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Assessing Digital Maturity in Healthcare: A Case Study of Jember Klinik Hospital, Indonesia

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ABSTRACT

This study aims to assess the digital maturity level of Jember Klinik Hospital, a private healthcare facility in Indonesia, using a structured evaluation framework. A descriptive cross-sectional design was employed in June 2024, involving six internal stakeholders representing IT, medical, nursing, and administrative leadership. Data were collected using the Digital Maturity Level Assessment Tool (Version 1.1) developed by the Indonesian Ministry of Health, consisting of 38 parameters across seven domains. The assessment was conducted collaboratively through structured meetings, document reviews, and consensus-based scoring. Descriptive analysis revealed that the hospital has reached an advanced level of digital maturity. The highest scores were found in Standards and Interoperability (4.8) and Governance and IT Management (4.8), reflecting strong planning and regulatory alignment. Electronic Medical Records and Patient-Centered Care also scored highly (4.7), indicating effective digital integration in clinical workflows. However, Data Analytics received the lowest score (2.8), pointing to significant gaps in data quality and analytical capacity. These findings suggest the need for enhanced investment in data infrastructure, staff training, and interoperability improvements. The results contribute to understanding digital health readiness in Indonesia's private healthcare sector and provide actionable insights for supporting targeted digital transformation strategies.

Kata kunci:
Kematangan digital;
Rekam medis elektronik;
Sistem informasi rumah sakit;
Interoperabilitas

Penelitian ini bertujuan untuk menilai tingkat maturitas digital di Rumah Sakit Jember Klinik, sebuah rumah sakit swasta di Indonesia, dengan menggunakan kerangka evaluasi terstruktur. Penelitian ini menggunakan desain deskriptif cross-sectional yang dilakukan pada bulan Juni 2024, melibatkan enam pemangku kepentingan internal yang mewakili bidang IT, pelayanan medis, keperawatan, dan administrasi. Data dikumpulkan menggunakan Instrumen Penilaian Tingkat Maturitas Digital Versi 1.1 dari Kementerian Kesehatan Republik Indonesia, yang terdiri dari 38 parameter dalam tujuh komponen. Penilaian dilakukan secara kolaboratif melalui diskusi terstruktur, telaah dokumen, dan validasi skor berbasis konsensus. Hasil analisis deskriptif menunjukkan bahwa rumah sakit telah mencapai tingkat maturitas digital yang lanjut. Skor tertinggi diperoleh pada komponen Standar dan Interoperabilitas (4,8) serta Tata Kelola dan Manajemen TI (4,8), mencerminkan perencanaan strategis dan kepatuhan regulasi yang kuat. Komponen Rekam Medis Elektronik (EMR) dan Pelayanan Berpusat pada Pasien juga memperoleh skor tinggi (4,7). Namun, komponen Analisis Data memiliki skor terendah (2,8), menunjukkan adanya kesenjangan dalam kualitas dan pemanfaatan data. Temuan ini memberikan gambaran kesiapan digital rumah sakit swasta di Indonesia dan rekomendasi untuk strategi transformasi digital yang lebih terarah.

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INTRODUCTION

The digital transformation of healthcare systems has become a global priority, driven by the need to enhance efficiency, improve patient outcomes, and ensure the sustainability of healthcare delivery. Digital health technologies have demonstrated significant potential to improve accessibility and personalize patient care, which is crucial for managing chronic

diseases and increasing patient engagement (Wu et al., 2023; Zharima et al., 2023). Existing literature indicates that digital health interventions positively influence clinical outcomes and patient satisfaction, particularly through facilitating virtual consultations, benefiting individuals in remote or underserved areas (Maita et al., 2024; Victoria-Castro et al., 2022). To effectively leverage digital health technologies, a clear understanding of an organization's digital maturity is essential.

Digital maturity refers to the systematic assessment of an organization's technological capabilities, enabling the identification of strengths and weaknesses in its digital transformation journey (Nyangena et al., 2021; Teixeira et al., 2022; Woods et al., 2022, 2023). In healthcare, higher digital maturity levels can improve communication, streamline processes, and ultimately enhance patient care quality (Alotaibi et al., 2024; Woods et al., 2023). Digital maturity assessment frameworks establish benchmarks that guide healthcare institutions in navigating the complexities of modern healthcare environments (Woods et al., 2023). These frameworks encompass technological infrastructure as well as institutional capacity, governance structures, and digital culture, influencing policy directions in many countries, including Indonesia.

