-looking statements. Given these risks and uncertainties, investors should not place undue reliance on forward-looking statements as a prediction of actual results.

Investors should also be aware that while NIKE does, from time to time, communicate with securities analysts, it is against NIKE's policy to disclose to them any material nonpublic information or other confidential commercial information. Accordingly, shareholders should not assume that NIKE agrees with any statement or report issued by any analyst irrespective of the content of the statement or report. Furthermore, NIKE has a policy against confirming financial forecasts or projections issued by others. Thus, to the extent that reports issued by securities analysts contain any projections, forecasts or opinions, such reports are not the responsibility of NIKE.

Economic and Industry Risks

1. Our financial condition and results of operations have been, and could in the future be, adversely affected by the coronavirus pandemic.
2. Global economic conditions could have a material adverse effect on our business, operating results and financial condition.
3. Our products, services and experiences face intense competition.
4. Economic factors beyond our control, and changes in the global economic environment, including fluctuations in inflation and currency exchange rates, could result in lower revenues, higher costs and decreased margins and earnings.
5. We may be adversely affected by the financial health of our customers.
6. Extreme weather conditions and natural disasters could negatively impact our operating results and financial condition.

Business and Operational Risks

1. Failure to maintain our reputation, brand image and culture could negatively impact our business.
2. Our business is affected by seasonality, which could result in fluctuations in our operating results.
3. If we are unable to anticipate consumer preferences and develop new products, we may not be able to maintain or increase our revenues and profits.
4. We rely on technical innovation and high-quality products to compete in the market for our products.
5. Failure to continue to obtain or maintain high-quality endorsers of our products could harm our business.
6. Failure to accurately forecast consumer demand could lead to excess inventories or inventory shortages, which could result in decreased operating margins, reduced cash flows and harm to our business.
7. Our NIKE Direct operations have required and will continue to require a substantial investment and commitment of resources and are subject to numerous risks and uncertainties.
8. If the technology-based systems that give our consumers the ability to shop or interact with us online do not function effectively, our operating results, as well as our ability to grow our digital commerce business globally or to retain our customer base, could be materially adversely affected.
9. We rely significantly on information technology to operate our business, including our supply chain and retail operations, and any failure, inadequacy or interruption of that technology could harm our ability to effectively operate our business.
10. We are subject to the risk our licensees may not generate expected sales or maintain the value of our brands.
11. Consolidation of retailers or concentration of retail market share among a few retailers may increase and concentrate our credit risk and impair our ability to sell products.
12. If one or more of our counterparty financial institutions default on their obligations to us or fail, we may incur significant losses.
13. We rely on a concentrated source base of contract manufacturers to supply a significant portion of our footwear products.
14. The market for prime real estate is competitive.
15. The success of our business depends, in part, on high-quality employees, including key personnel as well as our ability to maintain our workplace culture and values.
16. Our business operations and financial performance could be adversely affected by changes in our relationship with our workforce or changes to United States or foreign employment regulations.

Risks Related to Operating a Global Business

1. Our international operations involve inherent risks which could result in harm to our business.
2. Our products are subject to risks associated with overseas sourcing, manufacturing and financing.
3. Our success depends on our global distribution facilities.

Legal, Regulatory, and Compliance Risks

1. We are subject to a complex array of laws and regulations and litigation and other legal and regulatory proceedings, which could have an adverse effect on our business, financial condition and results of operations.
2. Changes to U.S. or other countries' trade policies and tariff and import/export regulations or our failure to comply with such regulations may have a material adverse effect on our reputation, business, financial condition and results of operations.
3. Failure to adequately protect or enforce our intellectual property rights could adversely affect our business.
4. We are subject to data security and privacy risks that could negatively affect our results, operations or reputation.

5. We could be subject to changes in tax rates, adoption of new tax laws, additional tax liabilities or increased volatility in our effective tax rate.
6. Failure of our contractors or our licensees' contractors to comply with our code of conduct, local laws and other standards could harm our business.

Risks Related to Our Securities, Investments and Liquidity

1. Our financial results may be adversely affected if substantial investments in businesses and operations fail to produce expected returns.
2. The sale of a large number of shares of common stock by our principal stockholder could depress the market price of our common stock.
3. Changes in our credit ratings or macroeconomic conditions may affect our liquidity, increasing borrowing costs and limiting our financing options.
4. If our internal controls are ineffective, our operating results could be adversely affected.
5. If our estimates or judgments relating to our critical accounting policies prove to be incorrect, our operating results could be adversely affected.
6. Anti-takeover provisions may impair an acquisition of the Company or reduce the price of our common stock.
7. We may fail to meet market expectations, which could cause the price of our stock to decline.

Item 2. Properties

The following is a summary of principal properties owned or leased by NIKE:

The NIKE World Campus, owned by NIKE and located near Beaverton, Oregon, USA, is an approximately 400-acre site consisting of over 40 buildings which, together with adjacent leased properties, functions as our world headquarters and is occupied by approximately 11,700 employees engaged in management, research, design, development, marketing, finance and other administrative functions serving nearly all of our segments. We lease a similar, but smaller, administrative facility in Hilversum, the Netherlands, which serves as the headquarters for our Europe, Middle East & Africa geography and management of certain brand functions for our non-U.S. operations. We also lease an office complex in Shanghai, China, our headquarters for our Greater China geography, occupied by employees focused on implementing our wholesale, NIKE Direct and merchandising strategies in the region, among other functions.

In the United States, NIKE has seven significant distribution centers. Four are located in Memphis, Tennessee, two of which are owned and two of which are leased. Two other distribution centers, one located in Indianapolis, Indiana and one located in Dayton, Tennessee, are leased and operated by third-party logistics providers. One distribution center for Converse is located in Ontario, California, which is leased. NIKE has a number of distribution facilities outside the United States, some of which are leased and operated by third-party logistics providers. The most significant distribution facilities outside the United States are located in Laakdal, Belgium; Taicang, China; Tomisato, Japan and Incheon, Korea, all of which we own, as well as in Suzhou, China, which is leased and operated by a third-party logistics provider.

Air Manufacturing Innovation manufactures cushioning components used in footwear at NIKE-owned and leased facilities located near Beaverton, Oregon, and in Dong Nai Province, Vietnam, as well as at NIKE-owned facilities in St. Charles, Missouri.

Aside from the principal properties described above, we lease many offices worldwide for sales and administrative purposes. We lease approximately 1,043 retail stores worldwide, which primarily consist of factory stores. See "United States Market" and "International Markets" for additional information regarding our retail stores. Our leases expire at various dates through the fiscal year 2043.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

NIKE designs, develops, markets and sells athletic footwear, apparel, equipment, accessories and services worldwide. We are the largest seller of athletic footwear and apparel in the world. We sell our products through NIKE-owned retail stores and through digital platforms (which we refer to collectively as our "NIKE Direct" operations), to retail accounts and to a mix of independent distributors, licensees and sales representatives in virtually all countries around the world.

Our goal is to deliver value to our shareholders by building a profitable global portfolio of branded footwear, apparel, equipment and accessories businesses. Our strategy is to achieve long-term revenue growth by creating innovative, “must-have” products, building deep personal consumer connections with our brands and delivering compelling consumer experiences through digital platforms and at retail.

Since fiscal 2018, through the Consumer Direct Offense and our Triple Double strategy, we have focused on doubling the impact of innovation, increasing our speed and agility to market and growing our direct connections with consumers. In June 2020, we announced a new digitally empowered phase of the Consumer Direct Offense strategy: Consumer Direct Acceleration. This strategic acceleration will focus on three specific areas. First, creating the marketplace of the future through more premium, consistent and seamless consumer experiences that more closely align with what consumers want and need. This strategy will lead with NIKE Digital and our owned stores, as well as through select strategic partners who share our marketplace vision. Second, we will align our product creation and category organizations around a new consumer construct focused on Men’s, Women’s and Kids’. This approach is intended to allow us to create product that better meets individual consumer needs, including more specialization of our category approach, while re-aligning and simplifying our offense to accelerate our largest growth opportunities. In particular, we expect to reinvest in our Women’s and Kids’ businesses and also simplify our operating model across the remainder of the Company to optimize effectiveness. Third, we will unify investments in data and analytics, demand sensing, insight gathering, inventory management and other areas against an end-to-end technology foundation to accelerate our digital transformation. We believe this unified approach will accelerate growth and unlock more efficiency for our business, while driving speed and responsiveness as we serve consumers globally. As such, our new financial goals through fiscal 2025 are outlined below:

- High single-digit to low double-digit revenue growth;
- Gross margin rate in the high 40s by fiscal 2025;
- Earnings before interest and taxes as a percent of revenues (“EBIT Margin”) in the high teens by fiscal 2025;
- Mid to high teens diluted earnings per share growth;
- Exceeding low 30% range rate of return on invested capital (ROIC); and
- Annual capital expenditures at roughly 3% of Revenues.

As a result of our strategic acceleration, management announced on July 22, 2020, a series of leadership and operating model changes to streamline and speed up our execution. These changes resulted in a net reduction of our global workforce and during fiscal 2021, we incurred pre-tax charges of \$294 million, which relate to employee termination costs and, to a lesser extent, stock-based compensation expense. All related actions are now substantially complete, and we expect future annual wage-related savings will be reinvested to execute against this next phase of our strategy. For more information related to our organizational realignment and related costs, see Note 21—Restructuring within the accompanying Notes to the Consolidated Financial Statements.

COVID-19 Update

Throughout fiscal 2021, the COVID-19 pandemic impacted our business results and operations globally. Our business and wholesale partners experienced temporary store closures and stores operating on reduced hours, as a result of mandatory lockdowns across our North America, EMEA and APLA geographies. Additionally, disruption in the global supply chain due to container shortages, transportation delays and U.S. port congestion interrupted the flow of our inventory. Despite the disruption caused by the pandemic, we achieved record Revenues for fiscal 2021, which increased 19% to \$44.5 billion, compared to the prior fiscal year, with gross margin expansion of 140 basis points. We ended the fiscal year with Inventories down 7% compared to May 31, 2020, and our liquidity position remains strong with \$13.5 billion of Cash and equivalents and Short-term investments, an increase of \$4.7 billion compared to May 31, 2020.

Our NIKE Direct business fueled our growth throughout the year as we navigated the pandemic, leveraging our digital platforms with our store footprint to connect directly with the consumer. NIKE Brand digital revenues grew 60% on a currency-neutral basis, with strong double-digit growth across each of our geographies. Despite temporary store closures throughout the year, due to COVID-19 safety-related measures, we experienced a 4% increase in comparable

store sales, driven by growth in Greater China and North America, partially offset by declines in EMEA and APLA. As of July 15, 2021, approximately 99% of our owned stores were open with some operating on reduced hours.

We continue to monitor the rapidly evolving situation, as well as guidance from international and domestic authorities, including federal, state and local public health authorities and may take additional actions based on their recommendations. In these circumstances, there may be developments outside our control requiring us to adjust our operating plan. There remains risk that COVID-19 could have material adverse impacts on our future revenue growth as well as our overall profitability and may lead to higher than normal inventory levels in various markets, adverse impacts on the global supply chain, revised payment terms with certain of our wholesale customers, higher sales-related reserves, factory cancellation costs and a volatile effective tax rate driven by changes in the mix of earnings across our jurisdictions.

Fiscal 2021 Overview

In fiscal 2021, NIKE, Inc. achieved record Revenues which increased 19% to \$44.5 billion. The NIKE Brand, which represents over 90% of NIKE, Inc. Revenues, experienced growth of 19%, up 17% on a currency-neutral basis, driven by increases across all geographies. NIKE Direct grew 30% on a currency-neutral basis, driven by 60% growth in digital, with all geographies growing strong double digits, while wholesale revenues grew 10%. Revenues for Converse increased 19% and 16%, on a reported and currency-neutral basis, respectively, led by strong double-digit growth in digital.

Income (loss) before income taxes increased 131% for fiscal 2021, primarily due to higher revenues, gross margin expansion and selling and administrative expense leverage. NIKE, Inc. gross margin increased 140 basis points primarily due to annualizing the impacts of COVID-19 including lower factory cancellation charges, lower inventory obsolescence reserves as well as the favorable rate impact of fixed supply chain costs on a higher volume of wholesale shipments. The increase in gross margin also reflects higher full-price product margins across wholesale and NIKE Direct. Selling and administrative expense decreased due to lower Demand creation expense, partially offset by higher Operating overhead expense. Demand creation expense decreased primarily due to lower marketing and advertising expenses for our brand events and retail operations, as well as lower sports marketing expenses as sporting events were postponed due to COVID-19. These decreases were partially offset by higher digital marketing investments. Operating overhead expense increased primarily due to an increase in strategic technology investments, higher NIKE Direct variable costs and \$255 million in restructuring-related costs, partially offset by lower bad debt expense and travel and related expenses. ROIC as of May 31, 2021, was 48.8% compared to 21.5% as of May 31, 2020. ROIC is considered a non-GAAP financial measure, see “Use of Non-GAAP Financial Measures” for further information.

During fiscal 2020, we entered into definitive agreements to sell our NIKE Brand businesses in Brazil, Argentina, Chile and Uruguay and to shift to a distributor operating model. During fiscal 2021, the transaction with Grupo SBF S.A. to purchase substantially all of our NIKE Brand operations in Brazil closed. Additionally, during the third quarter of fiscal 2021, we mutually agreed with Grupo Axo to terminate the sale and purchase agreement for the transition of NIKE’s businesses in Argentina, Chile and Uruguay to a distributor partnership. However, as we remain committed to selling the legal entities in all three countries and granting distribution rights to third-party distributors, the assets and liabilities of the entities have remained classified as held-for-sale on our Consolidated Balance Sheets as of May 31, 2021. For more information related to our planned distributor partnership transition within APLA, see Note 20—Acquisitions and Divestitures within the accompanying Notes to the Consolidated Financial Statements. In future quarters, as we shift from a wholesale and direct to consumer operating model to a distributor operating model within these countries, we expect consolidated NIKE, Inc. and APLA revenue growth will be reduced due to differences in commercial terms. However, we expect the future operating model to have a favorable impact on our overall profitability as we reduce selling and administrative expenses, as well as lessen exposure to foreign exchange rate volatility.

While foreign currency markets remain volatile, in part due to geopolitical dynamics which may lead to a stronger U.S. Dollar, we continue to see opportunities to drive future growth and profitability. We remain committed to effectively managing our business and mitigating financial market risks to achieve our financial goals over the long-term by executing against the operational strategies outlined above.

Use of Non-GAAP Financial Measures

Throughout this Annual Report on Form 10-K, we discuss non-GAAP financial measures, including references to wholesale equivalent revenues, currency-neutral revenues, Total NIKE Brand earnings before interest and taxes (EBIT) and Total NIKE, Inc. EBIT, as well as EBIT Margin and ROIC, which should be considered in addition to, and not in lieu of, the financial measures calculated and presented in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”).

References to wholesale equivalent revenues are intended to provide context as to the total size of our NIKE Brand market footprint if we had no NIKE Direct operations. NIKE Brand wholesale equivalent revenues consist of (1) sales to external wholesale customers and (2) internal sales from our wholesale operations to our NIKE Direct operations, which are charged at prices comparable to those charged to external wholesale customers. Additionally, currency-neutral revenues are calculated using actual exchange rates in use during the comparative prior year period to enhance the visibility of the underlying business trends, excluding the impact of translation arising from foreign currency exchange rate fluctuations. EBIT is calculated as Net Income before Interest expense (income), net and Income tax expense in the Consolidated Statements of Income. EBIT Margin is calculated as EBIT divided by total NIKE Inc. Revenues. ROIC represents a performance measure that management believes is useful information in understanding the Company’s ability to effectively manage invested capital, see the table below for how the Company calculates this measure.

Management uses these non-GAAP financial measures when evaluating the Company’s performance, including when making financial and operating decisions. Additionally, management believes these non-GAAP financial measures provide investors with additional financial information that should be considered when assessing our underlying business performance and trends. However, references to wholesale equivalent revenues, currency-neutral revenues, ROIC and EBIT should not be considered in isolation or as a substitute for other financial measures calculated and presented in accordance with U.S. GAAP and may not be comparable to similarly titled non-GAAP measures used by other companies.

Our ROIC calculation as of May 31, 2021 and 2020 is as follows:

FOR THE TRAILING FOUR QUARTERS ENDED

	May 31, 2021	May 31, 2020
	(Dollars in millions)	
Numerator		
Net income	\$5,727	\$2,539
Add: Interest expense (income), net	262	89
Add: Income tax expense	934	348
Earnings before interest and taxes	6,923	2,976
Income tax adjustment ⁽¹⁾	(970)	(352)
Earnings before interest and after taxes	\$5,953	\$2,624

AVERAGE FOR THE TRAILING FIVE QUARTERS ENDED

	May 31, 2021	May 31, 2020
Denominator		
Total debt ^{(2), (3)}	\$12,890	\$ 8,022
Add: Shareholders’ equity	10,523	8,938
Less: Cash and equivalents and Short-term investments	11,217	4,756
Total invested capital	\$12,196	\$12,204
Return on Invested Capital	48.8%	21.5%

⁽¹⁾ Equals Earnings before interest and taxes multiplied by the effective tax rate as of the respective quarter end.

⁽²⁾ Total debt includes the following: 1) Current portion of long-term debt, 2) Notes Payable, 3) Current portion of operating lease liabilities, 4) Long-term debt and 5) Operating lease liabilities.

⁽³⁾ The Company adopted Accounting Standards Codification No. 842, Leases, on June 1, 2019. For comparability, total debt for each quarter prior to adoption includes approximately \$3.2 billion, which represents the current and long-term portion of the Company’s operating lease liabilities as of June 1, 2019.

RESULTS OF OPERATIONS

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
(Dollars in millions, except per share data)					
Revenues	\$44,538	\$37,403	19%	\$39,117	-4%
Cost of sales	24,576	21,162	16%	21,643	-2%
Gross profit	19,962	16,241	23%	17,474	-7%
Gross margin	44.8%	43.4%		44.7%	
Demand creation expense	3,114	3,592	-13%	3,753	-4%
Operating overhead expense	9,911	9,534	4%	8,949	7%
Total selling and administrative expense	13,025	13,126	-1%	12,702	3%
% of revenues	29.2%	35.1%		32.5%	
Interest expense (income), net	262	89	—	49	—
Other (income) expense, net	14	139	—	(78)	—
Income before income taxes	6,661	2,887	131%	4,801	-40%
Income tax expense	934	348	168%	772	-55%
Effective tax rate	14.0%	12.1%		16.1%	
Net Income	\$ 5,727	\$ 2,539	126%	\$ 4,029	-37%
Diluted earnings per common share	\$ 3.56	\$ 1.60	123%	\$ 2.49	-36%

CONSOLIDATED OPERATING RESULTS

Revenues

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(In millions)							
Revenues	\$44,538	\$37,403	19%	17%	\$37,218	-4%	-2%

Fiscal 2021 Compared to Fiscal 2020 On a currency-neutral basis, NIKE, Inc. Revenues increased 17% for fiscal 2021, driven by growth in both the NIKE Brand and Converse. Higher revenues in North America contributed approximately 7 percentage points to NIKE, Inc. Revenues, with EMEA and Greater China each contributing approximately 4 percentage points of growth and APLA and Converse each contributing approximately 1 percentage point of growth.

On a currency-neutral basis, NIKE Brand footwear revenues increased 18% for fiscal 2021, driven by growth in nearly all key categories, primarily Sportswear and the Jordan Brand. Unit sales of footwear increased 11%, while higher average selling price (ASP), on a wholesale equivalent basis, per pair contributed approximately 7 percentage points of footwear revenue growth. The increase in ASP was primarily due to higher full-price ASP, in part reflecting lower discounts, as well as higher NIKE Direct ASP and the favorable impact of growth in our NIKE Direct business.

Currency-neutral NIKE Brand apparel revenues increased 15% for fiscal 2021, due to growth in all key categories, primarily Sportswear, Football (Soccer) and the Jordan Brand. Unit sales of apparel increased 14%, while higher ASP per unit contributed approximately 1 percentage point of apparel revenue growth. The increase in ASP was primarily due to the favorable impact of growth in our NIKE Direct business, as well as higher NIKE Direct ASP, partially offset by lower full-price ASP.

On a reported basis, NIKE Direct revenues represented approximately 39% of our total NIKE Brand revenues for fiscal 2021 compared to 35% for fiscal 2020. Digital commerce sales were \$9.1 billion for fiscal 2021 compared to \$5.5 billion for fiscal 2020. On a currency-neutral basis, NIKE Direct revenues increased 30% for fiscal 2021, driven by strong digital commerce sales growth of 60%, comparable store sales growth of 4% and the addition of new stores. Comparable store sales, which exclude digital commerce sales, comprises revenues from NIKE-owned

in-line and factory stores for which all three of the following requirements have been met: (1) the store has been open at least one year, (2) square footage has not changed by more than 15% within the past year and (3) the store has not been permanently repositioned within the past year. Comparable store sales includes revenues from stores that were temporarily closed during the period as a result of COVID-19. Comparable store sales represents a performance measure that we believe is useful information for management and investors in understanding the performance of our established NIKE-owned in-line and factory stores. Management considers this metric when making financial and operating decisions. The method of calculating comparable store sales varies across the retail industry. As a result, our calculation of this metric may not be comparable to similarly titled measures used by other companies.

On a currency-neutral basis, fiscal 2021 NIKE Brand Men's and Women's revenues increased 11% and 20%, respectively. Higher NIKE Brand Men's revenues were driven by growth in nearly all key categories, primarily Sportswear, the Jordan Brand and Football (Soccer). Higher NIKE Brand Women's revenues were driven by growth in all key categories, primarily Sportswear, the Jordan Brand, Training and Running. Revenues for our NIKE Kids' business increased 15%, due to growth primarily in the Jordan Brand and Football (Soccer).