Indonesia's healthcare system has embarked on significant digital initiatives through programs such as "Satu Data Kesehatan" (One Health Data) and mandatory Electronic Medical Records (EMR) implementation, aimed at improving data integration and accelerating digital transformation (Kesehatan, 2022). Despite these advancements, disparities in digital maturity remain apparent across different types of healthcare institutions. Public hospitals typically benefit from more robust governmental support and standardized digital frameworks, facilitating smoother digital transitions (Shrivastava et al., 2023). Conversely, private hospitals, particularly those in regional areas, encounter unique challenges such as limited funding, diverse management structures, and balancing sustainability with technology adoption, resulting in uneven digital maturity levels (Garg et al., 2020; Li et al., 2023). Regional hospitals are further disadvantaged by limited infrastructure and fewer skilled personnel, contributing to wider health inequalities (Kutza et al., 2022).

East Java, one of Indonesia's most populous provinces, exhibits significant variations in healthcare infrastructure and resource availability. Jember Regency, a prominent regional area in East Java, faces specific challenges related to digital health implementation, such as limited technical expertise, financial constraints, and fragmented data management systems. Addressing digital maturity gaps in such regional settings is critical to ensuring equitable healthcare provision and achieving national digital health goals.

This study aimed to evaluate the digital maturity level of Jember Klinik Hospital, a private healthcare institution in Jember Regency, East Java. The objectives were to assess the current status of digital maturity using a structured assessment framework, identify key strengths and areas needing improvement, and provide context-specific recommendations to enhance digital capabilities. By explicitly focusing on a private hospital in a regional context, an area underrepresented in previous studies, this research contributes valuable insights into digital maturity challenges and opportunities unique to Indonesia's private healthcare sector. Such contributions are essential for developing targeted strategies that support effective digital transformation and policy formulation in similar regional settings.

RESEARCH METHOD

This study employed a descriptive cross-sectional design conducted at Jember Klinik Hospital, a private healthcare facility located in Jember Regency, East Java, in June 2024. The purpose of this study was to evaluate the hospital's digital maturity through an assessment involving six key internal stakeholders: the Head of IT, IT staff, and vice directors responsible for medical services, nursing, allied health, and general administration. The inclusion of these six stakeholders was purposively recruited to represent diverse roles and expertise, covering critical areas essential for a comprehensive evaluation of digital maturity. The decision to involve these specific stakeholders aligns with standard assessment practices recommended by the Indonesian Ministry of Health.

The assessment utilized the Digital Maturity Level Assessment Tool (Version 1.1) developed and validated by the Indonesian Ministry of Health. This instrument, which has undergone validation processes including expert validation and pilot testing by the Ministry of Health, consists of 38 assessment parameters grouped into seven domains: IT services, governance, interoperability, data analytics, human resources, information security, and electronic medical records. Each parameter was rated on a 5-point Likert scale, where Level 1 represents ad hoc and fragmented systems, Level 2 indicates initial but unsystematic efforts, Level 3 denotes structured systems with regular evaluation, Level 4 reflects well-managed and policy-aligned digital practices, and Level 5 signifies fully integrated and continuously improved digital systems.

Data collection involved structured meetings wherein the stakeholders collaboratively assessed the hospital's digital maturity using the standardized assessment instrument. The collaborative approach facilitated discussion, allowing for immediate clarification of perspectives and rationale for scoring decisions. However, to mitigate potential bias arising from hierarchical dynamics or pressure for consensus, stakeholders were initially asked to independently rate each parameter before engaging in group discussions. Rating differences were openly discussed, and final scores were determined through consensus after considering individual justifications and verifying evidence.

Inter-rater reliability was ensured through this structured consensus process, which clearly documented areas of agreement and disagreement, allowing for transparency and reproducibility. Additionally, document review complemented the scoring process, examining supporting materials such as strategic IT plans, organizational policies, EMR implementation reports, cybersecurity audits, and human resource training records. These documents were sourced internally and validated through cross-checking among stakeholders and referencing official guidelines from the Ministry of Health.

Data analysis was conducted descriptively to identify the hospital's overall digital maturity level and highlight areas for improvement. The use of multiple data sources, the structured independent scoring followed by consensus discussions, and validation of supporting documents served to enhance objectivity, reliability, and methodological rigor of the assessment.

Ethical approval for this study was obtained from the Health Research Ethics Committee *(Komisi Etik Penelitian Kesehatan)* of the Faculty of Dentistry, University of Jember, under approval number 2622/UN25.8/KEPK/DL/2024, dated 14 June 2024. All participants provided informed consent prior to their involvement in the research process.