Gross Margin

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
(In millions)					
Gross Margin	\$19,962	\$16,241	23%	\$17,474	-7%
Gross Margin %	44.8%	43.4%	(140) bps	44.7%	(130) bps

Fiscal 2021 Compared to Fiscal 2020 For fiscal 2021, our consolidated gross profit increased 23% to \$19,962 million compared to \$16,241 million for fiscal 2020, as the prior fiscal year was significantly impacted by lower shipments to our wholesale customers and store closures within our NIKE Direct operations due to COVID-19. Gross margin increased 140 basis points to 44.8% for fiscal 2021 compared to 43.4% for fiscal 2020.

Favorable NIKE Brand full-price product margins across both our wholesale and NIKE Direct businesses primarily reflect higher full-price ASP, net of discounts. Additionally, the favorable impact of growth in our higher margin NIKE Direct business, led by NIKE owned Digital, was more than offset by higher promotions in our factory stores during the first half of fiscal 2021 to reduce excess inventory as a result of COVID-19. Lower other costs are due to annualizing certain impacts of COVID-19 from fiscal 2020, including lower factory cancellation charges, lower inventory obsolescence reserves as well as the favorable rate impact of fixed supply chain costs on a higher volume of wholesale shipments.

Total Selling and Administrative Expense

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
(Dollars in millions)					
Demand creation expense ⁽¹⁾	\$ 3,114	\$ 3,592	-13%	\$ 3,753	-4%
Operating overhead expense	9,911	9,534	4%	8,949	7%
Total selling and administrative expense	\$13,025	\$13,126	-1%	\$12,702	3%
% of revenues	29.2%	35.1%	(590) bps	32.5%	260 bps

⁽¹⁾ Demand creation expense consists of advertising and promotion costs, including costs of endorsement contracts, complimentary product, television, digital and print advertising and media costs, brand events and retail brand presentation.

Fiscal 2021 Compared to Fiscal 2020 Demand creation expense decreased 13% for fiscal 2021, due to lower marketing and advertising expenses for our brand events and retail operations, as well as lower sports marketing expense as sporting events were postponed due to COVID-19. This activity was partially offset by higher digital marketing investments. Changes in foreign currency exchange rates increased Demand creation expense by approximately 2 percentage points for fiscal 2021.

Operating overhead expense increased 4% for fiscal 2021, due to an increase in strategic technology investments, higher NIKE Direct variable costs, and approximately \$255 million in restructuring-related costs, partially offset by lower bad debt expense and lower travel and related expenses. Changes in foreign currency exchange rates increased. Operating overhead expense by approximately 1 percentage point for fiscal 2021.

Other (Income) Expense, net

	Fiscal 2021	Fiscal 2020	Fiscal 2019
	(Dollars in millions)		
Other (income) expense, net	\$14	\$139	\$(78)

Other (income) expense, net comprises foreign currency conversion gains and losses from the remeasurement of monetary assets and liabilities denominated in non-functional currencies and the impact of certain foreign currency derivative instruments, as well as unusual or non-operating transactions that are outside the normal course of business.

Fiscal 2021 Compared to Fiscal 2020 Other (income) expense, net decreased from \$139 million of other expense, net in fiscal 2020 to \$14 million of other expense, net in the current year, primarily due to the nonrecurring impairment charge of \$405 million incurred in the prior year associated with our planned, strategic distributor partnership transition within APLA, partially offset by a \$241 million net detrimental change in foreign currency conversion gains and losses, including hedges.

For more information related to our distributor partnership transition within APLA, see Note 20—Acquisitions and Divestitures within the accompanying Notes to the Consolidated Financial Statements.

We estimate the combination of the translation of foreign currency-denominated profits from our international businesses, and the year-over-year change in foreign currency related gains and losses included in Other (income) expense, net had a favorable impact on our Income before income taxes of \$19 million for fiscal 2021.

Income Taxes

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
Effective tax rate	14.0%	12.1%	190 bps	16.1%	(400) bps

Fiscal 2021 Compared to Fiscal 2020 Our effective tax rate was 14.0% for fiscal 2021, compared to 12.1% for fiscal 2020 due to a change in the proportion of earnings taxed in the U.S. related to the recovery from the impact of the COVID-19 pandemic and less favorable impacts from discrete items such as stock-based compensation.

OPERATING SEGMENTS Our operating segments are evidence of the structure of the Company's internal organization. The NIKE Brand segments are defined by geographic regions for operations participating in NIKE Brand sales activity.

Each NIKE Brand geographic segment operates predominantly in one industry: the design, development, marketing and selling of athletic footwear, apparel and equipment. The Company's reportable operating segments for the NIKE Brand are: North America; Europe, Middle East & Africa (EMEA); Greater China; and Asia Pacific & Latin America (APLA), and include results for the NIKE and Jordan brands, with results for the Hurley brand, prior to its divestiture in fiscal 2020, included in North America. Refer to Note 20—Acquisitions and Divestitures within the accompanying Notes to the Consolidated Financial Statements for additional information. The Company's NIKE Direct operations are managed within each geographic operating segment. Converse is also a reportable operating segment for the Company and operates predominately in one industry: the design, marketing, licensing and selling of athletic lifestyle sneakers, apparel and accessories.

As part of our centrally managed foreign exchange risk management program, standard foreign currency exchange rates are assigned twice per year to each NIKE Brand entity in our geographic operating segments and Converse. These rates are set approximately nine and twelve months in

advance of the future selling seasons to which they relate (specifically, for each currency, one standard rate applies to the fall and holiday selling seasons and one standard rate applies to the spring and summer selling seasons) based on average market spot rates in the calendar month preceding the date they are established. Inventories and Cost of sales for geographic operating segments and Converse reflect the use of these standard rates to record non-functional currency product purchases into the entity's functional currency. Differences between assigned standard foreign currency exchange rates and actual market rates are included in Corporate, together with foreign currency hedge gains and losses generated from our centrally managed foreign exchange risk management program and other conversion gains and losses.

The breakdown of revenues follows:

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes ⁽²⁾	Fiscal 2019	% Change	% Change Excluding Currency Changes ⁽¹⁾
(Dollars in millions)							
North America	\$17,179	\$14,484	19%	19%	\$15,902	−9%	−9%
Europe, Middle East & Africa	11,456	9,347	23%	17%	9,812	−5%	−1%
Greater China	8,290	6,679	24%	19%	6,208	8%	11%
Asia Pacific & Latin America ⁽²⁾	5,343	5,028	6%	8%	5,254	−4%	1%
Global Brand Divisions ⁽³⁾	25	30	−17%	−17%	42	−29%	−26%
Total Nike Brand	42,293	35,568	19%	17%	37,218	−4%	−2%
Converse	2,205	1,846	19%	16%	1,906	−3%	−1%
Corporate ⁽⁴⁾	40	(11)	—	—	(7)	—	—
Total Nike, Inc. Revenues	\$44,538	\$37,403	19%	17%	\$39,117	−4%	−2%

⁽¹⁾ The percent change excluding currency changes represents a non-GAAP financial measure. See "Use of Non-GAAP Financial Measures" for further information.

⁽²⁾ Refer to Note 20—Acquisition and Divestitures within the accompanying Notes to the Consolidated Financial Statements for additional information on the transition of our NIKE Brand business in Brazil to a third-party distributor.

⁽³⁾ Global Brand Divisions revenues include NIKE Brand licensing and other miscellaneous revenues that are not part of a geographic operating segment.

⁽⁴⁾ Corporate revenues primarily consist of foreign currency hedge gains and losses related to revenues generated by entities within the NIKE Brand geographic operating segments and Converse, but managed through our central foreign exchange risk management program.

The primary financial measure used by the Company to evaluate performance of individual operating segments is earnings before interest and taxes (commonly referred to as "EBIT") which represents net income before interest expense (income), net and income taxes in the consolidated statements of income. As discussed in Note 17—Operating Segments and Related Information in the accompanying Notes to the Consolidated Financial Statements, certain corporate costs are not included in EBIT of our operating segments.

The breakdown of earnings before interest and taxes is as follows:

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
(Dollars in millions)					
North America	\$5,089	\$2,899	76%	\$3,925	−26%
Europe, Middle East & Africa	2,435	1,541	58%	1,995	−23%
Greater China	3,243	2,490	30%	2,376	5%
Asia Pacific & Latin America	1,530	1,184	29%	1,323	−11%
Global Brand Divisions	(3,656)	(3,468)	−5%	(3,262)	−6%
Total Nike Brand⁽¹⁾	\$8,641	\$4,646	86%	\$6,357	−27%
Converse	543	297	83%	303	−2%
Corporate	(2,261)	(1,967)	−15%	(1,810)	−9%

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
Total Nike, Inc. Earnings Before Interest and Taxes⁽¹⁾	<u>\$6,923</u>	<u>\$2,976</u>	133%	<u>\$4,850</u>	–39%
EBIT margin ⁽¹⁾	15.5%	8.0%		12.4%	
Interest expense (income), net	<u>262</u>	<u>89</u>	—	<u>49</u>	—
Total Nike, Inc. Income Before Income Taxes	<u>\$6,661</u>	<u>\$2,887</u>	131%	<u>\$4,801</u>	–40%

⁽¹⁾ Total NIKE Brand EBIT, Total NIKE, Inc. EBIT and EBIT Margin, represent non-GAAP financial measures. See “Use of Non-GAAP Financial Measures” for further information.

North America

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(Dollars in millions)							
Revenues by:							
Footwear	\$11,644	\$ 9,329	25%	25%	\$10,045	–7%	–7%
Apparel	5,028	4,639	8%	8%	5,260	–12%	–12%
Equipment	<u>507</u>	<u>516</u>	–2%	–2%	<u>597</u>	–14%	–14%
Total Revenues	<u>\$17,179</u>	<u>\$14,484</u>	19%	19%	<u>\$15,902</u>	–9%	–9%
Revenues by:							
Sales to Wholesale Customers	\$10,186	\$9,371	9%	9%	\$10,875	–14%	–14%
Sales through NIKE Direct	<u>6,993</u>	<u>5,113</u>	37%	37%	<u>5,027</u>	2%	2%
Total Revenues	<u>\$17,179</u>	<u>\$14,484</u>	19%	19%	<u>\$15,902</u>	–9%	–9%
Earnings Before Interest and Taxes	\$ 5,089	\$ 2,899	76%		\$ 3,925	–26%	

We believe there continues to be a meaningful shift in the way consumers shop for product and make purchasing decisions across each of our geographies. Consumers are demanding a constant flow of fresh and innovative product, and have an expectation for superior service and rapid delivery, all fueled by the shift toward digital and monobrand experiences in NIKE Direct. We anticipate continued evolution within the retail landscape, driven by shifting consumer traffic patterns across digital and physical channels. Specifically in North America, we remain focused on building long-term momentum with our strategic wholesale customers, which offer a differentiated retail experience. Additionally, over the last three years we have significantly reduced the number of undifferentiated wholesale accounts. During fiscal 2021, we took further steps towards account and channel consolidation by reprioritizing product allocation to benefit NIKE Direct and our differentiated strategic wholesale customers. We expect that over the next two fiscal years, we will more aggressively accelerate these changes as we work to reprofile the shape of the marketplace and recapture wholesale revenue declines over time.

On a currency-neutral basis, North America revenues increased 19%, driven by growth in nearly all key categories, led by Sportswear and the Jordan Brand. NIKE Direct revenues increased 37%, driven by strong digital sales growth of 73%, comparable store sales growth of 5% and the addition of new stores.

Footwear revenues increased 25% on a currency-neutral basis due to higher revenues in several key categories, led by Sportswear and the Jordan Brand. Unit sales of footwear increased 17%, while higher ASP per pair contributed approximately 8 percentage points of footwear revenue growth. Higher ASP per pair was primarily due to higher NIKE Direct and

full-price ASPs, in part reflecting lower-discounts, as well as the favorable impact of growth in our NIKE Direct business.

On a currency-neutral basis, apparel revenues increased 8% for fiscal 2021 driven by growth in all key categories, led by Sportswear. Unit sales of apparel increased 8%, while ASP per unit was flat, as the favorable impact of growth in our NIKE Direct business was offset by lower full-price ASP.

Reported EBIT increased 76% driven by higher revenues, lower selling and administrative expense as a percent of revenues and gross margin expansion. Gross margin increased approximately 430 basis points, primarily due to lower other costs, higher full-price ASP, reflecting lower discounts, the favorable impact of growth in our NIKE Direct business and lower product costs. The decrease in other costs was primarily due to annualizing the impacts of COVID-19 from fiscal 2020, including lower factory cancellation charges, lower inventory obsolescence reserves and the favorable rate impact of fixed supply chain costs on a higher volume of wholesale shipments. Selling and administrative expense decreased due to lower operating overhead and demand creation expense. Operating overhead expense decreased primarily as a result of lower bad debt and wage-related expenses, partially offset by higher NIKE Direct variable costs. The decrease in demand creation expense was primarily due to lower advertising and marketing expense for brand events and our retail operations, as well as lower sports marketing expense, partially offset by continued investments in digital marketing to support heightened digital demand.

Europe, Middle East & Africa

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(Dollars in millions)							
Revenues by:							
Footwear	\$ 6,970	\$5,892	18%	13%	\$6,293	-6%	-3%
Apparel	3,996	3,053	31%	25%	3,087	-1%	2%
Equipment	490	402	22%	19%	432	-7%	-3%
Total Revenues	\$11,456	\$9,347	23%	17%	\$9,812	-5%	-1%
Revenues by:							
Sales to Wholesale Customers	\$ 7,812	\$6,574	19%	14%	\$7,076	-7%	-4%
Sales through NIKE Direct	3,644	2,773	31%	25%	2,736	1%	5%
Total Revenues	\$11,456	\$9,347	23%	17%	\$9,812	-5%	-1%
Earnings Before Interest and Taxes	\$ 2,435	\$1,541	58%		\$1,995	-23%	

Fiscal 2021 Compared to Fiscal 2020 On a currency-neutral basis, EMEA revenues for fiscal 2021 grew 17%, driven by higher revenues across nearly all territories, led by UK & Ireland and Central Europe, which grew 34% and 20%, respectively. Revenues increased in all key categories, led by Sportswear and the Jordan Brand. NIKE Direct revenues increased 25%, driven by strong digital sales growth of 67%, partially offset by a 10% decline in comparable store sales, primarily due to reduced physical retail traffic, in part resulting from temporary store closures and safety-related measures in response to COVID-19.

Currency-neutral footwear revenues increased 13%, driven by higher revenues in nearly all key categories, led by Sportswear and the Jordan Brand. Unit sales of footwear increased 9% and higher ASP per pair contributed approximately 4 percentage points, resulting from higher full-price ASP and the favorable impact of growth in our NIKE Direct business.

Currency-neutral apparel revenues increased 25% due to growth in all key categories, led by Sportswear and Football (Soccer). Unit sales of apparel increased 26%, while lower ASP per unit reduced apparel revenues by approximately 1 percentage point. Lower ASP per unit was primarily due to a lower mix of NIKE Direct sales, partially offset by higher full-price ASP, in part reflecting lower discounts.

Reported EBIT increased 58% as higher revenues and lower selling and administrative expense more than offset a decline in gross margin. Gross margin decreased approximately 110 basis points primarily due to lower NIKE Direct margins and unfavorable changes in standard foreign currency exchange rates, which more than offset lower product costs and lower other costs. The decrease in other costs was primarily due to annualizing the impacts of COVID-19, including lower inventory obsolescence reserves, as well as the favorable rate impact of fixed supply chain costs on a higher volume of wholesale shipments. Selling and administrative expense decreased due to lower demand creation and operating overhead expense. The decrease in demand creation expense was primarily driven by lower retail brand presentation costs and lower sports marketing expense. Lower operating overhead expense was primarily due to lower bad debt and travel and related expenses, partially offset by higher NIKE Direct variable costs.

Greater China

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(Dollars in millions)							
Revenues by:							
Footwear	\$5,748	\$4,635	24%	19%	\$4,262	9%	12%
Apparel	2,347	1,896	24%	19%	1,808	5%	8%
Equipment	195	148	32%	24%	138	7%	11%
Total Revenues	\$8,290	\$6,679	24%	19%	\$6,208	8%	11%
Revenues by:							
Sales to Wholesale Customers	\$4,513	\$3,803	19%	14%	\$3,726	2%	6%
Sales through NIKE Direct	3,777	2,876	31%	26%	2,482	16%	20%
Total Revenues	\$8,290	\$6,679	24%	19%	\$6,208	8%	11%
Earnings Before Interest and Taxes	\$3,243	\$2,490	30%		\$2,376	5%	

Fiscal 2021 Compared to Fiscal 2020 On a currency-neutral basis, Greater China revenues for fiscal 2021 increased 19%, driven by higher revenues in all key categories, led by Sportswear, the Jordan Brand and NIKE Basketball. NIKE Direct revenues increased 26%, driven by digital sales growth of 26%, comparable store sales growth of 22% and the addition of new stores.

Currency-neutral footwear revenues increased 19%, driven by growth in all key categories, led by Sportswear, the Jordan Brand and NIKE Basketball. Unit sales of footwear increased 20%, while lower ASP per pair reduced footwear revenues by approximately 1 percentage point, driven by an unfavorable full-price mix, partially offset by higher fullprice ASP, due to lower discounts.

Currency-neutral apparel revenue growth of 19% was fueled by higher revenues in nearly all key categories, most notably Sportswear. Unit sales of apparel increased 18%, while higher ASP per unit contributed approximately 1 percentage point of apparel revenue growth. Higher ASP was driven by higher off-price ASP, partially offset by lower NIKE Direct ASP due to higher levels of promotion to liquidate excess inventory through our factory stores. Reported EBIT increased 30% as higher revenues and lower selling and administrative expense more than offset a decline in gross margin. Gross margin decreased approximately 200 basis points primarily due to unfavorable changes in standard foreign currency exchange rates and higher product costs. Selling and administrative expense decreased due to lower demand creation expense, partially offset by higher operating overhead expense. Demand creation expense decreased primarily due to lower advertising and marketing, as well as digital marketing expenses. Growth in operating overhead expense was driven by higher investments within our NIKE Direct operations.

Asia Pacific and Latin America

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(Dollars in millions)							
Revenues by:							
Footwear	\$3,659	\$3,449	6%	8%	\$3,622	-5%	0%
Apparel	1,494	1,365	9%	10%	1,395	-2%	3%
Equipment	190	214	-11%	-9%	237	-10%	-4%
Total Revenues	\$5,343	\$5,028	6%	8%	\$5,254	-4%	1%
Revenues by:							
Sales to Wholesale Customers	\$3,387	\$3,408	-1%	2%	\$ 3,746	-9%	-4%
Sales through NIKE Direct	1,956	1,620	21%	22%	1,508	7%	12%
Total Revenues	\$5,343	\$5,028	6%	8%	\$5,254	-4%	1%
Earnings Before Interest and Taxes	\$1,530	\$1,184	29%		\$1,323	-11%	

As discussed previously, our NIKE Brand business in Brazil transitioned to a distributor operating model during the third quarter of fiscal 2021 and our NIKE Brand businesses in Argentina, Chile and Uruguay have remained classified as held-for-sale. The impacts of closing the Brazil transaction as well as entering into agreements to transition these entities in the prior year are included within Corporate and are not reflected in the APLA operating segment results. For more information see Note 20—Acquisitions and Divestitures within the accompanying Notes to the Consolidated Financial Statements.

Fiscal 2021 Compared to Fiscal 2020 On a currency-neutral basis, APLA revenues increased 8% for fiscal 2021. The increase was due to higher revenues across most territories, led by a 15% increase in Japan, a 37% increase in Pacific, which includes Australia and New Zealand, and a 12% increase in Korea, partially offset by a decline in Latin Distributors of 48%. Additionally, the transition of our NIKE Brand business in Brazil to a third-party distributor operating model reduced APLA revenue growth by approximately 2 percentage points. Revenues increased in most key categories, led by Sportswear and the Jordan Brand. NIKE Direct revenues increased 22%, primarily fueled by strong digital sales growth of 73%, partially offset by comparable store sales declines of 4%, largely due to reduced physical retail traffic, in part resulting from safety-related measures in response to COVID-19.

Currency-neutral footwear revenues increased 8% for fiscal 2021 due to higher revenues in several key categories, primarily the Jordan Brand and Sportswear. Unit sales of footwear decreased 5%, while higher ASP per pair contributed approximately 13 percentage points of footwear revenue growth, driven by higher full-price and NIKE Direct ASPs, in part reflecting inflationary conditions in our SOCO territory, which includes Argentina, Chile and Uruguay, as well as the favorable impact of growth in our NIKE Direct business.

Currency-neutral apparel revenues increased 10% for fiscal 2021 due to higher revenues in most key categories, led by Sportswear. Unit sales of apparel increased 5%, while higher ASP per unit contributed approximately 5 percentage points of apparel revenue growth. Higher ASP per unit was primarily driven by higher full-price ASP, in part reflecting inflationary conditions in our SOCO territory.

Reported EBIT increased 29% for fiscal 2021 driven by higher revenues, lower selling and administrative expense and gross margin expansion. Gross margin increased approximately 130 basis points as higher full-price ASP, net of discounts, in part reflecting inflationary conditions in our SOCO territory, and lower other costs, were partially offset by higher product costs, unfavorable standard foreign currency exchange rates and lower margin in our NIKE Direct business.

The decrease in other costs was primarily due to annualizing the impacts of COVID-19, including lower factory cancellation charges and lower inventory obsolescence reserves. Selling and administrative expense decreased due to lower demand creation and operating overhead expense. The decrease in demand creation expense was primarily due to lower advertising and marketing expense, as well as a decline in sports marketing costs. Lower operating overhead expense was primarily due to lower bad debt and travel and related costs, partially offset by higher NIKE Direct variable costs.

Global Brand Divisions

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(Dollars in millions)							
Revenues	\$ 25	\$ 30	-17%	-17%	\$ 42	-29%	-26%
Earnings (Loss) Before Interest and Taxes	\$(3,656)	\$(3,468)	-5%		\$(3,262)	-6%	

Global Brand Divisions primarily represent demand creation and operating overhead expense, including product creation and design expenses that are centrally managed for the NIKE Brand, as well as costs associated with NIKE Direct global digital operations and enterprise technology. Global Brand Divisions revenues include NIKE Brand licensing and other miscellaneous revenues that are not part of a geographic operating segment.

Fiscal 2021 Compared to Fiscal 2020 Global Brand Divisions' loss before interest and taxes increased 5% for fiscal 2021 due to higher total selling and administrative expense, driven by higher operating overhead expense, partially offset by lower demand creation expense. The increase in operating overhead expense was primarily due to continued investments in digital capabilities, partially offset by lower travel and related expenses. Lower demand creation expense was primarily due to lower sports marketing costs.

Converse

	Fiscal 2021	Fiscal 2020	% Change	% Change Excluding Currency Changes	Fiscal 2019	% Change	% Change Excluding Currency Changes
(Dollars in millions)							
Revenues by:							
Footwear	\$1,986	\$1,642	21%	17%	\$1,658	-1%	1%
Apparel	104	89	17%	13%	118	-25%	-22%
Equipment	29	25	16%	14%	24	4%	8%
Other ⁽¹⁾	86	90	-4%	-1%	106	-15%	-14%
Total Revenues	\$2,205	\$1,846	19%	16%	\$1,906	-3%	-1%
Revenues by:							
Sales to Wholesale Customers	\$1,353	\$1,154	17%	13%	\$1,247	-7%	-5%
Sales through Direct to Consumer	766	602	27%	24%	553	9%	11%
Other ⁽¹⁾	86	90	-4%	-1%	106	-15%	-14%
Total Revenues	\$2,205	\$1,846	19%	16%	\$1,906	-3%	-1%
Earnings Before Interest and Taxes	\$ 543	\$ 297	83%		\$ 303	-2%	

⁽¹⁾ Other revenues consist of territories serviced by third-party licensees who pay royalties to Converse for the use of its registered trademarks and other intellectual property rights. We do not own the Converse trademarks in Japan and accordingly do not earn revenues in Japan.

Fiscal 2021 Compared to Fiscal 2020 On a currency-neutral basis, Converse revenues increased 16% for fiscal 2021. The increase in revenues was driven by revenue growth across Western Europe, North America and Asia. Wholesale revenues increased 13%, driven primarily by growth in Western Europe and Asia, in part due to the impacts of COVID-19 in the prior year. Direct to consumer revenues increased 24%, driven by strong digital sales growth across North America and Western Europe. Combined unit sales within the wholesale and direct to consumer channels increased 9%, while ASP increased 8%, primarily due to growth in full-price sales, including through our digital channel.

Reported EBIT increased 83%, driven by higher revenues and lower selling and administrative expense. Gross margin was flat, as higher full-price ASP, net of discounts, and the favorable rate impact of fixed supply chain costs on a higher volume of wholesale shipments was offset by higher product costs and unfavorable changes in standard foreign currency exchange rates. Selling and administrative expense decreased due to lower operating overhead and demand creation expense. Operating overhead expense decreased primarily due to lower bad debt, travel and related costs and other administrative costs. Demand creation expense decreased as a result of lower advertising and marketing, as well as digital marketing expenses.

Corporate

	Fiscal 2021	Fiscal 2020	% Change	Fiscal 2019	% Change
(Dollars in millions)					
Revenues	\$ 40	\$ (11)	—	\$ (7)	—
Earnings (Loss) Before Interest and Taxes	\$(2,261)	\$(1,967)	–15%	\$(1,810)	–9 %

Corporate revenues primarily consist of foreign currency hedge gains and losses related to revenues generated by entities within the NIKE Brand geographic operating segments and Converse, but managed through our central foreign exchange risk management program.

The Corporate loss before interest and taxes primarily consists of unallocated general and administrative expenses, including expenses associated with centrally managed departments; depreciation and amortization related to our corporate headquarters; unallocated insurance, benefit and compensation programs, including stock-based compensation; and certain foreign currency gains and losses.

In addition to the foreign currency gains and losses recognized in Corporate revenues, foreign currency results in Corporate include gains and losses resulting from the difference between actual foreign currency exchange rates and standard rates used to record non-functional currency denominated product purchases within the NIKE Brand geographic operating segments and Converse; related foreign currency hedge results; conversion gains and losses arising from remeasurement of monetary assets and liabilities in non-functional currencies; and certain other foreign currency derivative instruments.

Fiscal 2021 Compared to Fiscal 2020 Corporate's loss before interest and taxes increased \$294 million during fiscal 2021, primarily due to the following:

- an unfavorable change in net foreign currency gains and losses of \$241 million related to the remeasurement of monetary assets and liabilities denominated in nonfunctional currencies and the impact of certain foreign currency derivative instruments, reported as a component of consolidated Other (income) expense, net;
- a favorable change of \$132 million related to the difference between actual foreign currency exchange rates and standard foreign currency exchange rates assigned to the NIKE Brand geographic operating segments and Converse, net of hedge gains and losses; these results are reported as a component of consolidated gross margin; and
- an unfavorable change of \$185 million in part due to restructuring-related costs of \$294 million associated with changes to our organizational model announced in July 2020, partially offset by the \$405 million charge in the prior year related to our planned distributor transition within APLA.

LIQUIDITY AND CAPITAL RESOURCES

Cash Flow Activity Cash provided (used) by operations was an inflow of \$6,657 million for fiscal 2021 compared to \$2,485 million for fiscal 2020. Net income, adjusted for non-cash items, generated \$6,612 million of operating cash inflow for fiscal 2021 compared to \$3,730 million for fiscal 2020. The increase primarily reflects the recovery of our business operations from the impact of COVID-19. The net change in working capital and other assets and liabilities resulted in an increase to Cash provided (used) by operations of \$45 million for fiscal 2021, compared to a decrease of \$1,245 million for fiscal 2020. The net change in working capital was impacted by a \$2,361 million decrease in Inventories, driven by strong consumer demand as we return to healthy inventory levels across markets closed in the prior year due to COVID-19. An increase in Accounts Payable and Accrued Liabilities also contributed to the net change in working capital, primarily due to reduced spending in fiscal 2020 as a result of COVID-19. In addition, the net change in working capital was impacted by a \$2,845 million increase in Accounts receivable, net, primarily driven by higher revenues in the fourth quarter of fiscal 2021.

Cash provided (used) by investing activities was an outflow of \$3,800 million for fiscal 2021, compared to an outflow of \$1,028 million for fiscal 2020, primarily driven by higher purchases of short-term investments. During fiscal 2021, the net change in investments (including sales, maturities and purchases) resulted in a cash outflow of \$3,276 million compared to a cash inflow of \$27 million in fiscal 2020. Additionally, during fiscal 2021, we continued investing in our infrastructure to support future growth, specifically focused around digital capabilities, our end-to-end technology foundation, our corporate facilities and improvements across our supply chain. In future periods, we expect to make annual capital expenditures of approximately 3% of annual revenues.

Cash provided (used) by financing activities was an outflow of \$1,459 million for fiscal 2021 compared to an inflow of \$2,491 million for fiscal 2020. This change was primarily due to the net proceeds from a \$5,942 million corporate bond issuance in the fourth quarter of fiscal 2020, partially offset by lower share repurchases during fiscal 2021.

During the fourth quarter of fiscal 2020, to enhance our liquidity position in response to COVID-19, we elected to temporarily suspend share repurchases under our existing share repurchase program. The existing program remained authorized by the Board of Directors and during the fourth quarter of fiscal 2021, we began repurchasing shares under the program. In fiscal 2021, we purchased 4.9 million shares of NIKE's Class B Common Stock for \$650 million (an average price of \$133.54 per share) under the fouryear, \$15 billion share repurchase program approved by the Board of Directors in June 2018. As of May 31, 2021, we had repurchased 50.0 million shares at a cost of \$4,669 million (an average price of \$93.33 per share) under this program. We continue to expect funding of share repurchases will come from operating cash flows and excess cash. The timing and the amount of share repurchases will be dictated by our capital needs and stock market conditions.

Off-Balance Sheet Arrangements

In connection with various contracts and agreements, we routinely provide indemnification relating to the enforceability of intellectual property rights, coverage for legal issues that arise and other items where we are acting as the guarantor. Currently, we have several such agreements in place. Based on our historical experience and the estimated probability of future loss, we have determined that the fair value of such indemnification is not material to our financial position or results of operations.

Contractual Obligations

Our significant long-term contractual obligations as of May 31, 2021, and significant endorsement contracts, including related marketing commitments, entered into through the date of this report are as follows:

Description of Commitment	Cash Payments Due During The Year Ending May 31,						Total
	2022	2023	2024	2025	2026	Thereafter	
	(Dollars in millions)						
Operating Leases	\$ 534	\$ 530	\$ 490	\$ 437	\$ 357	\$ 1,397	\$ 3,745
Long-Term Debt ⁽¹⁾	286	786	275	1,275	251	11,290	14,163

Description of Commitment	Cash Payments Due During The Year Ending May 31,						Total
	2022	2023	2024	2025	2026	Thereafter	
	(Dollars in millions)						
Endorsement Contracts ⁽²⁾	1,502	1,244	1,091	966	726	2,863	8,392
Product Purchase Obligations ⁽³⁾	6,448	—	—	—	—	—	6,448
Other Purchase Obligations ⁽⁴⁾	1,347	541	331	191	96	230	2,736
Transition Tax Related to the Tax Cuts and Jobs Act ⁽⁵⁾	86	86	161	215	268	—	816
Total	\$10,203	\$ 3,187	\$ 2,348	\$ 3,084	\$ 1,698	\$15,780	\$36,300

⁽¹⁾ The cash payments due for long-term debt include estimated interest payments. Estimates of interest payments are based on outstanding principal amounts, applicable fixed interest rates or currently effective interest rates as of May 31, 2021 (if variable), timing of scheduled payments and the term of the debt obligations.

⁽²⁾ The amounts listed for endorsement contracts represent approximate amounts of base compensation and minimum guaranteed royalty fees we are obligated to pay athlete, public figure, sport team and league endorsers of our products. Actual payments under some contracts may be higher than the amounts listed as these contracts provide for bonuses to be paid to the endorsers based upon athletic achievements and/or royalties on product sales in future periods. Actual payments under some contracts may also be lower as these contracts include provisions for reduced payments if athletic performance declines in future periods.

In addition to the cash payments, we are obligated to furnish our endorsers with NIKE product for their use. It is not possible to determine how much we will spend on this product on an annual basis as the contracts generally do not stipulate a specific amount of cash to be spent on the product. The amount of product provided to the endorsers will depend on many factors, including general playing conditions, the number of sporting events in which they participate and our own decisions regarding product and marketing initiatives. In addition, the costs to design, develop, source and purchase the products furnished to the endorsers are incurred over a period of time and are not necessarily tracked separately from similar costs incurred for products sold to customers.

⁽³⁾ We generally order product at least four to five months in advance of sale based primarily on advanced orders received from external wholesale customers and internal orders from our direct to customer operations. The amounts listed for product purchase obligations represent agreements (including open purchase orders) to purchase products in the ordinary course of business that are enforceable and legally binding and specify all significant terms. In some cases, prices are subject to change throughout the production process.

⁽⁴⁾ Other purchase obligations primarily include construction, service and marketing commitments, including marketing commitments associated with endorsement contracts, made in the ordinary course of business. The amounts represent the minimum payments required by legally binding contracts and agreements that specify all significant terms, and may include open purchase orders for non-product purchases.

⁽⁵⁾ Represents the future cash payments due as part of the transition tax on deemed repatriation of undistributed earnings of foreign subsidiaries, which is reflected net of foreign tax credits we utilized. Refer to Part II, Item 8. Financial Statements and Supplementary Data, Note 9—Income Taxes, in our fiscal 2020 Form 10-K, which was filed with the United States Securities and Exchange Commission on July 24, 2020 for additional information.

In addition to the above, we have long-term obligations for uncertain tax positions and various post-retirement benefits for which we are not able to reasonably estimate when cash payments will occur. Refer to Note 9—Income Taxes and Note 13—Benefit Plans in the accompanying Notes to the Consolidated Financial Statements for further information related to uncertain tax positions and post-retirement benefits, respectively.

We also have the following outstanding short-term debt obligations as of May 31, 2021. Refer to Note 7—Short-Term Borrowings and Credit Lines in the accompanying Notes to the Consolidated Financial Statements for further description and interest rates related to the short-term debt obligations listed below.

May 31, 2021	
(Dollar in millions)	
Notes payable, due at mutually agreed-upon dates within one year of issuance or on demand	\$2

As of May 31, 2021, we had bank guarantees and letters of credit outstanding totaling \$275 million, issued primarily for real estate agreements, self-insurance programs and other general business obligations.

Capital Resources

On July 23, 2019, we filed a shelf registration statement (the “Shelf”) with the U.S. Securities and Exchange Commission (SEC) which permits us to issue an unlimited amount of debt securities from time to time. The Shelf expires on July 23, 2022.

On August 16, 2019, we entered into a committed credit facility agreement with a syndicate of banks which provides for up to \$2 billion of borrowings, with the option to increase borrowings up to \$3 billion in total upon lender approval. The facility matures on August 16, 2024, with a one-year extension option prior to any anniversary of the closing date, provided that in no event shall the facility extend beyond August 16, 2026. This facility replaces the prior \$2 billion credit facility agreement entered into on August 28, 2015, which would have matured August 28, 2020. On March 15, 2021, we entered into a committed credit facility agreement with a syndicate of banks which provides for up to \$1 billion of borrowings, with the option to increase borrowings up to \$1.5 billion in total upon lender approval. The facility matures on March 14, 2022, with a 364-day extension option up to 30 days prior to the existing termination date, provided that in no event shall the facility extend beyond March 13, 2023. This facility replaces the prior \$2 billion credit facility agreement entered into on April 6, 2020, which would have matured on April 5, 2021. As of May 31, 2021 and 2020, no amounts were outstanding under our committed credit facilities. Refer to Note 7—Short-Term Borrowings and Credit Lines for additional information.

We currently have long-term debt ratings of AA- and A1 from Standard and Poor's Corporation and Moody's Investor Services, respectively. As it relates to our committed credit facilities entered into on August 16, 2019 and March 15, 2021, if our long-term debt ratings were to decline, the facility fees and interest rates would increase. Conversely, if our long-term debt ratings were to improve, the facility fees and interest rates would decrease. Changes in our long-term debt ratings would not trigger acceleration of maturity of any then-outstanding borrowings or any future borrowings under the committed credit facilities. Under these facilities, we have agreed to various covenants. These covenants include limits on our disposal of assets and the amount of debt secured by liens we may incur. In the event we were to have any borrowings outstanding under these facilities, failed to meet any covenant and were unable to obtain a waiver from a majority of the banks in the syndicate, any borrowings would become immediately due and payable. As of May 31, 2021, we were in full compliance with each of these covenants and believe it is unlikely we will fail to meet any of these covenants in the foreseeable future.

Liquidity was also provided by our \$3 billion commercial paper program, which we decreased from \$4 billion in connection with the new credit facility agreement, entered into on March 15, 2021, as described above. During the fiscal year ended May 31, 2021, the maximum amount of commercial paper borrowings outstanding at any point was \$248 million. No commercial paper was outstanding as of May 31, 2021. As of May 31, 2020, we had \$248 million of commercial paper outstanding at a weighted average interest rate of 1.65%.

We may continue to issue commercial paper or other debt securities depending on general corporate needs. We currently have short-term debt ratings of A1+ and P1 from Standard and Poor's Corporation and Moody's Investor Services, respectively.

To date, we have not experienced difficulty accessing the credit markets; however, future volatility in the capital markets may increase costs associated with issuing commercial paper or other debt instruments or affect our ability to access those markets.

As of May 31, 2021, we had cash, cash equivalents and short-term investments totaling \$13.5 billion, primarily consisting of commercial paper, corporate notes, deposits held at major banks, money market funds, U.S. government sponsored enterprise obligations, U.S. Treasury obligations and other investment grade fixed-income securities. Our fixed-income investments are exposed to both credit and interest rate risk. All of our investments are investment grade to minimize our credit risk. While individual securities have varying durations, as of May 31, 2021, the weighted-average days to maturity of our cash equivalents and short-term investments portfolio was 54 days.

We believe that existing cash, cash equivalents, short-term investments and cash generated by operations, together with access to external sources of funds as described above, will be sufficient to meet our domestic and foreign capital needs in the foreseeable future.

We utilize a variety of tax planning and financing strategies to manage our worldwide cash and deploy funds to locations where they are needed. We indefinitely reinvest a significant portion of our foreign earnings, and our current plans do not demonstrate a need to repatriate these earnings. Should we require additional capital in the United States, we may determine to repatriate indefinitely reinvested foreign funds or raise capital in the United States through debt. Given our existing structure, if we were to repatriate indefinitely reinvested foreign earnings, we would be required to accrue and pay withholding taxes in certain foreign jurisdictions.

Item 8. Financial Statements and Supplemental Data

Management of NIKE, Inc. is responsible for the information and representations contained in this report. The financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America (“U.S. GAAP”) and include certain amounts based on our best estimates and judgments. Other financial information in this report is consistent with these financial statements.

Our accounting systems include controls designed to reasonably assure assets are safeguarded from unauthorized use or disposition and provide for the preparation of financial statements in conformity with U.S. GAAP. These systems are supplemented by the selection and training of qualified financial personnel and an organizational structure providing for appropriate segregation of duties.

An internal corporate audit department reviews the results of its work with the Audit & Finance Committee of the Board of Directors, presently comprised of three outside, independent directors. The Audit & Finance Committee is responsible for the appointment of the independent registered public accounting firm and reviews, with the independent registered public accounting firm, management and the internal corporate audit staff, the scope and the results of the annual audit, the effectiveness of the accounting control system and other matters relating to the financial affairs of NIKE as the Audit & Finance Committee deems appropriate. The independent registered public accounting firm and the internal corporate auditors have full access to the Audit & Finance Committee, with and without the presence of management, to discuss any appropriate matters.

Management’s Annual Report on Internal Control Over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Rule 13(a)-15(f) and Rule 15(d)-15(f) of the Securities Exchange Act of 1934, as amended. Internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of the financial statements for external purposes in accordance with generally accepted accounting principles in the United States of America. Internal control over financial reporting includes those policies and procedures that: (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of assets of the Company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of our management and directors; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of assets of the Company that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, our management conducted an evaluation of the effectiveness of our internal control over financial reporting based upon the framework in Internal Control—Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on the results of our evaluation, our management concluded that our internal control over financial reporting was effective as of May 31, 2021.

PricewaterhouseCoopers LLP, an independent registered public accounting firm, has audited (1) the Consolidated Financial Statements and (2) the effectiveness of our internal control over financial reporting as of May 31, 2021, as stated in their report herein.

John J. Donahoe II
President and Chief Executive Officer

Matthew Friend
Executive Vice President and Chief Financial Officer

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of NIKE, Inc.:

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of NIKE, Inc. and its subsidiaries (the “Company”) as of May 31, 2021 and 2020, and the related consolidated statements of income, of comprehensive income, of shareholders’ equity and of cash flows for each of the three years in the period ended May 31, 2021, including the related notes and financial statement schedule listed in the index appearing under Item 15(a)(2) (collectively referred to as the “consolidated financial statements”). We also have audited the Company’s internal control over financial reporting as of May 31, 2021, based on criteria established in Internal Control-Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of May 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended May 31, 2021 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of May 31, 2021, based on criteria established in Internal Control-Integrated Framework (2013) issued by the COSO.

Changes in Accounting Principles

As discussed in Note 1 to the consolidated financial statements, the Company changed the manner in which it accounts for leases as of June 1, 2019 and the manner in which it accounts for revenue from contracts with customers and the manner in which it accounts for income taxes related to intra-entity transfers other than inventory as of June 1, 2018.

Basis for Opinions

The Company’s management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management’s Annual Report on Internal Control over Financial Reporting. Our responsibility is to express opinions on the Company’s consolidated financial statements and on the Company’s internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Accounting for Income Taxes

As described in Notes 1 and 9 to the consolidated financial statements, the Company recorded income tax expense of \$934 million for the year ended May 31, 2021, and has net deferred tax assets of \$1,133 million, including a valuation allowance of \$12 million, and total gross unrecognized tax benefits, excluding related interest and penalties, of \$896 million as of May 31, 2021, \$609 million of which would affect the Company's effective tax rate if recognized in future periods. The realization of deferred tax assets is dependent on future taxable earnings. Management assesses the scheduled reversal of deferred tax liabilities, projected future taxable income and available tax planning strategies and considers foreign tax credit utilization in making this assessment of realization. A valuation allowance is established against the net deferred tax asset to the extent that recovery is not likely. The Company is subject to taxation in the United States, as well as various state and foreign jurisdictions. As disclosed by management, the use of significant judgment and estimates, as well as the interpretation and application of complex tax laws is required by management to determine the Company's provision for income taxes.

The principal considerations for our determination that performing procedures relating to the accounting for income taxes is a critical audit matter are the high degree of auditor judgment, subjectivity and effort in performing procedures and evaluating audit evidence relating to (i) management's assessment of complex tax laws and regulations, including recent court rulings, as it relates to determining the provision for income taxes and other tax positions, and (ii) management's assessment of realizability of deferred tax assets, specifically around future taxable income, foreign tax credit utilization and available tax planning strategies. In addition, the audit effort involved the use of professionals with specialized skill and knowledge.

Addressing the matters involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the provision for income taxes and other tax positions, including controls over management's assessments of the realizability of deferred tax assets. These procedures also included, among others, evaluating the effect on the Company's tax provision of changes in its legal entity structure, evaluating changes in and compliance with tax laws, and testing management's tax calculations including the Company's

forecast of future taxable income, tax planning strategies, and foreign tax credit utilization of deferred tax assets. Professionals with specialized skill and knowledge were used to assist in evaluating the application of relevant tax laws, the provision for income taxes and the reasonableness of management's assessments of whether certain tax positions are more-likely-than-not of being sustained.