RESULTS AND DISCUSSION

Preliminary findings indicated that although Jember Klinik Hospital has implemented multiple digital health systems, there remain critical gaps, particularly in data interoperability, strategic alignment, and digital culture. These findings have significant implications for hospital administrators, IT specialists, and policymakers, underscoring the necessity for targeted investments and tailored approaches to bolster digital health capabilities in Indonesia's regional private healthcare institutions.

Table 1. Digital Maturity Component Scores

No	Component	Total Score
1.	Hospital Information System and IT Infrastructure	4.4
2.	Standards and Interoperability	4.8
3.	Governance and IT Management	4.8
4.	Data Analytics	2.8
5.	Human Resources, Skills, and System Usage	4.2
6.	Information Security, Privacy, and Confidentiality	4.3
7.	Electronic Medical Record (EMR) and Patient Centered Care	4.7

Source: *Primary data*

Jember Klinik Hospital scored highest in Standards and Interoperability and Governance and IT Management (4.8 each, Table 1), indicating strong leadership, structured digital planning, and compliance with national standards (Snowdon et al., 2024; Woods et al., 2023). These strengths have enabled the hospital to implement digital health initiatives with clear direction and stability, an advantage that supports sustainable transformation, especially in a private hospital context (Burmann et al., 2022; Elizondo, 2024).

A high score in Electronic Medical Record (EMR) and Patient-Centered Care (4.7) reflects the hospital's success in integrating digital systems into clinical workflows to improve service quality and patient engagement (Arabi et al., 2022; von Wedel et al., 2022). The hospital uses EMR to personalize care and enhance communication, although some technical gaps remain, such as digital imaging integration.

The lowest score was in Data Analytics (2.8), pointing to significant challenges in data quality, analytical capabilities, and workforce skills (Burmann et al., 2022; Duncan et al., 2022). These limitations mirror broader trends in private hospitals, where resource constraints hinder the full adoption of data-driven healthcare. Targeted investment in digital literacy and analytics training is needed to close these gaps (Baihaqy & Subriadi, 2024; Strumann et al., 2024).

Jember Klinik Hospital's experience illustrates the dual reality for private hospitals: the innovation potential, yet persistent limitations due to budget and resource constraints. Collaboration, staff development, and adaptive strategies are necessary to advance digital maturity further (Phiri et al., 2023; Putra et al., 2024).