/s/ PRICEWATERHOUSECOOPERS LLP

Portland, Oregon

July 20, 2021

CONSOLIDATED STATEMENTS OF INCOME

	Year Ended May 31,		
	2021	2020	2019
	(In millions, except per share data)		
Revenues (Note 16)	\$ 44,538	\$ 37,403	\$ 39,117
Cost of sales	24,576	21,162	21,643
Gross profit	19,962	16,241	17,474
Demand creation expense	3,114	3,592	3,753
Operating overhead expense	9,911	9,534	8,949
Total selling and administrative expense	13,025	13,126	12,702
Interest expense (income), net	262	89	49
Other (income) expense, net	14	139	(78)
Income before income taxes	6,661	2,887	4,801
Income tax expense (Note 9)	934	348	772
Net Income	\$ 5,727	\$ 2,539	\$ 4,029
Earnings per common share: (Note 12)			
Basic	\$ 3.64	\$ 1.63	\$ 2.55
Diluted	\$ 3.56	\$ 1.60	\$ 2.49
Weighted average common shares outstanding:			
Basic	1,573.0	1,558.8	1,579.7
Diluted	1,609.4	1,591.6	1,618.4

The accompanying notes to the consolidated financial statements are an integral part of this statement.

CONSOLIDATED BALANCE SHEETS

	May 31,	
	2021	2020
	(In millions)	
ASSETS		
Current assets:		
Cash and equivalents	\$ 9,889	\$ 8,348
Short-term investments	3,587	439
Accounts receivable, net	4,463	2,749
Inventories	6,854	7,367
Prepaid expenses and other current assets	<u>1,498</u>	<u>1,653</u>
Total current assets	26,291	20,556
Property, plant and equipment, net	4,904	4,866
Operating lease right-of-use assets, net	3,113	3,097
Identifiable intangible assets, net	269	274

	May 31,	
	2021	2020
	(In millions)	
Goodwill	242	223
Deferred income taxes and other assets	2,921	2,326
Total Assets	\$ 37,740	\$ 31,342
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current liabilities:		
Current portion of long-term debt	\$ —	\$ 3
Notes payable	2	248
Accounts payable	2,836	2,248
Current portion of operating lease liabilities	467	445
Accrued liabilities	6,063	5,184
Income taxes payable	306	156
Total current liabilities	9,674	8,284
Long-term debt	9,413	9,406
Operating lease liabilities	2,931	2,913
Deferred income taxes and other liabilities	2,955	2,684
Commitments and contingencies (Note 18)	—	—
Redeemable preferred stock	—	—
Shareholders' equity:		
Common stock at stated value:		
Class A convertible—305 and 315 shares outstanding	—	—
Class B—1,273 and 1,243 shares outstanding	3	3
Capital in excess of stated value	9,965	8,299
Accumulated other comprehensive income (loss)	(380)	(56)
Retained earnings (deficit)	3,179	(191)
Total shareholders' equity	12,767	8,055
Total Liabilities and Shareholders' Equity	\$ 37,740	\$ 31,342

The accompanying notes to the consolidated financial statements are an integral part of this statement.

CONSOLIDATED STATEMENTS OF CASH FLOWS

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Cash provided (used) by operations:			
Net income	\$5,727	\$2,539	\$4,029
Adjustments to reconcile net income to net cash provided (used) by operations:			
Depreciation	744	721	705
Deferred income taxes	(385)	(380)	34
Stock-based compensation	611	429	325
Amortization, impairment and other	53	398	15
Net foreign currency adjustments	(138)	23	233
Changes in certain working capital components and other assets and liabilities:			
(Increase) decrease in accounts receivable	(1,606)	1,239	(270)
(Increase) decrease in inventories	507	(1,854)	(490)
(Increase) decrease in prepaid expenses, operating lease right-of-use assets and other current and non-current assets	(182)	(654)	(203)

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Increase (decrease) in accounts payable, accrued liabilities, operating lease liabilities and other current and non-current liabilities	1,326	24	1,525
Cash provided (used) by operations	6,657	2,485	5,903
Cash provided (used) by investing activities:			
Purchases of short-term investments	(9,961)	(2,426)	(2,937)
Maturities of short-term investments	4,236	74	1,715
Sales of short-term investments	2,449	2,379	2,072
Additions to property, plant and equipment	(695)	(1,086)	(1,119)
Other investing activities	171	31	5
Cash provided (used) by investing activities	(3,800)	(1,028)	(264)
Cash provided (used) by financing activities:			
Proceeds from borrowings, net of debt issuance costs	—	6,134	—
Increase (decrease) in notes payable, net	(52)	49	(325)
Repayment of borrowings	(197)	(6)	(6)
Proceeds from exercise of stock options and other stock issuances	1,172	885	700
Repurchase of common stock	(608)	(3,067)	(4,286)
Dividends—common and preferred	(1,638)	(1,452)	(1,332)
Other financing activities	(136)	(52)	(44)
Cash provided (used) by financing activities	(1,459)	2,491	(5,293)
Effect of exchange rate changes on cash and equivalents	143	(66)	(129)
Net increase (decrease) in cash and equivalents	1,541	3,882	217
Cash and equivalents, beginning of year	8,348	4,466	4,249
Cash and Equivalents, End of Year	<u>\$9,889</u>	<u>\$8,348</u>	<u>\$4,466</u>
Supplemental disclosure of cash flow information:			
Cash paid during the year for:			
Interest, net of capitalized interest	\$ 293	\$ 140	\$ 153
Income taxes	1,177	1,028	757
Non-cash additions to property, plant and equipment	179	121	160
Dividends declared and not paid	438	385	347

The accompanying notes to the consolidated financial statements are an integral part of this statement.

CONSOLIDATED STATEMENTS OF SHAREHOLDERS' EQUITY

	Common Stock							
	Class A		Class B		Capital in Excess of Stated Value	Accumulated Other Comprehensive Income (Loss)	Retained Earnings (Deficit)	Total
	Shares	Amount	Shares	Amount				
	(In millions, except per share data)							
Balance at May 31, 2018	329	\$ —	1,272	\$ 3	\$ 6,384	\$ (92)	\$ 3,517	\$ 9,812
Stock options exercised			18		539			539
Conversion to Class B Common Stock	(14)		14					—
Repurchase of Class B Common Stock			(54)		(227)		(4,056)	(4,283)
Dividends on common stock (\$0.86 per share) and preferred stock (\$0.10 per share)							(1,360)	(1,360)

	Common Stock							
	Class A		Class B		Capital in Excess of Stated Value	Accumulated Other Comprehensive Income (Loss)	Retained Earnings (Deficit)	Total
	Shares	Amount	Shares	Amount				
(In millions, except per share data)								
Issuance of shares to employees, net of shares withheld for employee taxes			3		142		(3)	139
Stock-based compensation					325			325
Net income							4,029	4,029
Other comprehensive income (loss)						323		323
Adoption of ASU 2016-16 (Note 1)							(507)	(507)
Adoption of ASC Topic 606 (Note 1)							23	23
Balance at May 31, 2019	315	\$ —	1,253	\$ 3	\$ 7,163	\$ 231	\$ 1,643	\$ 9,040
Stock options exercised			20		703			703
Repurchase of Class B Common Stock			(34)		(161)		(2,872)	(3,033)
Dividends on common stock (\$0.955 per share) and preferred stock (\$0.10 per share)							(1,491)	(1,491)
Issuance of shares to employees, net of shares withheld for employee taxes			4		165		(9)	156
Stock-based compensation					429			429
Net income							2,539	2,539
Other comprehensive income (loss)						(287)		(287)
Adoption of ASC Topic 842 (Note 1)							(1)	(1)
Balance at May 31, 2020	315	\$ —	1,243	\$ 3	\$ 8,299	\$ (56)	\$ (191)	\$ 8,055
Stock options exercised			21		954			954
Conversion to Class B Common Stock	(10)		10					—
Repurchase of Class B Common Stock			(5)		(28)		(622)	(650)
Dividends on common stock (\$1.070 per share) and preferred stock (\$0.10 per share)							(1,692)	(1,692)
Issuance of shares to employees, net of shares withheld for employee taxes			4		129		(43)	86
Stock-based compensation					611			611
Net income							5,727	5,727
Other comprehensive income (loss)						(324)		(324)
Balance at May 31, 2021	305	\$ —	1,273	\$ 3	\$ 9,965	\$ (380)	\$ 3,179	\$ 12,767

The accompanying notes to the consolidated financial statements are an integral part of this statement.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Note 1—Summary of Significant Accounting Policies

Description of Business

NIKE, Inc. is a worldwide leader in the design, development and worldwide marketing and selling of athletic footwear, apparel, equipment, accessories and services. NIKE, Inc. portfolio brands include the NIKE Brand, Jordan Brand, Hurley, prior to its divestiture in fiscal 2020, and Converse. The NIKE Brand is focused on performance athletic footwear, apparel, equipment, accessories and services across a wide range of sport categories, amplified with sport-inspired lifestyle products carrying the Swoosh trademark, as well as other NIKE Brand trademarks. The Jordan Brand is focused on athletic and casual footwear, apparel and accessories using the Jumpman trademark. Sales and operating results of Jordan Brand products are reported within the respective NIKE Brand geographic operating segments. Sales and operating results of Hurley brand products, prior to its divestiture in fiscal 2020, were reported within the NIKE Brand's North America geographic operating segment. Refer to Note 20—Acquisitions and Divestitures for information regarding the divestiture of the Company's wholly-owned subsidiary, Hurley. Converse designs, distributes, licenses and sells casual sneakers, apparel and accessories under the Converse, Chuck Taylor, All Star, One Star, Star Chevron and Jack Purcell trademarks. In some markets outside the U.S., these trademarks are licensed to third parties who design, distribute, market and sell similar products. Operating results of the Converse brand are reported on a stand-alone basis.

Basis of Consolidation

The Consolidated Financial Statements include the accounts of NIKE, Inc. and its subsidiaries (the "Company" or "NIKE"). All significant intercompany transactions and balances have been eliminated.

Recognition of Revenues

Beginning in fiscal 2019, the Company adopted Accounting Standards Update (ASU) No. 2014-09, Revenue from Contracts with Customers (Topic 606). The Company's revenue recognition policies under Topic 606 are described in the following paragraphs.

Revenue transactions associated with the sale of NIKE Brand footwear, apparel and equipment, as well as Converse products, comprise a single performance obligation, which consists of the sale of products to customers either through wholesale or direct to consumer channels. The Company satisfies the performance obligation and records revenues when transfer of control to the customer has occurred, based on the terms of sale. A customer is considered to have control once they are able to direct the use and receive substantially all of the benefits of the product.

Control is transferred to wholesale customers upon shipment or upon receipt depending on the country of the sale and the agreement with the customer. Control transfers to retail store customers at the time of sale and to substantially all digital commerce customers upon shipment. The transaction price is determined based upon the invoiced sales price, less anticipated sales returns, discounts and miscellaneous claims from customers. Payment terms for wholesale transactions depend on the country of sale or agreement with the customer and payment is generally required within 90 days or less of shipment to or receipt by the wholesale customer. Payment is due at the time of sale for retail store and digital commerce transactions.

Consideration for trademark licensing contracts is earned through sales-based or usage-based royalty arrangements, and the associated revenues are recognized over the license period.

Taxes assessed by governmental authorities that are both imposed on and concurrent with a specific revenue-producing transaction, and are collected by the Company from a customer, are excluded from Revenues and Cost of sales in the Consolidated Statements of Income. Shipping and handling costs associated with outbound freight after control over a product has transferred to a customer are accounted for as fulfillment costs and are included in Cost of sales when the related revenues are recognized.

Sales-Related Reserves

Consideration promised in the Company's contracts with customers is variable due to anticipated reductions, such as sales returns, discounts and miscellaneous claims from customers. The Company estimates the most likely amount it will be entitled to receive and records an anticipated reduction against Revenues, with an offsetting increase to Accrued liabilities at the time revenues are recognized. The estimated cost of inventory for product returns is recorded in Prepaid expenses and other current assets on the Consolidated Balance Sheets.

The provision for anticipated sales returns consists of both contractual return rights and discretionary authorized returns. Provisions for post-invoice sales discounts consist of both contractual programs and discretionary discounts that are expected to be granted at a later date.

Estimates of discretionary authorized returns, discounts and claims are based on (1) historical rates, (2) specific identification of outstanding returns not yet received from customers and outstanding discounts and claims and (3) estimated returns, discounts and claims expected but not yet finalized with customers. Actual returns, discounts and claims in any future period are inherently uncertain and thus may differ from estimates recorded. If actual or expected future returns, discounts or claims are significantly greater or lower than the reserves established, a reduction or increase to net Revenues is recorded in the period in which such determination is made.

Cost of Sales

Cost of sales consists primarily of inventory costs, as well as warehousing costs (including the cost of warehouse labor), third-party royalties, certain foreign currency hedge gains and losses and product design costs. Shipping and handling costs are expensed as incurred and included in Cost of sales.

Demand Creation Expense

Demand creation expense consists of advertising and promotion costs, including costs of endorsement contracts, complimentary products, television, digital and print advertising and media costs, brand events and retail brand presentation. Advertising production costs are expensed the first time an advertisement is run. Advertising media costs are expensed when the advertisement appears. Costs related to brand events are expensed when the event occurs. Costs related to retail brand presentation are expensed when the presentation is complete and delivered.

A significant amount of the Company's promotional expenses result from payments under endorsement contracts. In general, endorsement payments are expensed on a straight-line basis over the term of the contract. However, certain contracts contain elements that may be accounted for differently based upon the facts and circumstances of each individual contract. Prepayments made under contracts are included in Prepaid expenses and other current assets or Deferred income taxes and other assets depending on the period to which the prepayment applies.

Certain contracts provide for contingent payments to endorsers based upon specific achievements in their sport (e.g., winning a championship). The Company records Demand creation expense for these amounts when the endorser achieves the specific goal.

Certain contracts provide for variable payments based upon endorsers maintaining a level of performance in their sport over an extended period of time (e.g., maintaining a specified ranking in a sport for a year). When the Company determines payments are probable, the amounts are reported in Demand creation expense ratably over the contract period based on the Company's best estimate of the endorser's performance. In these instances, to the extent actual payments to the endorser differ from the Company's estimate due to changes in the endorser's performance, adjustments to Demand creation expense may be recorded in a future period.

Certain contracts provide for royalty payments to endorsers based upon a predetermined percent of sales of particular products, which the Company records in Cost of sales as the related sales occur. For contracts containing minimum guaranteed royalty payments, the Company records the amount of any guaranteed payment in excess of that earned through sales of product within Demand creation expense.

Through cooperative advertising programs, the Company reimburses its wholesale customers for certain costs of advertising the Company's products. The Company records these costs in Demand creation expense at the point in time it is obligated to its customers for the costs. This obligation may arise prior to the related advertisement being run.

Total advertising and promotion expenses, which the Company refers to as Demand creation expense, were \$3,114 million, \$3,592 million and \$3,753 million for the years ended

May 31, 2021, 2020 and 2019, respectively. Prepaid advertising and promotion expenses totaled \$630 million and \$686 million at May 31, 2021 and 2020, respectively, of which \$338 million and \$326 million, respectively, were recorded in Prepaid expenses and other current assets, and \$292 million and \$360 million, respectively, were recorded in Deferred income taxes and other assets, depending on the period to which the prepayment applied.

Operating Overhead Expense

Operating overhead expense consists primarily of wage and benefit-related expenses, research and development costs, bad debt expense as well as other administrative expenses such as rent, depreciation and amortization, professional services, meetings and travel.

Cash and Equivalents

Cash and equivalents represent cash and short-term, highly liquid investments, that are both readily convertible to known amounts of cash, and so near their maturity they present insignificant risk of changes in value because of changes in interest rates, including commercial paper, U.S. Treasury, U.S. Agency, money market funds, time deposits and corporate debt securities with maturities of 90 days or less at the date of purchase.

Short-Term Investments

Short-term investments consist of highly liquid investments, including commercial paper, U.S. Treasury, U.S. Agency, time deposits and corporate debt securities with maturities over 90 days at the date of purchase. At May 31, 2021 and 2020, Short-term investments consisted of available-for-sale debt securities, which are recorded at fair value with unrealized gains and losses reported, net of tax, in Accumulated other comprehensive income (loss), unless unrealized losses are determined to be unrecoverable.

Realized gains and losses on the sale of securities are determined by specific identification. The Company considers all available-for-sale debt securities, including those with maturity dates beyond 12 months, as available to support current operational liquidity needs and, therefore, classifies all securities with maturity dates beyond 90 days at the date of purchase as current assets within Short-term investments on the Consolidated Balance Sheets.

Refer to Note 6—Fair Value Measurements for more information on the Company's Short-term investments.

Allowance for Uncollectible Accounts Receivable

Accounts receivable, net consist primarily of amounts due from customers. The Company makes ongoing estimates relating to the collectability of its accounts receivable and maintains an allowance for expected losses resulting from the inability of its customers to make required payments. In addition to judgments about the creditworthiness of significant customers based on ongoing credit evaluations, the Company considers historical levels of credit losses, as well as macroeconomic and industry trends, such as the impacts of COVID-19, to determine the amount of the allowance. Accounts receivable with anticipated collection dates greater than 12 months from the balance sheet date and related allowances are considered non-current and recorded in Deferred income taxes and other assets. The allowance for uncollectible accounts receivable was \$93 million and \$214 million as of May 31, 2021 and 2020, respectively.

Inventory Valuation

Inventories are stated at lower of cost and net realizable value, and valued on either an average or a specific identification cost basis. In some instances, the Company ships products directly from its suppliers to the customer, with the related inventory and cost of sales recognized on a specific identification basis. Inventory costs primarily consist of product cost from the Company's suppliers, as well as inbound freight, import duties, taxes, insurance, logistics and other handling fees.

Property, Plant and Equipment and Depreciation

Property, plant and equipment are recorded at cost. Depreciation is determined on a straight-line basis for land improvements, buildings and leasehold improvements over 2 to 40 years and for machinery and equipment over 2 to 15 years.

Depreciation and amortization of assets used in manufacturing, warehousing and product distribution are recorded in Cost of sales. Depreciation and amortization of all other assets are recorded in Operating overhead expense.

Software Development Costs

Expenditures for major software purchases and software developed for internal use are capitalized and amortized over a 2- to 12-year period on a straight-line basis. The Company's policy provides for the capitalization of external direct costs associated with developing or obtaining internal use computer software. The Company also capitalizes certain payroll and payroll-related costs for employees who are directly associated with internal use computer software projects. The amount of capitalizable payroll costs with respect to these employees is limited to the time directly spent on such projects. Costs associated with preliminary project stage activities, training, maintenance and all other post-implementation stage activities are expensed as incurred.

Development costs of computer software to be sold, leased or otherwise marketed as an integral part of a product are subject to capitalization beginning when a product's technological feasibility has been established and ending when a product is available for general release to customers. In most instances, the Company's products are released soon after technological feasibility has been established; therefore, software development costs incurred subsequent to achievement of technological feasibility are usually not significant, and generally, most software development costs have been expensed as incurred.

Impairment of Long-Lived Assets

The Company reviews the carrying value of long-lived assets or asset groups to be used in operations whenever events or changes in circumstances indicate the carrying amount of the assets might not be recoverable. Factors that would necessitate an impairment assessment include a significant adverse change in the extent or manner in which an asset is used, a significant adverse change in legal factors or the business climate that could affect the value of the asset or a significant decline in the observable market value of an asset, among others. If such facts indicate a potential impairment, the Company would assess the recoverability of an asset group by determining if the carrying value of the asset group exceeds the sum of the projected undiscounted cash flows expected to result from the use and eventual disposition of the assets over the remaining economic life of the primary asset in the asset group. If the recoverability test indicates that the carrying value of the asset group is not recoverable, the Company will estimate the fair value of the asset group using appropriate valuation methodologies, which would typically include an estimate of discounted cash flows. Any impairment would be measured as the difference between the asset group's carrying amount and its estimated fair value.

Goodwill and Indefinite-Lived Intangible Assets

The Company performs annual impairment tests on goodwill and intangible assets with indefinite lives in the fourth quarter of each fiscal year or when events occur or circumstances change that would, more likely than not, reduce the fair value of a reporting unit or an intangible asset with an indefinite life below its carrying value. Events or changes in circumstances that may trigger interim impairment reviews include significant changes in business climate, operating results, planned investments in the reporting unit, planned divestitures or an expectation that the carrying amount may not be recoverable, among other factors. For purposes of testing goodwill for impairment, the Company allocates goodwill across its reporting units, which are considered the Company's operating segments. The Company may first assess qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If, after assessing the totality of events and circumstances, the Company determines it is more likely than not that the fair value of the reporting unit is greater than its carrying amount, an impairment test is unnecessary. If an impairment test is necessary, the Company will estimate the fair value of its related reporting units. If the carrying value of a reporting unit exceeds its fair value, the goodwill of that reporting unit is determined to be impaired and the Company will proceed with recording an impairment charge equal to the excess of the carrying value over the related fair value.

Indefinite-lived intangible assets primarily consist of acquired trade names and trademarks. The Company may first perform a qualitative assessment to determine whether it is more likely than not that an indefinite-lived intangible asset is impaired. If, after assessing the totality of events and circumstances, the Company determines it is more likely than not that the indefinite-lived intangible asset is not impaired, no quantitative fair value measurement is necessary. If a quantitative fair value measurement calculation is required for these intangible assets, the Company primarily utilizes the relief-from-royalty method. This method assumes trade names and trademarks have value to the extent their owner is relieved of the obligation to pay royalties for the benefits received from them. This method requires the Company to estimate the future

revenues for the related brands, the appropriate royalty rate and the weighted average cost of capital. If the carrying value of the indefinite-lived intangible exceeds its fair value, the asset is determined to be impaired, and the Company will proceed with recording an impairment charge equal to the excess of the carrying value over the related fair value.

Operating Leases

Beginning in fiscal 2020, the Company adopted Accounting Standards Update (ASU) No. 2016-02, Leases (Topic 842). Periods prior to fiscal 2020 have not been restated and continue to be reported in accordance with the Company's historical accounting policies. The Company's lease recognition policies under Topic 842 are described in the following paragraphs.

The Company primarily leases retail store space, certain distribution and warehouse facilities, office space, equipment and other non-real estate assets. The Company determines if an arrangement is a lease at inception and begins recording lease activity at the commencement date, which is generally the date in which the Company takes possession of or controls the physical use of the asset. Lease components are not separated from nonlease components for real estate leases within the Company's lease portfolio. Right-of-use (ROU) assets and lease liabilities are recognized based on the present value of lease payments over the lease term with lease expense recognized on a straight-line basis. The Company's incremental borrowing rate is used to determine the present value of future lease payments unless the implicit rate is readily determinable.

Lease agreements may contain rent escalation clauses, renewal or termination options, rent holidays or certain landlord incentives, including tenant improvement allowances. ROU assets include amounts for scheduled rent increases and are reduced by the amount of lease incentives. The lease term includes the non-cancelable period of the lease and options to extend or terminate the lease when it is reasonably certain the Company will exercise those options. The Company does not record leases with an initial term of 12 months or less on the Consolidated Balance Sheets, and recognizes related lease payments in the Consolidated Statements of Income on a straight-line basis over the lease term. Certain lease agreements include variable lease payments, which are based on a percent of retail sales over specified levels or adjust periodically for inflation as a result of changes in a published index, primarily the Consumer Price Index, and are expensed as incurred.

Fair Value Measurements

The Company measures certain financial assets and liabilities at fair value on a recurring basis, including derivatives, equity securities and available-for-sale debt securities.

Fair value is the price the Company would receive to sell an asset or pay to transfer a liability in an orderly transaction with a market participant at the measurement date. The Company uses a three-level hierarchy established by the Financial Accounting Standards Board (FASB) that prioritizes fair value measurements based on the types of inputs used for the various valuation techniques (market approach, income approach and cost approach).

The levels of the fair value hierarchy are described below:

- Level 1: Quoted prices in active markets for identical assets or liabilities.
- Level 2: Inputs other than quoted prices that are observable for the asset or liability, either directly or indirectly; these include quoted prices for similar assets or liabilities in active markets and quoted prices for identical or similar assets or liabilities in markets that are not active.
- Level 3: Unobservable inputs with little or no market data available, which require the reporting entity to develop its own assumptions.

The Company's assessment of the significance of a particular input to the fair value measurement in its entirety requires judgment and considers factors specific to the asset or liability. Financial assets and liabilities are classified in their entirety based on the most conservative level of input that is significant to the fair value measurement.

Pricing vendors are utilized for a majority of Level 1 and Level 2 investments. These vendors either provide a quoted market price in an active market or use observable inputs without applying significant adjustments in their pricing. Observable inputs include broker quotes, interest rates and yield curves observable at commonly quoted intervals, volatilities and credit risks. The fair value of derivative contracts is determined using observable market inputs such as the daily market foreign currency rates, forward pricing curves, currency volatilities, currency correlations and interest rates and considers nonperformance risk of the Company and its counterparties.

The Company's fair value measurement process includes comparing fair values to another independent pricing vendor to ensure appropriate fair values are recorded.

Foreign Currency Translation and Foreign Currency Transactions

Adjustments resulting from translating foreign functional currency financial statements into U.S. Dollars are included in the foreign currency translation adjustment, a component of Accumulated other comprehensive income (loss) in Total shareholders' equity.

The Company's global subsidiaries have various monetary assets and liabilities, primarily receivables and payables, which are denominated in currencies other than their functional currency. These balance sheet items are subject to remeasurement, the impact of which is recorded in Other (income) expense, net, within the Consolidated Statements of Income.

Accounting for Derivatives and Hedging Activities

The Company uses derivative financial instruments to reduce its exposure to changes in foreign currency exchange rates and interest rates. All derivatives are recorded at fair value on the Consolidated Balance Sheets and changes in the fair value of derivative financial instruments are either recognized in Accumulated other comprehensive income (loss) (a component of Total shareholders' equity), Long-term debt or Net income depending on the nature of the underlying exposure, whether the derivative is formally designated as a hedge and, if designated, the extent to which the hedge is effective. The Company classifies the cash flows at settlement from derivatives in the same category as the cash flows from the related hedged items. For undesignated hedges and designated cash flow hedges, this is primarily within the Cash provided by operations component of the Consolidated Statements of Cash Flows. For designated net investment hedges, this is within the Cash used by investing activities component of the Consolidated Statements of Cash Flows. For the Company's fair value hedges, which are interest rate swaps used to mitigate the change in fair value of its fixed-rate debt attributable to changes in interest rates, the related cash flows from periodic interest payments are reflected within the Cash provided by operations component of the Consolidated Statements of Cash Flows.

Refer to Note 14—Risk Management and Derivatives for additional information on the Company's risk management program and derivatives.

Stock-Based Compensation

The Company accounts for stock-based compensation by estimating the fair value, net of estimated forfeitures, of equity awards and recognizing the related expense as Cost of sales or Operating overhead expense, as applicable, in the Consolidated Statements of Income on a straight-line basis over the vesting period. Substantially all awards vest ratably over four years of continued employment, with stock options expiring 10 years from the date of grant. The fair value of options, stock appreciation rights and employees' purchase rights under the employee stock purchase plans (ESPPs) is determined using the Black-Scholes option pricing model. The fair value of restricted stock and restricted stock units is established by the market price on the date of grant.

Refer to Note 11—Common Stock and Stock-Based Compensation for additional information on the Company's stock-based compensation programs.

Income Taxes

The Company accounts for income taxes using the asset and liability method. This approach requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of temporary differences between the carrying amounts and the tax basis of assets and liabilities. The Company records a valuation allowance to reduce deferred tax assets to the amount management believes is more likely than not to be realized. Realization of deferred tax assets is dependent on future taxable earnings and is therefore uncertain. At least quarterly, the Company assesses taxable income in prior carryback periods, the scheduled reversal of deferred tax liabilities, projected future taxable income and available tax planning strategies. The Company uses forecasts of taxable income and considers foreign tax credit utilization in making this assessment of realization, which are inherently uncertain and can result in significant variation between estimated and actual results. To the extent the Company believes that recovery is not likely, a valuation allowance is established against the net deferred tax asset, which increases the Company's income tax expense in the period when such determination is made. The Company recognizes a tax benefit from uncertain tax positions in the financial statements only when it is more likely than not the position will be sustained upon examination by relevant tax authorities. The Company recognizes interest and penalties related to income tax matters in Income tax expense.

Refer to Note 9—Income Taxes for further discussion.

Earnings Per Share

Basic earnings per common share is calculated by dividing Net income by the weighted average number of common shares outstanding during the year. Diluted earnings per common share is calculated by adjusting weighted average outstanding shares, assuming conversion of all potentially dilutive stock options and awards.

Refer to Note 12—Earnings Per Share for further discussion.

Management Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates, including estimates relating to assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates. Additionally, the extent to which the evolving COVID-19 pandemic impacts the Company's financial statements will depend on a number of factors, including the magnitude and duration of the pandemic. There remains risk that COVID-19 could have a material, adverse impact on future revenue growth as well as overall profitability and may lead to higher than normal inventory levels in various markets, adverse impacts on the global supply chain, revised payment terms with certain wholesale customers, higher sales-related reserves, factory cancellation costs and a volatile effective tax rate driven by changes in the mix of earnings across the Company's jurisdictions.

Recently Adopted Accounting Standards

In October 2016, the FASB issued ASU No. 2016-16, Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory. The updated guidance requires companies to recognize the income tax consequences of an intra-entity transfer of an asset other than inventory when the transfer occurs. Income tax effects of intra-entity transfers of inventory will continue to be deferred until the inventory has been sold to a third party. The Company adopted the standard on June 1, 2018, using a modified retrospective approach, with the cumulative effect of applying the new standard recognized in Retained earnings at the date of adoption. The adoption resulted in reductions to Retained earnings, Deferred income taxes and other assets and Prepaid expenses and other current assets of \$507 million, \$422 million and \$45 million, respectively, and an increase in Deferred income taxes and other liabilities of \$40 million on the Consolidated Balance Sheets.

Note 2—Inventories

Inventory balances of \$6,854 million and \$7,367 million as of May 31, 2021 and 2020, respectively, were substantially all finished goods.

Note 3—Property, Plant and Equipment

Property, plant and equipment included the following:

	May 31,	
	2021	2020
	(Dollars in million)	
Land and improvements	\$ 363	\$ 345
Buildings	3,365	2,442
Machinery and equipment	3,023	2,751
Internal-use software	1,391	1,483
Leasehold improvements	1,608	1,554
Construction in process	311	1,086
Total property, plant and equipment, gross	10,061	9,661
Less accumulated depreciation	5,157	4,795
Total property, plant and equipment, net	<u>\$4,904</u>	<u>\$4,866</u>

Capitalized interest was not material for the years ended May 31, 2021, 2020 and 2019.

Note 4—Identifiable Intangible Assets, Goodwill

Identifiable intangible assets, net consist of indefinite-lived trademarks, acquired trademarks and other intangible assets. The following table summarizes the Company's Identifiable intangible assets, net balances as of May 31, 2021 and 2020:

	May 31,					
	2021		2020			
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
(Dollars in millions)						
Indefinite-lived trademarks	\$246	\$—	\$246	\$246	\$—	\$246
Acquired trademarks and other	50	27	23	47	19	28
Identifiable intangible assets, net	\$296	\$27	\$269	\$293	\$19	\$274

Goodwill was \$242 million and \$223 million as of May 31, 2021 and 2020, respectively, and there were no accumulated impairment losses as of May 31, 2021 and 2020.

Additionally, the impact to Goodwill during fiscal 2021 and 2020 as a result of acquisitions and divestitures was not material.

Note 5—Accrued Liabilities

Accrued liabilities included the following:

	May 31,	
	2021	2020
(Dollars in millions)		
Compensation and benefits, excluding taxes	\$1,472	\$1,248
Sales-related reserves	1,077	1,178
Allowances for expected loss on sale ⁽¹⁾	358	405
Other	3,156	2,353
Total accrued liabilities	\$6,063	\$5,184

Note 7—Short-Term Borrowings and Credit Lines

Notes payable as of May 31, 2021 and 2020, are summarized below:

	May 31,			
	2021		2020	
	Borrowings	Interest Rate	Borrowings	Interest Rate
(Dollars in millions)				
Notes payable:				
Commercial paper ⁽¹⁾	\$—	0.00%	\$248	1.65%
U.S. operations	—	0.00%	—	0.00% ⁽²⁾
Non-U.S. operations	2	17.80% ⁽²⁾	—	0.00%
Total notes payable	\$ 2		\$248	

⁽¹⁾ Commercial paper borrowings and repayments with original maturities greater than three months are included in Proceeds from borrowings, net of debt issuance costs and Repayment of borrowings, respectively, on the Consolidated Statements of Cash Flows.

⁽²⁾ Weighted average interest rate includes non-interest bearing overdrafts.

The carrying amounts reflected in the Consolidated Balance Sheets for Notes payable approximate fair value.

On August 16, 2019, the Company entered into a committed credit facility agreement with a syndicate of banks, which provides up to \$2 billion of borrowings, with the option to increase borrowings up to \$3 billion in total upon lender approval. The facility matures on August 16, 2024,

with a one-year extension option prior to any anniversary of the closing date, provided that in no event shall the facility extend beyond August 16, 2026. Based on the Company's current long-term senior unsecured debt ratings of AA- and A1 from Standard and Poor's Corporation and Moody's Investor Services, respectively, the interest rate charged on any outstanding borrowings would be the prevailing London Interbank Offered Rate (LIBOR) plus 0.46%. The facility fee is 0.04% of the total commitment. This facility replaces the prior \$2 billion credit facility agreement entered into on August 28, 2015, which would have matured August 28, 2020.

On March 15, 2021, the Company entered into a committed credit facility agreement with a syndicate of banks, which provides up to \$1 billion of borrowings, with the option to increase borrowings up to \$1.5 billion in total upon lender approval. The facility matures on March 14, 2022, with a 364-day extension option up to 30 days prior to the existing termination date, provided that in no event shall the facility extend beyond March 13, 2023. This facility replaces the prior \$2 billion credit facility agreement entered into on April 6, 2020, which would have matured on April 5, 2021. Based on the Company's current long-term senior unsecured debt ratings of AA- and A1 from Standard and Poor's Corporation and Moody's Investor Services, respectively, the interest rate charged on any outstanding borrowings would be the prevailing LIBOR plus 0.50%. The facility fee is 0.03% of the total undrawn commitment. Additionally, the Company decreased its \$4 billion commercial paper program to \$3 billion in connection with the new credit facility agreement.

As of and for the periods ended May 31, 2021 and 2020, no amounts were outstanding under any of the Company's committed credit facilities.

Note 8—Long-Term Debt

Long-term debt, net of unamortized premiums, discounts and debt issuance costs, comprises the following:

				Book Value Outstanding as of May 31,	
	Original Principal	Interest Rate	Interest Payments	2021	2020
Scheduled Maturity (Dollars and Yen in Millions)					
Corporate Term Debt: ⁽¹⁾⁽²⁾					
May 1, 2023	\$ 500	2.25%	Semi-Annually	\$ 499	\$ 499
March 27, 2025	1,000	2.40%	Semi-Annually	995	994
November 1, 2026	1,000	2.38%	Semi-Annually	996	995
March 27, 2027	1,000	2.75%	Semi-Annually	995	994
March 27, 2030	1,500	2.85%	Semi-Annually	1,490	1,489
March 27, 2040	1,000	3.25%	Semi-Annually	986	985
May 1, 2043	500	3.63%	Semi-Annually	496	495
November 1, 2045	1,000	3.88%	Semi-Annually	984	984
November 1, 2046	500	3.38%	Semi-Annually	491	491
March 27, 2050	1,500	3.38%	Semi-Annually	1,481	1,480
Japanese Yen Notes: ⁽³⁾					
August 20, 2001 through November 20, 2020	¥ 9,000	2.60%	Quarterly	\$ —	\$ 2
August 20, 2001 through November 20, 2020	4,000	2.00%	Quarterly	—	1
Total				9,413	9,409
Less current maturities				—	3
Total long-term debt				\$ 9,413	\$ 9,406

⁽¹⁾ These senior unsecured obligations rank equally with the Company's other unsecured and unsubordinated indebtedness.

⁽²⁾ The bonds are redeemable at the Company's option at a price equal to the greater of (i) 100% of the aggregate principal amount of the notes to be redeemed or (ii) the sum of the present values of the remaining scheduled payments, plus in each case, accrued and unpaid interest. However, the bonds also feature a par call provision, which allows for the bonds to be redeemed at a price equal to 100% of the aggregate principal amount of the notes being redeemed, plus accrued and unpaid interest on or after the Par Call Date, as defined in the respective notes.

⁽³⁾ NIKE Logistics YK assumed a total of ¥13.0 billion in loans as part of its agreement to purchase a distribution center in Japan, which serves as collateral for the loans. These loans matured in equal quarterly installments during the period August 20, 2001 through November 20, 2020.

The scheduled maturity of Long-term debt in each of the years ending May 31, 2022 through 2026, are \$0 million, \$500 million, \$0 million, \$1,000 million and \$0 million, respectively, at face value.

The Company's Long-term debt is recorded at adjusted cost, net of unamortized premiums, discounts and debt issuance costs. The fair value of long-term debt is estimated based upon quoted prices for similar instruments or quoted prices for identical instruments in inactive markets (Level 2). The fair value of the Company's Long-term debt, including the current portion, was approximately \$10,275 million and \$10,645 million as of May 31, 2021 and 2020, respectively.

Note 9—Income Taxes

Income before income taxes is as follows:

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Income before income taxes:			
United States	\$5,723	\$2,954	\$ 593
Foreign	938	(67)	4,208
Total income before income taxes	<u>\$6,661</u>	<u>\$2,887</u>	<u>\$4,801</u>

The provision for income taxes is as follows:

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Current:			
United States			
Federal	\$328	\$(109)	\$74
State	134	81	56
Foreign	857	756	608
Total Current	<u>1,319</u>	<u>728</u>	<u>738</u>
Deferred:			
United States			
Federal	(371)	(231)	(33)
State	(34)	(47)	(9)
Foreign	20	(102)	76
Total Deferred	<u>(385)</u>	<u>(380)</u>	<u>34</u>
Total income tax expense	<u>\$934</u>	<u>\$348</u>	<u>\$772</u>

A reconciliation from the U.S. statutory federal income tax rate to the effective income tax rate follows:

	Year Ended May 31,		
	2021	2020	2019
Federal income tax rate	21.0%	21.0%	21.0%
State taxes, net of federal benefit	1.3%	0.8%	1.0%
Foreign earnings	0.2%	5.9%	-1.1%
Foreign-derived intangible income benefit	-3.7%	-8.1%	—%
Excess tax benefits from share-based compensation	-4.5%	-7.2%	-3.6%
Income tax audits and contingency reserves	1.5%	-1.4%	1.3%
U.S. research and development tax credit	-0.9%	-1.8%	-1.0%
Other, net	-0.9%	2.9%	-1.5%
Effective income tax rate	14.0%	12.1%	16.1%

On December 22, 2017, the United States enacted the Tax Cuts and Jobs Act (the “Tax Act”), which significantly changed U.S. tax law and included a provision to tax global intangible low-taxed income (GILTI) of foreign subsidiaries. The Company recognizes taxes due under the GILTI provision as a current period expense.

The effective tax rate for the fiscal year ended May 31, 2021, was higher than the effective tax rate for the fiscal year ended May 31, 2020, due to a change in the proportion of earnings taxed in the U.S., related to the recovery from the impact of the COVID-19 pandemic and less favorable impacts from discrete items such as stock-based compensation. Income tax audit and contingency reserves for the fiscal year ended May 31, 2021, reflects recognition of a reserve of 1.2% related to *Altera Corp. v. Commissioner*, where the taxpayer was denied a hearing before the U.S. Supreme Court on June 22, 2020, thereby ratifying the Ninth Circuit Court’s decision and requiring the inclusion of stock-based compensation in intercompany cost-sharing arrangements, and other matters of 0.3%.

The effective tax rate for the fiscal year ended May 31, 2020, was lower than the effective tax rate for the fiscal year ended May 31, 2019, due to increased benefits from discrete items such as stock-based compensation. The foreign earnings rate impact shown above for the fiscal year ended May 31, 2020, includes withholding taxes of 6.5% and held for sale accounting items of 2.9%, offset by a benefit for statutory rate differences and other items of 3.5%. The foreign derived intangible income benefit reflects U.S. tax benefits introduced by the Tax Act for companies serving foreign markets. This benefit became available to the Company as a result of a restructuring of its intellectual property interests. Income tax audit and contingency reserves reflect benefits associated with the modification of the treatment of certain research and development expenditures of 2.9% offset by an increase related to the resolution of an audit by the U.S. Internal Revenue Service (“IRS”) and other matters of 1.5%. Included in other is the deferral of income tax effects related to intra-entity transfers of inventory of 2.3% and other items of 0.6%.

Deferred tax assets and (liabilities) are comprised of the following:

	May 31,	
	2021	2020
	(Dollars in millions)	
Deferred tax assets:		
Inventories ⁽¹⁾	\$ 78	\$ 84
Sales return reserves ⁽¹⁾	100	115
Deferred compensation ⁽¹⁾	350	295
Stock-based compensation	175	168
Reserve and accrued liabilities ⁽¹⁾	96	120
Operating lease liabilities	499	491
Intangibles	187	—
Capitalized research and development expenditures	349	189
Net operating loss carry-forwards ⁽¹⁾	15	21
Other ⁽¹⁾	<u>178</u>	<u>127</u>
Total deferred tax assets	2,027	1,610
Valuation allowance ⁽¹⁾	<u>(12)</u>	<u>(26)</u>
Total deferred tax assets after valuation allowance	2,015	1,584
Deferred tax liabilities:		
Foreign withholding tax on undistributed earnings of foreign subsidiaries	(182)	(165)
Property, plant and equipment ⁽¹⁾	(255)	(232)
Right-of-use assets	(431)	(423)
Other ⁽¹⁾	<u>(14)</u>	<u>(32)</u>
Total deferred tax liabilities	<u>(882)</u>	<u>(852)</u>
Net deferred tax asset	<u>\$ 1,133</u>	<u>\$ 732</u>

⁽¹⁾ The above amounts exclude deferred taxes held-for-sale as of May 31, 2021 and 2020. See Note 20—Acquisitions and Divestitures for additional information.

The following is a reconciliation of the changes in the gross balance of unrecognized tax benefits:

	May 31,		
	2021	2020	2019
	(Dollars in millions)		
Unrecognized tax benefits, beginning of the period	\$771	\$808	\$698
Gross increases related to prior period tax positions	77	181	85
Gross decreases related to prior period tax positions	(22)	(171)	(32)
Gross increases related to current period tax positions	59	50	81
Settlements	(5)	(58)	—
Lapse of statute of limitations	(6)	(28)	(35)
Change due to currency translation	22	(11)	11
Unrecognized tax benefits, end of the period	<u>\$896</u>	<u>\$771</u>	<u>\$808</u>

As of May 31, 2021, total gross unrecognized tax benefits, excluding related interest and penalties, were \$896 million, \$609 million of which would affect the Company's effective tax rate if recognized in future periods. The majority of the total gross unrecognized tax benefits are long-term in nature and included within Deferred income taxes and other liabilities on the Consolidated Balance Sheets.

The Company recognizes interest and penalties related to income tax matters in income tax expense. The liability for payment of interest and penalties increased by \$45 million during the year ended May 31, 2021, decreased by \$16 million during the fiscal year ended May 31, 2020, and increased by \$17 million during the fiscal year ended May 31, 2019. As of May 31, 2021 and 2020, accrued interest and penalties related to uncertain tax positions were \$203 million and \$158 million, respectively (excluding federal benefit).

As of May 31, 2021 and 2020, long-term income taxes payable were \$640 million and \$757 million, respectively, and were included within Deferred income taxes and other liabilities on the Consolidated Balance Sheets.

The Company is subject to taxation in the United States, as well as various state and foreign jurisdictions. The Company is currently under audit by the IRS for fiscal years 2017 through 2019. The Company has closed all U.S. federal income tax matters through fiscal 2016, with the exception of certain transfer pricing adjustments. Tax years after 2010 remain open in certain major foreign jurisdictions. Although the timing of resolution of audits is not certain, the Company evaluates all domestic and foreign audit issues in the aggregate, along with the expiration of applicable statutes of limitations, and estimates that it is reasonably possible the total gross unrecognized tax benefits could decrease by up to \$40 million within the next 12 months. In January 2019, the European Commission opened a formal investigation to examine whether the Netherlands has breached State Aid rules when granting certain tax rulings to the Company. The Company believes the investigation is without merit. If this matter is adversely resolved, the Netherlands may be required to assess additional amounts with respect to current and prior periods, and the Company's Netherlands income taxes in the future could increase.

The Company historically provided for U.S. income taxes on the undistributed earnings of foreign subsidiaries unless they were considered indefinitely reinvested outside the United States. As a result of the enactment of the Tax Act, in fiscal 2018 the Company reevaluated its historic indefinite reinvestment assertion and determined that any historical or future undistributed earnings of foreign subsidiaries are no longer considered to be indefinitely reinvested. Effective January 1, 2020, however, the tax law in the Netherlands, one of the Company's major jurisdictions, changed. As a result of the change in law, the Company's undistributed earnings in the Netherlands are subject to withholding tax upon distribution. It is the Company's intention to indefinitely reinvest the historical earnings of certain foreign subsidiaries outside North America prior to May 31, 2020, to ensure there is sufficient working capital to expand operations outside the United States. Accordingly, the Company has not recorded a deferred tax liability related to foreign withholding taxes on approximately \$10.3 billion of undistributed earnings of these foreign subsidiaries as of May 31, 2021. Withholding taxes of approximately \$1.5 billion would be payable upon the remittance of these undistributed earnings as of May 31, 2021.

A portion of the Company's foreign operations benefit from a tax holiday, which is set to expire in 2031. This tax holiday may be extended when certain conditions are met or may be terminated early if certain conditions are not met. The tax benefit attributable to this tax holiday was \$238 million, \$238 million and \$167 million for the fiscal years ended May 31, 2021, 2020 and 2019, respectively. The benefit of the tax holiday on diluted earnings per common share was \$0.15, \$0.15 and \$0.10 for the fiscal years ended May 31, 2021, 2020 and 2019, respectively.

Deferred tax assets as of May 31, 2021 and 2020, were reduced by a valuation allowance. For the fiscal year ended May 31, 2021, a valuation allowance was provided for U.S. capital loss carryforwards and on tax benefits generated by certain entities with operating losses. For the fiscal year ended May 31, 2020, a valuation allowance was provided for U.S. foreign tax credit carryforwards and on tax benefits generated by certain entities with operating losses. There was a \$14 million net decrease in the valuation allowance for the fiscal year ended May 31, 2021, compared to a \$62 million net decrease for the fiscal year ended May 31, 2020, and \$7 million net decrease for the year ended May 31, 2019.

The Company has available domestic and foreign loss carry-forwards of \$65 million as of May 31, 2021. If not utilized, such losses will expire as follows:

	Year Ending May 31,						
	2022	2023	2024	2025	2026–2041	Indefinite	Total
	(Dollars in millions)						
Net operating losses	\$ —	\$ —	\$ —	\$ —	\$42	\$23	\$65

Note 10—Redeemable Preferred Stock

Sojitz America is the sole owner of the Company's authorized redeemable preferred stock, \$1 par value, which is redeemable at the option of Sojitz America or the Company at par value aggregating \$0.3 million. A cumulative dividend of \$0.10 per share is payable annually on May 31, and no dividends may be declared or paid on the common stock of the Company unless dividends on the redeemable preferred stock have been declared and paid in full. There have been no changes in the redeemable preferred stock in the fiscal years ended May 31, 2021, 2020 and 2019. As the holder of the redeemable preferred stock, Sojitz America does not have general voting rights but does have the right to vote as a separate class on the sale of all or substantially all of the assets of the Company and its subsidiaries; on merger, consolidation, liquidation or dissolution of the Company; or on the sale or assignment of the NIKE trademark for athletic footwear sold in the United States. The redeemable preferred stock has been fully issued to Sojitz America and is not blank check preferred stock. The Company's articles of incorporation do not permit the issuance of additional preferred stock.

Note 11—Common Stock and Stock-Based Compensation

Common Stock

The authorized number of shares of Class A Common Stock, no par value, and Class B Common Stock, no par value, are 400 million and 2,400 million, respectively. Each share of Class A Common Stock is convertible into one share of Class B Common Stock. Voting rights of Class B Common Stock are limited in certain circumstances with respect to the election of directors. There are no differences in the dividend and liquidation preferences or participation rights of the holders of Class A and Class B Common Stock. From time to time, the Company's Board of Directors authorizes share repurchase programs for the repurchase of Class B Common Stock. The value of repurchased shares is deducted from Total shareholders' equity through allocation to Capital in excess of stated value and Retained earnings.

Stock-Based Compensation

The NIKE, Inc. Stock Incentive Plan (the "Stock Incentive Plan") provides for the issuance of up to 798 million previously unissued shares of Class B Common Stock in connection with equity awards granted under the Stock Incentive Plan. The Stock Incentive Plan authorizes the grant of non-statutory stock options, incentive stock options, stock appreciation rights, restricted stock, restricted stock units and performance-based awards. The exercise price for stock options and stock appreciation rights may not be less than the fair market value of the underlying shares on

the date of grant. A committee of the Board of Directors administers the Stock Incentive Plan. The committee has the authority to determine the employees to whom awards will be made, the amount of the awards and the other terms and conditions of the awards. The Company generally grants stock options and restricted stock on an annual basis. Substantially all awards under the Stock Incentive Plan vest ratably over 4 years of continued employment, with stock options expiring 10 years from the date of grant.

The following table summarizes the Company's total stock-based compensation expense recognized in Cost of sales or Operating overhead expense, as applicable:

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Stock options ⁽¹⁾	\$323	\$237	\$207
ESPPs	63	53	40
Restricted stock ⁽¹⁾	225	139	78
Total Stock-Based Compensation Expense	\$611	\$429	\$325

⁽¹⁾ Expense for stock options includes the expense associated with stock appreciation rights. Accelerated stock option expense is primarily recorded for employees meeting certain retirement eligibility requirements and was \$67 million, \$53 million and \$41 million for the fiscal years ended May 31, 2021, 2020 and 2019, respectively. During fiscal 2021, an immaterial amount of accelerated stock option and restricted stock expense was also recorded for certain employees impacted by the Company's Organizational realignment. For more information, see Note 21—Restructuring.

The income tax benefit related to stock-based compensation expense was \$297 million, \$207 million and \$175 million for the fiscal years ended May 31, 2021, 2020 and 2019, respectively, and reported within Income tax expense.

Stock Options

The weighted average fair value per share of the options granted during the years ended May 31, 2021, 2020 and 2019, computed as of the grant date using the BlackScholes pricing model, was \$26.75, \$18.71 and \$22.78, respectively. The weighted average assumptions used to estimate these fair values were as follows:

	Year Ended May 31,		
	2021	2020	2019
Dividend yield	0.9%	1.0%	1.0%
Expected volatility	27.3%	23.0%	26.6%
Weighted average expected life (in years)	6.0	6.0	6.0
Risk-free interest rate	0.4%	1.5%	2.8%

Expected volatilities are based on the historical volatility of the Company's common stock, the implied volatility in market traded options on the Company's common stock with a term greater than one year, as well as other factors. The weighted average expected life of options is based on an analysis of historical and expected future exercise patterns. The interest rate is based on the U.S. Treasury (constant maturity) risk-free rate in effect at the date of grant for periods corresponding with the expected term of the options.

The following summarizes the stock option transactions under the plan discussed above:

	Shares ⁽¹⁾	Weighted Average Option Price
	(In millions)	
Options outstanding as of May 31, 2020	88.1	\$60.98
Exercised	(20.7)	46.31
Forfeited	(3.8)	95.87
Granted	14.7	112.65
Options outstanding as of May 31, 2021	78.3	\$72.88

⁽¹⁾ Includes stock appreciation rights transactions.

Options exercisable as of May 31, 2021, were 44.2 million and had a weighted average option price of \$57.43 per share. The aggregate intrinsic value for options outstanding and exercisable as of May 31, 2021, was \$4,976 million and \$3,494 million, respectively. The total intrinsic value of the options exercised during the years ended May 31, 2021, 2020 and 2019 was \$1,571 million, \$1,161 million and \$938 million, respectively. The intrinsic value is the amount by which the market value of the underlying stock exceeds the exercise price of the options. The weighted average contractual life remaining for options outstanding and options exercisable as of May 31, 2021, was 5.9 years and 4.2 years, respectively. As of May 31, 2021, the Company had \$415 million of unrecognized compensation costs from stock options, net of estimated forfeitures, to be recognized in Cost of sales or Operating overhead expense, as applicable, over a weighted average remaining period of 2.5 years.

Employee Stock Purchase Plans

In addition to the Stock Incentive Plan, the Company gives employees the right to purchase shares at a discount from the market price under employee stock purchase plans (ESPPs). Subject to the annual statutory limit, employees are eligible to participate through payroll deductions of up to 10% of their compensation. At the end of each sixmonth offering period, shares are purchased by the participants at 85% of the lower of the fair market value at the beginning or the end of the offering period. Employees purchased 2.5 million, 2.7 million and 2.5 million shares during each of the fiscal years ended May 31, 2021, 2020 and 2019, respectively.

Restricted Stock and Restricted Stock Units

Recipients of restricted stock are entitled to cash dividends and to vote their respective shares throughout the period of restriction. Recipients of restricted stock units are entitled to dividend equivalent cash payments upon vesting. The number of restricted stock and restricted stock units vested includes shares of common stock withheld by the Company on behalf of employees to satisfy the minimum statutory tax withholding requirements.

The following summarizes the restricted stock and restricted stock unit activity under the plan discussed above:

	Shares	Weighted Average Grant Date Fair Value
	(In millions)	
Nonvested as of May 31, 2020	6.8	\$79.84
Vested	(2.7)	76.95
Forfeited	(1.1)	81.70
Granted	<u>3.6</u>	<u>113.84</u>
Nonvested as of May 31, 2021	6.6	\$99.70

The weighted average fair value per share of restricted stock and restricted stock units granted for the years ended May 31, 2021, 2020 and 2019, computed as of the grant date, was \$113.84, \$88.26 and \$80.95, respectively. During the years ended May 31, 2021, 2020 and 2019, the aggregate fair value of restricted stock and restricted stock units vested was \$310 million, \$98 million and \$44 million, respectively, computed as of the date of vesting. As of May 31, 2021, the Company had \$448 million of unrecognized compensation costs from restricted stock and restricted stock units, net of estimated forfeitures, to be recognized in Cost of sales or Operating overhead expense, as applicable, over a weighted average remaining period of 2.5 years.

Note 12—Earnings Per Share

The following is a reconciliation from basic earnings per common share to diluted earnings per common share. The computations of diluted earnings per common share excluded restricted stock and options, including shares under ESPPs, to purchase an additional 11.3 million, 30.6 million and 17.5 million shares of common stock outstanding for the fiscal years ended May 31, 2021, 2020 and 2019, respectively, because the awards were anti-dilutive.

	Year Ended May 31,		
	2021	2020	2019
	(In millions, except per share date)		
Net income available common stockholders			
Determination of shares:	\$5,727	\$2,539	\$4,029
Weighted average common shares outstanding	1,573.0	1,558.8	1,579.7
Assumed conversion of dilutive stock options and awards	36.4	32.8	38.7
Diluted weighted average common shares outstanding	<u>1,609.4</u>	<u>1,591.6</u>	<u>1,618.4</u>
Earnings per common share:			
Basic	\$ 3.64	\$ 1.63	\$ 2.55
Diluted	\$ 3.56	\$ 1.60	\$ 2.49

Note 13—Benefit Plans

The Company has a qualified 401(k) Savings and Profit Sharing Plan, in which all U.S. employees are able to participate. The Company matches a portion of employee contributions to the savings plan. Company contributions to the savings plan were \$110 million, \$107 million and \$90 million and included in Cost of sales or Operating overhead expense, as applicable, for the years ended May 31, 2021, 2020 and 2019, respectively. The terms of the plan also allow for annual discretionary profit sharing contributions, as recommended by senior management and approved by the Board of Directors, to the accounts of eligible U.S. employees who work at least 1,000 hours in a year. There were no profit sharing contributions made to the plan for the fiscal years ended May 31, 2021 and 2020. Profit sharing contributions of \$37 million were made to the plan and included in Cost of sales or Operating overhead expense, as applicable, for the year ended May 31, 2019.

The Company also has a Long-Term Incentive Plan (LTIP) adopted by the Board of Directors and approved by shareholders in September 1997, which has been amended from time to time. The Company recognized \$78 million, \$66 million and \$83 million of Operating overhead expense related to cash awards under the LTIP during the years ended May 31, 2021, 2020 and 2019, respectively.

The Company allows certain highly compensated employees and non-employee directors of the Company to defer compensation under a nonqualified deferred compensation plan. Deferred compensation plan liabilities were \$944 million and \$725 million as of May 31, 2021 and 2020, respectively, and primarily classified in Deferred income taxes and other liabilities on the Consolidated Balance Sheets.

The Company has pension plans in various countries worldwide. The pension plans are only available to local employees and are generally government mandated. The liability related to the unfunded pension liabilities of the plans was \$64 million and \$79 million as of May 31, 2021 and 2020, respectively, and primarily classified as non-current in Deferred income taxes and other liabilities on the Consolidated Balance Sheets.

Note 15—Accumulated Other Comprehensive Income (Loss)

The changes in Accumulated other comprehensive income (loss), net of tax, were as follows:

	Foreign Currency Translation Adjustment ⁽¹⁾	Cash Flow Hedges	Net Investment Hedges ⁽¹⁾	Other	Total
	(Dollars in millions)				
Balance at May 31, 2020	\$(494)	\$ 390	\$115	\$(67)	\$ (56)
Other comprehensive income (loss):					
Other comprehensive gains (losses) before reclassifications ⁽²⁾	499	(788)	—	(8)	(297)
Reclassifications to net income of previously deferred (gains) losses ⁽³⁾	(3)	(37)	—	13	(27)
Total other comprehensive income (loss)	496	(825)	—	5	(324)
Balance at May 31, 2021	\$ 2	\$(435)	\$115	\$(62)	\$(380)

⁽¹⁾ The accumulated foreign currency translation adjustment and net investment hedge gains/losses related to an investment in a foreign subsidiary are reclassified to Net income upon sale or upon complete or substantially complete liquidation of the respective entity.

⁽²⁾ Net of tax benefit (expense) of \$0 million, \$(6) million, \$0 million, \$(1) million and \$(7) million, respectively.

⁽³⁾ Net of tax (benefit) expense of \$0 million, \$8 million, \$0 million, \$0 million and \$8 million, respectively.

Note 18—Commitments and Contingencies

As of May 31, 2021 and 2020, the Company had bank guarantees and letters of credit outstanding totaling \$275 million and \$239 million, respectively, issued primarily for real estate agreements, self-insurance programs and other general business obligations. In connection with various contracts and agreements, the Company provides routine indemnification relating to the enforceability of intellectual property rights, coverage for legal issues that arise and other items where the Company is acting as the guarantor. Currently, the Company has several such agreements in place. However, based on the Company's historical experience and the estimated probability of future loss, the Company has determined the fair value of such indemnification is not material to the Company's financial position or results of operations.

In the ordinary course of business, the Company is involved in various legal proceedings involving contractual and employment relationships, product liability claims, trademark rights and a variety of other matters. While the Company cannot predict the outcome of its pending legal matters with certainty, the Company does not believe any currently identified claim, proceeding or litigation, either individually or in aggregate, will have a material impact on the Company's results of operations, financial position or cash flows.

Note 21—Restructuring

During the first quarter of fiscal 2021, the Company announced a new digitally empowered phase of its Consumer Direct Offense strategy: Consumer Direct Acceleration. As a result, management announced a series of leadership and operating model changes to streamline and speed up strategic execution for the Company. These changes resulted in a net reduction of the Company's global workforce, and during fiscal 2021, the Company incurred pre-tax charges of \$294 million, which relate to employee termination costs and, to a lesser extent, stock-based compensation expense. This amount reflects the continued evaluation and variability of the Company's original estimate of employee termination costs and required changes in assumptions used to calculate stock-based compensation expense. The related cash expenditures primarily took place throughout fiscal 2021, and all related actions are substantially complete.

As of May 31, 2021, the Company recognized employee termination costs of \$214 million and \$35 million within Operating overhead expense and Cost of sales, respectively, on the Consolidated Statements of Income. These costs were classified within Corporate.

The activity was recognized within Accrued liabilities as follows:

	(Dollars in millions)
Balance at May 31, 2020	\$ —
Employee termination costs	249
Cash payments	(212)
Foreign currency translation and other	1
Balance at May 31, 2021	\$38

Note 17—Operating Segments and Related Information

The Company's operating segments are evidence of the structure of the Company's internal organization. The NIKE Brand segments are defined by geographic regions for operations participating in NIKE Brand sales activity.

Each NIKE Brand geographic segment operates predominantly in one industry: the design, development, marketing and selling of athletic footwear, apparel and equipment. The Company's reportable operating segments for the NIKE Brand are: North America; Europe, Middle East & Africa (EMEA); Greater China; and Asia Pacific & Latin America (APLA), and include results for the NIKE and Jordan brands, results for the Hurley brand, prior to its divestiture in fiscal 2020, were included in North America. Refer to Note 20—Acquisitions and Divestitures for information regarding the fiscal 2020 divestiture of the Company's wholly-owned subsidiary, Hurley, and the planned transition of NIKE Brand businesses in certain countries within APLA to third-party distributors.

The Company's NIKE Direct operations are managed within each NIKE Brand geographic operating segment. Converse is also a reportable segment for the Company and operates in one industry: the design, marketing, licensing and selling of athletic lifestyle sneakers, apparel and accessories.

Global Brand Divisions is included within the NIKE Brand for presentation purposes to align with the way management views the Company. Global Brand Divisions revenues include NIKE Brand licensing and other miscellaneous revenues that are not part of a geographic operating segment. Global Brand Divisions costs represent demand creation and operating overhead expense that include product creation and design expenses centrally managed for the NIKE Brand, as well as costs associated with NIKE Direct global digital operations and enterprise technology.

Corporate consists primarily of unallocated general and administrative expenses, including expenses associated with centrally managed departments; depreciation and amortization related to the Company's headquarters; unallocated insurance, benefit and compensation programs, including stock-based compensation; and certain foreign currency gains and losses, including certain hedge gains and losses. For the fiscal year ended May 31, 2020, Corporate included a non-recurring impairment charge, recognized as a result of the Company's decision to transition certain NIKE Brand businesses within APLA to a third-party distributor. This charge primarily reflected the anticipated release of associated non-cash cumulative foreign currency translation losses. For more information regarding this charge, refer to Note 20—Acquisitions and Divestitures.

The primary financial measure used by the Company to evaluate performance of individual operating segments is earnings before interest and taxes (EBIT), which represents Net income before Interest expense (income), net and Income tax expense in the Consolidated Statements of Income.

As part of the Company's centrally managed foreign exchange risk management program, standard foreign currency rates are assigned twice per year to each NIKE Brand entity in the Company's geographic operating segments and to Converse. These rates are set approximately nine and twelve months in advance of the future selling seasons to which they relate (specifically, for each currency, one standard rate applies to the fall and holiday selling seasons, and one standard rate applies to the spring and summer selling seasons) based on average market spot rates in the calendar month preceding the date they are established. Inventories and Cost of sales for geographic operating segments and Converse reflect the use of these standard rates to record non-functional currency product purchases in the entity's functional currency. Differences between assigned standard foreign currency rates and actual market rates are included in Corporate, together with foreign currency hedge gains and losses generated from the Company's centrally managed foreign exchange risk management program and other conversion gains and losses.

Accounts receivable, net, Inventories and Property, plant and equipment, net for operating segments are regularly reviewed by management and are therefore provided below.

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Revenues			
North America	\$17,179	\$14,484	\$15,902
Europe, Middle East & Africa	11,456	9,347	9,812
Greater China	8,290	6,679	6,208
Asia Pacific & Latin America	5,343	5,028	5,254
Global Brand Divisions	<u>25</u>	<u>30</u>	<u>42</u>
Total NIKE Brand	42,293	35,568	37,218
Converse	2,205	1,846	1,906
Corporate	<u>40</u>	<u>(11)</u>	<u>(7)</u>
Total nike, inc. Revenues	<u>\$44,538</u>	<u>\$37,403</u>	<u>\$39,117</u>
Earnings before interest and taxes			
North America	\$ 5,089	\$ 2,899	\$3,925
Europe, Middle East & Africa	2,435	1,541	1,995
Greater China	3,243	2,490	2,376
Asia Pacific & Latin America	1,530	1,184	1,323
Global Brand Divisions	(3,656)	(3,468)	(3,262)
Converse	543	297	303

	Year Ended May 31,		
	2021	2020	2019
	(Dollars in millions)		
Corporate	(2,261)	(1,967)	(1,810)
Interest expense (income), net	<u>262</u>	<u>89</u>	<u>49</u>
Total nike, inc. Income before income taxes	<u>\$6,661</u>	<u>\$2,887</u>	<u>\$4,801</u>
Additions to property, plant and equipment			
North America	\$98	\$110	\$117
Europe, Middle East & Africa	153	139	233
Greater China	94	28	49
Asia Pacific & Latin America	54	41	47
Global Brand Divisions	<u>278</u>	<u>438</u>	<u>278</u>
Total NIKE Brand	677	756	724
Converse	7	12	18
Corporate	<u>107</u>	<u>356</u>	<u>333</u>
Total additions to property, plant and equipment	<u>\$791</u>	<u>\$1,124</u>	<u>\$1,075</u>
Depreciation			
North America	\$130	\$148	\$149
Europe, Middle East & Africa	136	132	111
Greater China	46	44	50
Asia Pacific & Latin America	43	46	53
Global Brand Divisions	<u>222</u>	<u>214</u>	<u>195</u>
Total NIKE Brand	577	584	558
Converse	26	25	31
Corporate	<u>141</u>	<u>112</u>	<u>116</u>
Total depreciation	<u>\$744</u>	<u>\$721</u>	<u>\$705</u>

	As of May 31,	
	2021	2020
	(Dollars in millions)	
Accounts Receivable, Net		
North America	\$1,777	\$1,020
Europe, Middle East & Africa	1,349	712
Greater China	288	321
Asia Pacific & Latin America ⁽¹⁾	643	425
Global Brand Divisions	<u>128</u>	<u>65</u>
Total NIKE Brand	4,185	2,543
Converse	225	149
Corporate	<u>53</u>	<u>57</u>
Total Accounts Receivable, Net	<u>\$4,463</u>	<u>\$2,749</u>
Inventories		
North America	\$2,851	\$3,077
Europe, Middle East & Africa	1,821	2,070
Greater China	1,247	882
Asia Pacific & Latin America ⁽¹⁾	667	770
Global Brand Divisions	<u>153</u>	<u>137</u>
Total NIKE Brand	6,739	6,936

	As of May 31,	
	2021	2020
	(Dollars in millions)	
Converse	290	341
Corporate	(175)	90
Total Inventories	<u>\$6,854</u>	<u>\$7,367</u>
Property, Plant and Equipment, Net		
North America	\$ 617	\$ 645
Europe, Middle East & Africa	982	885
Greater China	288	214
Asia Pacific & Latin America ⁽¹⁾	304	296
Global Brand Divisions	780	830
Total NIKE Brand	2,971	2,870
Converse	63	80
Corporate	1,870	1,916
Total Property, Plant and Equipment, Net	<u>\$4,904</u>	<u>\$4,866</u>

⁽¹⁾ Excludes assets held-for-sale as of May 31, 2021. See Note 20—Acquisitions and Divestitures for additional information.

Revenues and Long-Lived Assets by Geographic Area.

After allocation of revenues for Global Brand Divisions, Converse and Corporate to geographical areas based on the location where the sales originated, revenues by geographical area are essentially the same as reported above for the NIKE Brand operating segments with the exception of the United States. Revenues derived in the United States were \$17,363 million, \$14,625 million and \$16,091 million for the fiscal years ended May 31, 2021, 2020 and 2019, respectively. The Company's largest concentrations of long-lived assets primarily consist of the Company's corporate headquarters, retail locations and distribution facilities in the United States and China, as well as distribution facilities in Belgium. Long-lived assets attributable to operations in these countries, which primarily consists of property, plant and equipment, net and operating lease ROU assets, net, were as follows:

	MAY 31,	
	2021	2020
	(Dollars in millions)	
United States	\$ 4,927	\$ 5,114
Belgium	676	606
China	518	457

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Glossary

- absorption approach (absorption costing)** A costing approach that considers all indirect manufacturing costs (both variable and fixed) to be product (inventoriable) costs that become an expense in the form of manufacturing cost of goods sold only as sales occur (p. 202).
- accelerated depreciation** A pattern of depreciation that charges a larger proportion of an asset's cost to the earlier years and less to later years (p. 463).
- account analysis** Classifying each account as a variable cost or as a fixed cost with respect to a selected cost driver (p. 113).
- account** Each item in a financial statement (p. 638).
- accounting rate-of-return (ARR) model** A non-DCF capital-budgeting model expressed as the increase in expected average annual operating income divided by the initial required investment (p. 471).
- accounting system** A formal mechanism for gathering, organizing, and communicating information about an organization's activities (p. 23).
- accrual basis** A process of accounting that recognizes the impact of transactions on the financial statements in the time periods when revenues and expenses occur instead of when the company pays or receives cash (p. 642).
- accrue** To accumulate a receivable or payable during a given period, even though no explicit transaction occurs (p. 647).
- accrued expenses** Expenses reported on the income statement before a company pays for them with cash (p. 647).
- accrued revenues** Revenues that a company has earned but has not yet received in cash (p. 649).
- accumulated depreciation** The sum of all depreciation charged to past periods (p. 258).
- activity analysis** The process of identifying appropriate cost drivers and their effects on the costs of making a product or providing a service (p. 110).
- activity-based budget (ABB)** A budget that focuses on the budgeted cost of activities required to produce and sell products and services (p. 307).
- activity-based costing (ABC) system** A system that first accumulates indirect resource costs for each of the activities of the area being costed, and then assigns the costs of each activity to the products, services, or other cost objects that require that activity (p. 153).
- activity-based flexible budget** A budget based on budgeted costs for each activity using the related cost driver (p. 331).
- activity-based management (ABM)** Using the output of an activity-based cost accounting system to aid strategic decision making and to improve operational control of an organization (p. 160).
- activity-level variances** The differences between the static budget amounts and the amounts in the flexible budget (p. 333).
- adjustments (adjusting entries)** Entries that record implicit transactions such as unpaid wages, prepaid rent, interest owed, and the like (p. 643).
- after-tax cash flow** The cash flow after the effect of income taxes, generally the pretax cash flow multiplied by $(1 - \text{marginal tax rate})$ (p. 463).
- agency theory** A theory that deals with relationships where one party (the principal) delegates decision-making authority to another party (the agent) (p. 412).
- annual report** A report prepared by management for the company's shareholders (p. 705).
- assets** Economic resources that a company owns and expects to provide future benefits (p. 638).
- attention directing** Reporting and interpreting information that helps managers to focus on operating problems, imperfections, inefficiencies, and opportunities (p. 23).
- audit** An "examination" or in-depth inspection of financial statements and companies' records made in accordance with auditing standards (p. 653).
- available-for-sale securities** Investments that the investor company does not intend to sell in the near future (p. 735).
- avoidable costs** Costs that will not continue if an ongoing operation is changed or deleted (p. 253).
- backflush costing** An accounting system that applies costs to products only when the production is complete (p. 616).
- balanced scorecard (BSC)** A performance measurement and reporting system that strikes a balance between financial and nonfinancial measures, links performance to rewards, and gives explicit recognition to the link between performance measurement and organizational goals and objectives (p. 389).
- balance sheet (statement of financial position)** A snapshot of the financial status of an organization at a specific point in time (p. 638).
- behavioral implications** The accounting system's effect on the behavior, specifically the decisions, of managers (p. 27).
- benchmark comparisons** Comparison of a company's financial ratios with general rules of thumb (p. 749).
- benchmarking** The continuous process of comparing products, services, and activities against the best industry standards (p. 160).
- book value (net book value)** The original cost of equipment less accumulated depreciation (p. 258).
- break-even point** The level of sales at which revenue equals total cost and net income is zero (p. 64).

budget A quantitative expression of a plan of action and an aid to coordinating and implementing the plan (p. 25).

budgetary slack (budget padding) Overstatement of budgeted cost or understatement of budgeted revenue to create a budget goal that is easier to achieve (p. 292).

budgeted factory-overhead rate The budgeted total overhead for each cost pool divided by the budgeted cost-allocation base level (p. 552).

business-to-business (B2B) Electronic commerce from one business to another business (p. 34).

business-to-consumer (B2C) Electronic commerce from business to consumer (p. 34).

business process reengineering The fundamental rethinking and radical redesign of business processes to improve performance in areas such as cost, quality, service, and speed (p. 34).

by-product A product that, like a joint product, is not individually identifiable until manufacturing reaches a split-off point, but has relatively insignificant total sales value (p. 527).

capacity costs The fixed costs of being able to achieve a desired level of production or to provide a desired level of service while maintaining product or service attributes, such as quality (p. 106).

capital budget A budget that details the planned expenditures for facilities, equipment, new products, and other long-term investments (p. 295).

capital budgeting The long-term planning for investment commitments with returns spread over time, typically over multiple years (p. 453).

capital charge Company's cost of capital $\times$ average invested capital (p. 418).

capital turnover Revenue divided by invested capital (p. 415).

capitalize To record an amount as an asset rather than as an expense (p. 683).

cash basis A process of accounting where revenue and expense recognition occur when the company receives and pays out cash (p. 642).

cash budget A statement of planned cash receipts and disbursements (p. 301).

cash dividends (dividends) Distributions of cash to stockholders that reduce retained earnings (p. 650).

cash equivalents Short-term investments that a company can easily convert into cash with little delay (p. 681).

cash flows from financing activities The section in the statement of cash flows that lists the cash-flow effects of obtaining cash from creditors and owners, repaying creditors or buying back stock from owners, and paying cash dividends (p. 693).

cash flows from investing activities The section in the statement of cash flows that lists the cash-flow effects of (1) lending and collecting on loans and (2) acquiring and selling long-term assets (p. 693).

cash flows from operating activities The section in the statement of cash flows that lists the cash-flow effects of transactions that affect the income statement (p. 693).

centralization Concentration of decision-making authority only at the highest levels of an organization (p. 409).

certified management accountant (CMA) The management accountant's counterpart to the CPA (p. 22).

certified public accountant (CPA) In the United States, independent accountants who assure the reliability of companies' published financial statements (p. 21).

chartered accountant (CA) In many countries, the equivalent to the CPA in the United States—independent accountants who assure the reliability of companies' financial statements (p. 22).

chief financial officer (CFO) The top executive who deals with all finance and accounting issues in an organization. The CFO generally oversees the accounting function (p. 32).

code of conduct A document specifying the ethical standards of an organization (p. 36).

coefficient of determination (R^2) A measurement of how much of the fluctuation of a cost is explained by changes in the cost driver (p. 119).

committed fixed costs Costs arising from the possession of facilities, equipment, and a basic organization (p. 107).

common costs Those costs of facilities and services that are shared by users (p. 253).

common stock Stock that has no predetermined rate of dividends and is the last to obtain a share in the assets when the corporation liquidates. It usually confers voting power to elect the board of directors of the corporation (p. 686).

common-size statements Financial statements expressed in component percentages (p. 748).

comparability A characteristic of information produced when all companies use similar concepts and measurements and use them consistently (p. 660).

component percentages Analysis and presentation of financial statements in percentage form to aid comparability, frequently used when companies differ in size (p. 748).

compound entry A transaction that affects more than two accounts (p. 640).

computer-aided design (CAD) The use of computer technology for the design of real or virtual objects (p. 34).

computer-aided manufacturing (CAM) The use of computer-based software tools in manufacturing or prototyping (p. 34).

computer-integrated manufacturing (CIM) systems Systems that use computer-aided design, computer-aided manufacturing, robots, and computer-controlled machines (p. 34).

confirmatory value A quality of information that allows it to confirm or change existing expectations (p. 659).

conservatism convention Selecting the method of measurement that yields the gloomiest immediate results (p. 660).

consistency Using the same accounting policies and procedures from period to period (p. 660).

consolidated financial statements Financial statements that combine the books of two or more separate legal entities into one set of financial statements (p. 734).

- continuity convention (going concern convention)** The assumption that an organization will continue to exist and operate (p. 659).
- continuous budget (rolling budget)** A common form of master budget that adds a month in the future as the month just ended is dropped (p. 295).
- contribution approach** A method of internal (management accounting) reporting that emphasizes the distinction between variable and fixed costs for the purpose of better decision making (p. 203).
- contribution margin** A term used for either total contribution margin, unit contribution margin, or contribution margin percentage (p. 67).
- contribution-margin percentage** Total contribution margin divided by total sales revenue multiplied by 100 or 100% minus the variable cost percentage (p. 66).
- contribution-margin ratio** The ratio of contribution margin per unit to sales price per unit or total contribution margin to total sales revenue (p. 66).
- control** Implementing plans and using feedback to evaluate the attainment of objectives (p. 24).
- controllable cost** Any cost that a manager's decisions and actions can influence (p. 378).
- controller (comptroller)** The accounting officer of an organization who deals mainly with operating matters, such as aiding management decision making (p. 32).
- corporation** A business organized as a separate legal entity and owned by its stockholders (p. 637).
- cost** A sacrifice or giving up of resources for a particular purpose (p. 142).
- cost accounting** That part of the cost management system that measures costs for the purposes of management decision making and financial reporting (p. 142).
- cost accounting system** The techniques used to determine the cost of a product, service, customer, or other cost object (p. 142).
- cost accumulation** Collecting costs by some natural classification, such as activities performed, labor, or materials (p. 143).
- cost allocation** Assigning indirect costs to cost objects in proportion to the cost object's use of a particular cost-allocation base (p. 144).
- cost-allocation base** A measure of input or output that determines the amount of cost to be allocated to a particular cost object. An ideal cost-allocation base measures how much of the particular cost is generated by the cost object (p. 144).
- cost application** The allocation of total departmental costs to the revenue-producing products or services (p. 508).
- cost assignment** Attaching costs to one or more cost objects, such as activities, departments, customers, or products (p. 143).
- cost behavior** How the activities of an organization affect its costs (p. 55).
- cost-benefit balance** Weighing estimated costs against probable benefits, the primary consideration in choosing among accounting systems and methods (p. 27).
- cost-benefit criterion** An approach that implicitly underlies the decisions about the design of accounting systems. As companies change their accounting systems, the potential benefits should exceed the costs of gathering and interpreting the information (p. 661).
- cost of capital** The cost of long-term liabilities and stockholders' equity weighted by their relative size (p. 418).
- cost center** A responsibility center in which managers are responsible for costs only (p. 378).
- cost driver** A measure of activities that requires the use of resources and thereby generate costs (p. 55).
- cost function** An algebraic equation used by managers to describe the relationship between a cost and its cost driver(s) (p. 109).
- cost of goods sold** The cost of the merchandise that a company acquires or produces and sells (p. 76).
- cost management system (CMS)** A collection of tools and techniques that identify how management's decisions affect costs (p. 141).
- cost measurement** Estimating or predicting costs as a function of appropriate cost drivers (p. 109).
- cost object (cost objective)** Anything for which decision makers desire a separate measurement of costs. Examples include departments, products, activities, and territories (p. 142).
- cost pool** A group of individual costs that a company allocates to cost objects using a single cost-allocation base (p. 146).
- cost of quality report** A report that displays the financial impact of quality (p. 384).
- cost recovery** A concept in which companies carry forward as assets such items as inventories, prepayments, and equipment because they expect to recover the costs of these assets in the form of cash inflows (or reduced cash outflows) in future periods (p. 656).
- cost structure** The combination of variable- and fixed-cost resources used to carry out the organization's activities (p. 73).
- cost-volume-profit (CVP) analysis** The study of the effects of output volume on revenue (sales), expenses (costs), and net income (net profit) (p. 63).
- credit** An entry on the right side of an account (p. 662).
- cross-sectional comparisons** Comparisons of a company's financial ratios with ratios of similar companies, with industry averages, or "best-practices" ratios for the same period (p. 751).
- current assets** Cash and all other assets that a company reasonably expects to convert to cash or sell or consume within one year or during the normal operating cycle, if longer than a year (p. 679).
- current liabilities** An organization's debts that fall due within the coming year or within the normal operating cycle if longer than a year (p. 684).
- currently attainable standards** Levels of performance that managers can achieve by realistic levels of effort (p. 336).

cycle time (throughput time) The time taken to complete a product or service (p. 385).

debentures Formal certificates of indebtedness that are accompanied by a promise to pay interest at a specified annual rate (p. 685).

debit An entry on the left side of an account (p. 662).

decentralization The delegation of decision-making authority to lower levels of the organization. The lower in the organization that authority is delegated, the greater the decentralization (p. 409).

decision context The circumstances surrounding the decision for which the cost will be incurred (p. 60).

decision making Choosing among alternative courses of action designed to achieve some objective (p. 23).

decision model Any method for making a choice, sometimes requiring elaborate quantitative procedures (p. 200).

degree of operating leverage The ratio of contribution margin to profit, defined at a specific volume of sales (p. 74).

denominator level The expected cost-allocation base activity selected to determine the fixed-overhead rate (p. 561).

depreciation The periodic cost of equipment that a company spreads over the future periods in which the company will use the equipment (p. 258).

depreciation The process of systematically spreading an equipment cost across the years of its useful life (p. 645).

depreciation tax shield The tax savings due to depreciation deductions, generally the present value of the product of the tax rate and the depreciation deduction (p. 467).

differential analysis A decision process that compares the differential revenues and costs of alternatives (p. 245).

differential approach A method for comparing alternatives that computes the differences in cash flows between alternatives and then converts these differences in cash flows to their present values (p. 458).

differential cost The difference in total cost between two alternatives (p. 245).

differential revenue The difference in total revenue between two alternatives (p. 245).

direct costs Costs that accountants can identify specifically and exclusively with a given cost object in an economically feasible way (p. 144).

direct-labor costs The wages of all labor that a company can trace specifically and exclusively to the manufactured goods (p. 149).

direct-material costs The acquisition costs of raw materials that a company traces to the manufactured goods (p. 149).

direct method A method for allocating service department costs that ignores other service departments when allocating any given service department's costs to the operating departments (p. 505).

direct method for operating cash flows A method for computing cash flows from operating activities that subtracts operating cash disbursements from cash collections to arrive at cash flows from operations (p. 698).

discounted-cash-flow (DCF) models Capital-budgeting models that focus on cash inflows and outflows while taking into account the time value of money (p. 453).

discretionary fixed costs Costs determined by management as part of the periodic planning process in order to meet the organization's goals. They have no obvious relationship with levels of capacity or output activity (p. 107).

discriminatory pricing Charging different prices to different customers for the same product or service (p. 212).

double-entry system A method of record keeping in which each transaction affects at least two accounts (p. 661).

dysfunctional decision Any decision that is in conflict with organizational goals (p. 426).

earnings per share (EPS) Net income divided by the average number of common shares outstanding during the year (p. 689).

economic profit (residual income) After-tax operating income less a capital charge (p. 418).

economic value added (EVA) Adjusted after-tax operating income minus the weighted-average cost of capital multiplied by the adjusted average invested capital (p. 418).

effectiveness The degree to which an organization meets an objective (p. 337).

efficiency The degree to which an organization minimizes the resources used to achieve an objective (p. 337).

efficient capital market A market in which market prices fully reflect all information available to the public (p. 753).

electronic commerce (e-commerce) Conducting business online (p. 34).

engineering analysis The systematic review of materials, supplies, labor, support services, and facilities needed for products and services; measuring cost behavior according to what costs should be, not by what costs have been (p. 111).

enterprise resource planning (ERP) systems Integrated information systems that support all functional areas of a company (p. 34).

equity method A method of accounting for an investment by adjusting the acquisition cost of the investment for the investor's share of earnings or losses of the investee after the date of investment and for dividends received (p. 736).

equivalent units The number of completed (whole) units that could have been produced from the resources required for the partially completed units (p. 609).

expected cost The cost most likely to be attained (p. 336).

expenses Decreases in ownership claims arising from delivering goods or services or using up assets (p. 640).

explicit transactions Transactions that record day-to-day routine events—such as credit sales, credit purchases, cash received on account, and cash disbursed on account—that are supported by source documents (p. 643).

- eXtensible Business Reporting Language (XBRL)** An XML-based accounting language that helps communicate financial information electronically (p. 34).
- faithful representation** A quality of information that ensures that it captures the economic substance of the transactions, events, or circumstances it describes. It requires information to be complete, neutral, and free from material errors (p. 660).
- favorable cost variance** A variance that occurs when actual costs are less than budgeted costs (p. 330).
- favorable profit variance** A variance that occurs when actual profit exceeds budgeted profit (p. 329).
- favorable revenue variance** A variance that occurs when actual revenue exceeds budgeted revenue (p. 330).
- financial accounting** The branch of accounting that develops information for external decision makers, such as stockholders, suppliers, banks, and government regulatory agencies (p. 21).
- Financial Accounting Standards Board (FASB)** The body that sets GAAP in the United States (p. 653).
- financial budget** The part of a master budget that focuses on the effects that the operating budget and other plans (such as capital budgets and repayments of debt) have on cash balances (p. 295).
- financial planning model** A mathematical model of the master budget that can incorporate any set of assumptions about sales, costs, or product mix (p. 308).
- financial statements** Summarized reports of accounting transactions (p. 637).
- finished-goods inventory** Goods fully completed but not yet sold (p. 150).
- first-in, first-out (FIFO)** An inventory method that assumes that a company sells or uses up first the stock acquired earliest (p. 711).
- fiscal year** The year established for accounting purposes for the preparation of annual reports (p. 681).
- fixed assets (tangible assets)** Physical items that a person can see and touch, such as property, plant, and equipment (p. 681).
- fixed cost** A cost that is not affected by changes in the cost-driver level (p. 57).
- fixed-overhead rate** The amount of fixed manufacturing overhead applied to each unit of production. It is determined by dividing the budgeted fixed overhead by the expected cost-allocation base activity for the budget period (p. 561).
- fixed-overhead spending variance** The difference between actual fixed overhead and budgeted fixed overhead (p. 347).
- flexible budget (variable budget)** A budget that adjusts to different levels of activity (p. 331).
- flexible-budget variance** The difference between actual results and the flexible budget for the actual level of output achieved (p. 333).
- free cash flow** Cash flows from operations less capital expenditures (p. 703).
- full cost** The total of all manufacturing costs plus the total of all selling and administrative costs (p. 213).
- functional budgeting** Budgeting process that focuses on preparing budgets for various functions, such as production, selling, and administrative support (p. 307).
- general ledger** A collection of the group of accounts that supports the items shown in the major financial statements (p. 662).
- generally accepted accounting principles (GAAP)** A set of standards to which public companies' published financial statements must adhere (p. 22).
- goal congruence** A condition where employees, responding to the incentives created by the control system, make decisions that help meet the overall goals of the organization (p. 373).
- goodwill** The excess of the cost of an acquired company over the sum of the fair market values of its identifiable individual assets less its liabilities (p. 683).
- Grenzplankostenrechnung (GPK)** A German cost accounting system that goes a step further than ABC systems (p. 161).
- gross book value** The original cost of an asset before deducting accumulated depreciation (p. 416).
- gross margin (gross profit)** The excess of sales over the total cost of goods sold (p. 76).
- high-low method** A simple method for measuring a linear-cost function from past cost data, focusing on the highest-activity and lowest-activity points and fitting a line through these two points (p. 116).
- hybrid costing systems** An accounting system that is a blend of ideas from both job costing and process costing (p. 595).
- imperfect competition** A market in which the price a firm charges for a unit influences the quantity of units it sells (p. 210).
- implicit transactions** Transactions that record events that day-to-day recording procedures temporarily ignore, such as expiration of prepaid rent or accrual of interest due to the passage of time (p. 643).
- incentives** Rewards, both implicit and explicit, for managerial effort and actions (p. 412).
- income (net income, profits, earnings)** The excess of revenues over expenses (p. 640).
- income statement** A statement that summarizes a company's revenues and expenses. It measures the performance of an organization by matching its accomplishments (revenue from customers) and its efforts (cost of goods sold and other expenses) (p. 640).
- incremental analysis** An analysis of the incremental (additional) costs and benefits of a proposed alternative compared with the current situation (p. 245).
- incremental benefits** The additional revenues or reduced costs generated by the proposed alternative in comparison with the current situation (p. 245).
- incremental costs** The additional costs or reduced benefits generated by the proposed alternative in comparison with the current situation (p. 245).
- incremental effect** The change in total results (such as revenue, expenses, or income) under a new condition in comparison with some given or known condition (p. 69).

independent opinion The accountant's assurance that management's financial statements are in conformity with GAAP (p. 653).

indirect costs Costs that accountants cannot identify specifically and exclusively with a given cost object in an economically feasible way (p. 144).

indirect method for operating cash flows A method for computing cash flows from operating activities that adjusts the previously calculated accrual net income from the income statement to reflect only cash receipts and cash disbursements (p. 698).

indirect production costs (indirect manufacturing costs, factory burden, factory overhead, manufacturing overhead) All costs associated with the production process that a company cannot trace to the goods or services produced in an economically feasible way; usually all production costs except direct materials and direct labor (p. 149).

inflation The decline in the general purchasing power of the monetary unit (p. 475).

Institute of Management Accountants (IMA) A global association of accountants and financial professionals in business. (p. 21).

intangible assets Long-lived assets that are not physical in nature. Examples are goodwill, franchises, patents, trademarks, and copyrights (p. 683).

internal auditors Accountants who review and evaluate accounting systems, including their internal controls (p. 26).

internal controls Policies to protect and make the most efficient use of an organization's assets (p. 26).

internal rate of return (IRR) model A capital-budgeting model that determines the interest rate, the IRR, at which the NPV equals zero (p. 456).

International Accounting Standards Board (IASB) The group that establishes international GAAP (p. 653).

International Code of Ethics for Professional Accountants A code of conduct developed by the International Ethics Standards Board for Accountants (IESBA) of the International Federation of Accountants (IFAC) (p. 36).

inventory turnover The number of times the average inventory is sold per year (p. 255).

investment center A responsibility center where managers are responsible for investment as well as profits (p. 379).

job-cost record (job-cost sheet, job order) A document that shows all costs for a particular product, service, or batch of products (p. 595).

job-order costing (job costing) The method of allocating costs to heterogeneous products that are readily identified by individual units or batches, each of which requires differential (sometimes custom) amounts of materials, labor, and overhead (p. 595).

joint costs The costs of manufacturing joint products prior to the split-off point (p. 256).

joint products Two or more manufactured products that (1) have relatively significant sales values and (2) are not separately identifiable as individual products until their split-off point (p. 256).

just-in-time (JIT) philosophy A philosophy to eliminate waste by reducing the time products spend in the production process and eliminating the time products spend on activities that do not add value (p. 34).

kaizen costing The Japanese term for continuous improvement during manufacturing (p. 220).

key performance indicators Measures that drive the organization to achieve its goals (p. 389).

key success factors Characteristics or attributes that managers must achieve in order to drive the organization toward its goals (p. 372).

labor time tickets (time cards) The record of the time a particular direct laborer spends on each job (p. 595).

last-in, first-out (LIFO) An inventory method that assumes that a company sells or uses up the stock acquired most recently first (p. 711).

lean manufacturing Applying continuous process improvements to eliminate waste from the entire enterprise (p. 35).

least-squares regression (regression analysis) Measuring a cost function objectively by using statistics to fit a cost function to all the data (p. 118).

ledger accounts A method of keeping track of how transactions affect each particular asset, liability, revenue, and expense (p. 661).

liabilities The entity's economic obligations to nonowners (p. 638).

LIFO layers (LIFO increments) Separately identifiable additions to a LIFO inventory (p. 712).

limited liability A provision that a company's creditors cannot seek payment from stockholders as individuals if the corporation itself cannot pay its debts (p. 686).

limiting factor (scarce resource) The item that restricts or constrains the production or sale of a product or service (p. 254).

linear-cost behavior Activity that can be graphed with a straight line because costs are assumed to be either fixed or variable (p. 105).

line managers Managers who are directly involved with making and selling the organization's products or services (p. 31).

liquidation Converting assets to cash and using the cash to pay off outside claims (p. 685).

long-lived assets (fixed assets, noncurrent assets) Assets that will provide services for more than a year (p. 644).

long-range plan Forecasted financial statements for 5- to 10-year periods (p. 295).

lower-of-cost-or-market (LCM) An inventory method in which accountants compare the current market price of inventory with its cost (derived by specific identification, FIFO, LIFO, or weighted average) and select the lower of the two as the inventory value (p. 713).

management accounting The branch of accounting that produces information for managers within an organization. It is the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and communicating information that helps managers fulfill organizational objectives (p. 21).

- management audit** A review to determine whether managers are implementing the policies and procedures specified by top management (p. 26).
- management by exception** Concentrating more on areas that deviate from the plan and less on areas that conform with plans and are presumed to be running smoothly (p. 25).
- management by objectives (MBO)** The joint formulation by managers and their superiors of a set of goals and plans for achieving the goals for a forthcoming period (p. 431).
- management control system** An integrated set of techniques for gathering and using information to make planning and control decisions, for motivating employee behavior, and for evaluating performance (p. 371).
- management's discussion and analysis (MD&A)** A section of annual reports and 10-K filings that concentrates on explaining the major changes in the income statement, changes in liquidity and capital resources, and the impact of inflation from one year to the next (p. 748).
- managerial effort** Exertion toward a goal or objective, including all conscious actions (such as supervising, planning, and thinking) that result in more efficiency and effectiveness (p. 373).
- marginal cost** The additional cost resulting from producing and selling one additional unit (p. 210).
- marginal income tax rate** The tax rate paid on incremental taxable income (p. 463).
- marginal revenue** The additional revenue resulting from the sale of an additional unit (p. 210).
- margin of safety** Planned unit sales less the break-even unit sales; a measure of how far sales can fall below the planned level before losses occur (p. 73).
- market-value method** The method of accounting for investments in equity securities that shows the investment on the balance sheet at market value (p. 735).
- markup** The amount by which price exceeds cost (p. 213).
- master budget** An extensive analysis of the first year of the long-range plan. It summarizes the planned activities of all subunits of an organization (p. 295).
- matching** The linking of revenues (as measured by the selling prices of goods and services delivered) with the expenses incurred to generate them (as measured by the cost of goods and services used) (p. 656).
- materiality** The accounting convention that justifies the omission of insignificant information when its omission or misstatement would not mislead a user of the financial statements (p. 660).
- materials requisitions** Records of materials used in particular jobs (p. 595).
- measurement of cost behavior** Understanding and quantifying how activities of an organization affect its levels of costs (p. 104).
- mixed cost** A cost that contains elements of both fixed- and variable-cost behavior (p. 62).
- modified accelerated cost recovery system (MACRS)** The method companies use to depreciate most assets under U.S. income tax laws (p. 466).
- motivation** The drive that creates effort and action toward a goal (p. 374).
- net book value** The original cost of an asset less any accumulated depreciation (p. 416).
- net operating profit after-tax (NOPAT)** Income before interest expense but after tax (p. 418).
- net present value** The sum of the present values of all expected cash flows (p. 454).
- net-present-value (NPV) method** A discounted-cash-flow approach to capital budgeting that computes the present value of all expected future cash flows using a required rate of return (p. 454).
- net worth** A synonym for owners' equity (p. 652).
- nominal rate** Interest rate that includes an inflation element (p. 475).
- noncontrolling interests** An account that summarizes the outside stockholders' interest, as opposed to the parent's interest, in a subsidiary corporation (p. 739).
- noncurrent liabilities (long-term liabilities)** An organization's debts that fall due beyond one year (p. 684).
- non-value-added costs** Costs that a company can eliminate without affecting a product's value to the customer (p. 160).
- normal costing system** The cost system in which the cost of the manufactured product is composed of actual direct material, actual direct labor, and normal applied overhead (p. 554).
- operating budget (profit plan)** A major part of a master budget that focuses on the income statement and its supporting schedules (p. 295).
- operating cycle** The time span during which a company spends cash to acquire goods and services that it uses to produce the organization's output, which it in turn sells to customers, who in turn pay for their purchases with cash (p. 679).
- operating leverage** The sensitivity of a firm's profit to changes in volume of sales (p. 73).
- opportunity cost** For a resource that a company already owns or that it has already committed to purchase, the maximum available benefit forgone (or passed up) by using such a resource for a particular purpose (p. 246).
- other comprehensive income** A few special types of gains and losses that do not appear on the income statement and thus do not become part of retained earnings (p. 686).
- outlay cost** A cost that requires a future cash disbursement (p. 245).
- outsourcing** Purchasing products or services from an outside supplier (p. 247).
- overapplied overhead** The difference between actual and applied overhead when the amount applied exceeds the amount incurred (p. 555).
- owners' equity** The excess of the assets over the liabilities (p. 638).
- paid-in capital** The ownership claim arising from funds paid in by the owners (p. 638).

parent company A company that has effective control over another company. Usually this means owning more than 50% of the company's stock (p. 737).

participative budgeting Budgets formulated with the active participation of all affected employees (p. 292).

partnership An organization that joins two or more individuals together as co-owners (p. 652).

par value (stated value) The value often printed on the face of stock certificates (p. 686).

payback period (payback time) The time it will take to recoup, in the form of cash inflows from operations, the initial dollars invested in a project (p. 470).

perfect competition A market in which a firm can sell as much of a product as it can produce, all at a single market price (p. 209).

perfection standards (ideal standards) Expressions of the most efficient performance possible under the best conceivable conditions, using existing specifications and equipment (p. 336).

performance metric A specific measure of management accomplishment (p. 412).

performance reports Feedback provided by comparing results with plans and by highlighting variances (p. 25).

period costs Costs that become expenses during the current period without becoming part of inventory (p. 149).

planning Setting objectives for an organization and determining how to attain them (p. 24).

post-audit A follow-up evaluation of capital-budgeting decisions (p. 473).

predatory pricing Establishing prices so low that they drive competitors out of the market. The predatory pricer then has no significant competition and can raise prices dramatically (p. 212).

predictive value A quality of information that allows it to help users form their expectations about the future (p. 659).

preferred stock Stock that typically has some priority over other shares in the payment of dividends or the distribution of assets upon liquidation (p. 686).

present value (PV) The value today of a future cash flow (p. 453).

price elasticity The effect of price changes on sales volume (p. 211).

price variance The difference between actual input prices and standard input prices multiplied by the actual quantity of inputs used (p. 341).

problem solving Analysis of possible courses of action and identification of the best course to follow (p. 23).

process costing The method of allocating costs to homogeneous products by averaging costs over large numbers of nearly identical products (p. 595).

process map A schematic diagram capturing interrelationships between cost objects, activities, and resources (p. 153).

producing departments Departments where employees work on the organization's products or services (p. 499).

product costs (inventoriable costs) Costs identified with goods produced or purchased for resale (p. 149).

product life cycle The various stages through which a product passes, from conception and development to introduction into the market to maturation and, finally, withdrawal from the market (p. 27).

production-volume variance A variance that appears whenever actual production deviates from the expected volume of production used in computing the fixed overhead rate. It is calculated as (actual volume – expected volume) × fixed-overhead rate (p. 561).

productivity A measure of outputs divided by inputs (p. 386).

profit center A responsibility center in which managers are responsible for revenues as well as costs—that is, profitability (p. 378).

proration To assign underapplied overhead or overapplied overhead to cost of goods sold, work-in-process inventory, and finished-goods inventory in proportion to the ending balances of each account (p. 555).

quality control The effort to ensure that products and services perform to customer requirements (p. 383).

quality-control chart The statistical plot of measures of various product quality dimensions or attributes (p. 384).

quantity variance The difference between the actual quantity of inputs used and the standard quantity allowed for the good output achieved multiplied by the standard price of the input (p. 341).

rate variance An alternative name for the price variance applied to labor (p. 344).

raw material The basic material from which a product is made (p. 149).

raw-material inventory Raw material on hand and awaiting use in the production process (p. 150).

real options model A capital-budgeting model that recognizes the value of contingent investments—that is, investments that a company can adjust as it learns more about its potential for success (p. 457).

recognition The principle that specifies when a company should record revenue in the accounting records (p. 655).

recognize To formally record in the accounting records during the current period (p. 640).

recovery period The number of years over which a company can depreciate an asset for tax purposes (p. 463).

relevance The capability of information to make a difference to the decision maker (p. 659).

relevant information The predicted future costs and revenues that will differ among alternative courses of action (p. 199).

relevant range The limits of the cost-driver level within which a specific relationship between costs and the cost driver is valid (p. 60).

required rate of return (hurdle rate, discount rate) The minimum acceptable rate of return, based on the firm's cost of capital (p. 454).

- residual value** The predicted sales value of a long-lived asset at the end of its useful life (p. 645).
- responsibility accounting** Identifying what parts of the organization have primary responsibility for each action, developing performance measures and targets, and designing reports of these measures by responsibility center (p. 378).
- responsibility center** A set of activities and resources assigned to a manager, a group of managers, or other employees (p. 378).
- retained earnings (retained income)** The ownership claim arising from the reinvestment of previous profits of the company (p. 638).
- return on investment (ROI)** A measure of income divided by the investment required to obtain that income (p. 414).
- return on sales** Income divided by revenue (p. 415).
- revenue** Increases in ownership claims arising from the delivery of goods or services (p. 640).
- sales-activity variances** The activity-level variances when sales is used as the cost driver (p. 333).
- sales budget** The sales forecast that is the result of decisions to create conditions that will generate a desired level of sales (p. 294).
- sales forecast** A prediction of sales under a given set of conditions (p. 294).
- sales mix** The relative proportions or combinations of quantities of products that constitute total sales (p. 65).
- sales revenue (sales)** Revenue from customers (p. 640).
- scorekeeping** The accumulation, classification, and reporting of data that help users understand and evaluate performance (p. 23).
- Securities and Exchange Commission (SEC)** A government agency that regulates the financial markets in the United States, including financial reporting (p. 653).
- segment autonomy** The delegation of decision-making power to managers of segments in an organization (p. 410).
- segments** Responsibility centers for which a company develops separate measures of revenues and costs (p. 379).
- sensitivity analysis** The systematic varying of decision input assumptions to examine the effect on a decision (p. 311).
- separable costs** Any cost beyond the split-off point (p. 256).
- service departments** Units that exist only to support other departments or customers (p. 499).
- service organizations** Organizations that do not make or sell tangible goods but instead provide other forms of value (p. 33).
- short-term investments** Temporary investments in marketable securities (p. 681).
- Six Sigma** A data-driven continuous process improvement effort designed to eliminate defects and improve quality (p. 35).
- sole proprietorship** A business entity with a single owner (p. 652).
- source documents** Clear evidence of transactions, such as sales slips and purchase invoices (p. 643).
- specific identification** An inventory method that recognizes the actual cost paid for the specific physical item sold (p. 710).
- split-off point** The juncture of manufacturing where the joint products become individually identifiable (p. 256).
- staff managers** Managers who are advisory to the line managers. They have no authority over line managers, but they support the line managers by providing information and advice (p. 31).
- standard cost** A cost that should be achieved (p. 336).
- statement of cash flows** A statement that reports the cash receipts and cash payments of an organization during a particular period (p. 692).
- statement of stockholders' equity** A statement that shows the changes in each stockholders' equity account during the period (p. 651).
- static budget** A budget that is prepared for only one expected level of activity (p. 330).
- static-budget variance** The difference between actual results and the static budget for the original planned level of output (p. 332).
- step cost** A cost that changes abruptly at different intervals of activity because the resources and their costs come in indivisible chunks (p. 61).
- step-down method** A method for allocating service department costs that recognizes that some service departments support the activities in other service departments as well as those in operating departments (p. 506).
- stockholders' equity** The owners' equity of a corporation (p. 638).
- straight-line method** A method that depreciates an asset by the same amount each year (p. 645).
- strategic plan** A plan that sets the overall goals and objectives of the organization (p. 295).
- subordinated** A creditor claim that is junior to the other creditors in exercising claims against assets (p. 685).
- subsidiary** A company controlled by a parent company that generally owns more than 50% of its stock (p. 737).
- sunk cost** A historical or past cost, that is, a cost that the company has already incurred and, therefore, is irrelevant to the decision-making process (p. 258).
- T-accounts** Simplified versions of ledger accounts that take the form of the capital letter *T* (p. 661).
- target costing** Taking a product's market price as given and determining the maximum cost the company can spend to make the product and still achieve the desired profitability (p. 219).
- Timeliness** The quality that information must reach decision makers while it can still influence their decisions (p. 660).
- time-series comparisons** Comparison of a company's financial ratios with its own historical ratios (p. 749).
- total quality management (TQM)** An approach to quality that focuses on prevention of defects and on customer satisfaction (p. 384).
- total contribution margin** Total number of units sold times the unit contribution margin (p. 66).

total project approach A method for comparing alternatives that computes the total impact on cash flows for each alternative and then converts these total cash flows to their present values (p. 458).

tracing Physically identifying the amount of a direct cost that relates exclusively to a particular cost object (p. 144).

trade (or accounts) payable Amounts owed to vendors for purchases on open accounts (p. 637).

trade (or accounts) receivable Amounts due from customers for sales charged to an account instead of being paid for in cash (p. 637).

trading securities Investments “held for current resale,” that is, investments that the investor company intends to sell in the near future (p. 735).

traditional costing systems Accounting systems that do not accumulate or report costs of individual activities or processes. They often use a single cost pool for all indirect production costs with a labor-based cost-allocation base (p. 153).

transaction Any event that affects the financial position of an organization and requires recording (p. 637).

transfer price The price at which one segment of an organization sells products or services to another segment of the same organization (p. 422).

transferred-in costs In process costing, costs incurred in a previous department for items that have been received by a subsequent department (p. 614).

treasurer The executive who is concerned mainly with the company’s financial matters, such as raising and managing cash (p. 32).

treasury stock A corporation’s own stock that it has issued and subsequently repurchased but has not permanently retired (p. 686).

two-stage ABC system A costing system with two stages of allocation to get from the original indirect resource cost to the final product or service cost. The first stage allocates indirect resource costs to activity-cost pools. The second stage allocates activity costs to products or services (p. 156).

unallocated costs Costs that an accounting system records but does not allocate to any cost object (p. 147).

unavoidable costs Costs that will continue even if a company discontinues an operation (p. 253).

uncontrollable cost Any cost that the management of a responsibility center cannot affect within a given time span (p. 378).

underapplied overhead The difference between actual and applied overhead when the amount applied is less than the amount incurred (p. 555).

understandable A criterion that requires accountants to present information clearly and concisely (p. 660).

unearned revenue (deferred revenue) Collections from customers that companies receive and record before they earn the revenue (p. 647).

unexpired cost Any asset that managers expect to become an expense in future periods, for example, inventory and prepaid rent (p. 644).

unfavorable cost variance A variance that occurs when actual costs exceed budgeted costs (p. 330).

unfavorable profit variance A variance that occurs when actual profit falls below budgeted profit (p. 330).

unfavorable revenue variance A variance that occurs when actual revenue falls below budgeted revenue (p. 330).

unit contribution margin (marginal income per unit) The sales price per unit minus the variable cost per unit (p. 66).

usage variance (efficiency variance) Alternative names for the quantity variance (p. 344).

useful life The number of years the company expects to use an asset (p. 645).

value-added cost The necessary cost of an activity that cannot be eliminated without affecting a product’s value to the customer (p. 160).

value chain The set of business functions or activities that add value to the products or services of an organization (p. 28).

value engineering A cost-reduction technique, used primarily during design, that uses information about all value-chain functions to satisfy customer needs while reducing costs (p. 220).

variable cost A cost that changes in direct proportion to changes in the cost-driver level (p. 57).

variable-cost percentage Total variable costs divided by total sales revenue multiplied by 100 (p. 66).

variable-cost ratio The ratio of variable cost per unit to sales price per unit or total variable cost to total sales revenue (p. 66).

variable-overhead efficiency variance The difference between actual cost-driver activity and the standard amount allowed for the actual output achieved multiplied by the standard variable-overhead rate per cost-driver unit (p. 346).

variable-overhead spending variance The difference between the actual variable overhead cost and the amount predicted for the actual level of cost-driver activity (p. 346).

variances Deviations from plans (p. 25).

verifiability A characteristic of information that can be checked to ensure it is correct (p. 660).

visual-fit method A method in which the cost analyst visually fits a straight line through a plot of all the available data (p. 118).

volume variance A common name for the production-volume variance (p. 564).

weighted-average cost An inventory method that assigns the same unit cost to each unit available for sale (p. 712).

weighted-average (WA) process-costing method A process-costing method that determines total cost by adding together the cost of (1) all work done in the current period and (2) the work done in the preceding period on the current period’s beginning inventory of work in process, and divides the total by the equivalent units of work done to date (p. 613).

working capital Current assets less current liabilities (p. 684).

work-in-process inventory Goods undergoing the production process but not yet fully completed (p. 150).

zero-base budget A budget that requires justification of expenditures for every activity, including continuing activities (p. 289).

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