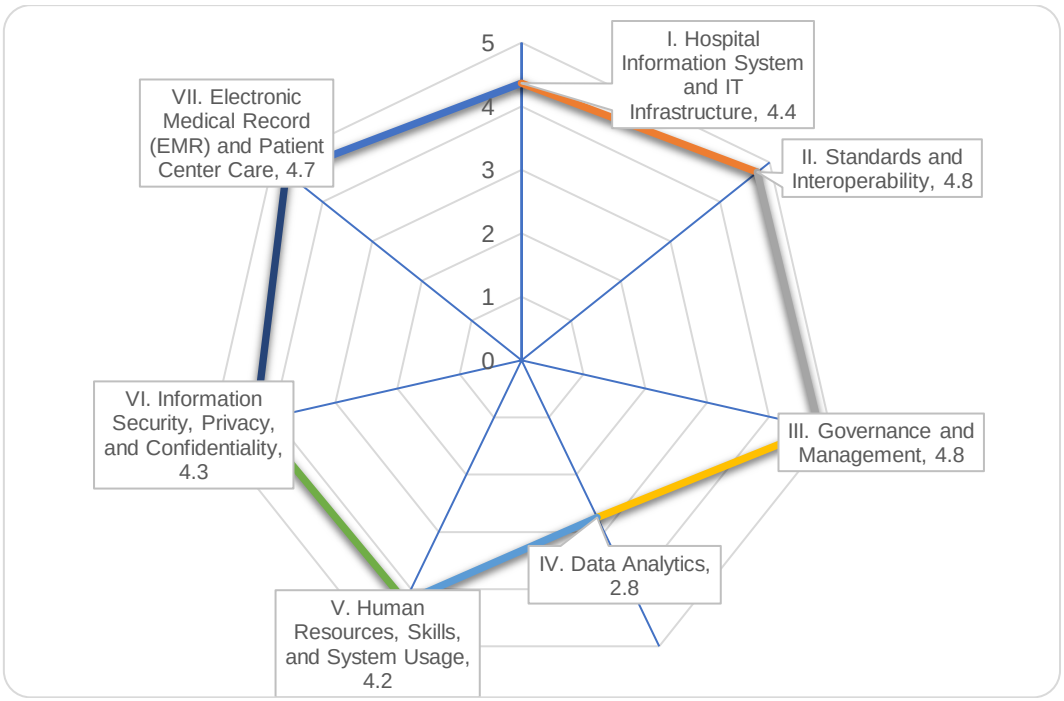

Figure 1. Jember Klinik Hospital's Digital Maturity Scores

The digital maturity sub-component scores of Jember Klinik Hospital (Table 2) revealed a structured digital foundation while uncovering critical gaps typical of many private healthcare institutions in Indonesia. The hospital had demonstrated high performance in internal operations, particularly through Back Office, ICT Quality, and ICT Service Quality sub-components, each scoring 5.0. These findings reflected well-established digital infrastructure and effective internal IT services. However, the Front Office sub-score (3.5) indicated that patient-facing digital services were underdeveloped. This imbalance highlighted a common challenge in private hospitals, where internal efficiency is prioritized over patient digital engagement. Such gaps may limit patient autonomy and satisfaction, despite the hospital's overall operational maturity (Elizondo, 2024; Woods et al., 2023).

Similarly, Interoperability Services and Routine Reporting scored 3.7, suggesting that while some bridging mechanisms were in place, core system integration remained partial. These findings pointed to fragmented internal data flows, a limitation that can delay clinical processes and reduce the utility of routine analytics. The hospital's IT Resource Planning (4.0) further revealed that although basic planning existed, long-term digital investments were not yet strategically aligned, as an issue frequently reported in resource-constrained private institutions (Burmann et al., 2022).

Table 2. Jember Klinik Hospital's Digital Maturity Sub-Component Scores

No	Sub-component	Sub-score
Component I. Hospital Information System and IT Infrastructure		
A	Front Office	3.5
B	Back Office	5.0
C	ICT Quality	5.0
D	ICT Service Quality	5.0
E	Interoperability Services and Routine Reporting	3.7
F	IT Resource Planning	4.0
Component II. Standards and Interoperability		
A	Internal Interoperability	4.5
B	External Interoperability	5.0
Component III. Governance and IT Management		
A	Strategic IT Planning	5.0
B	IT Governance	5.0
C	IT Human Resources (HR)	4.3
D	IT Investment	5.0
Component IV. Data Analytics		
A	Data Usage and Quality	3.0
B	Big Data Analysis	2.5
Component V. Human Resources, Skills, and System Usage		
A	Digital Literacy	3.8
B	Perceived Usefulness and Benefits of Information Systems	4.4
C	Encouragement to Use Information Systems	4.7
D	Knowledge Management	4.0
Component VI. Information Security, Privacy, and Confidentiality		
A	Security and Access to Patient Data	4.3
B	Implementation of Information Security Procedures	4.3
Component VII. EMR and Patient Centered Care		
A	EMR Functionality	4.1
B	Patient Centered Care	5.0
C	Depth of EMR Utilization	4.8
D	Personalized Patient Services	5.0

Source: *Primary data*

In Component II, Jember Klinik Hospital had successfully achieved a full score (5.0) for External Interoperability, indicating its technical and procedural readiness to connect with outside systems. However, Internal Interoperability (4.5) pointed to minor gaps in intra-organizational data exchange. These findings suggested that data silos still existed within departments, possibly hindering real-time information access. Krasuska et al. (2020) argue that strong internal interoperability enables timely, safer care, while Phiri et al. (2023) emphasize its role in reducing medical errors (Krasuska et al., 2020; Phiri et al., 2023). The hospital's ability to reach external interoperability was commendable, yet sustained gains will also require robust internal integration (Burmann et al., 2022; Duncan et al., 2022; Greenhalgh et al., 2021).

Component III reflected a solid foundation of digital leadership. The hospital achieved perfect scores (5.0) in Strategic IT Planning, IT Governance, and IT Investment, indicating proactive leadership, strong oversight, and committed resource allocation. These findings suggested the presence of a strategic digital roadmap. Nonetheless, the lower score in IT Human Resources (4.3) revealed limited personnel capacity, likely constraining operational

resilience. Duncan et al. (2022) suggest that strategic planning supports alignment with clinical goals, while Strumann et al. (2024) stress that investment alone is insufficient without skilled professionals (Duncan et al., 2022; Strumann et al., 2024). As such, improving workforce structures must accompany governance excellence (Burmann et al., 2022; Dhahri et al., 2020; Phiri et al., 2023).

Component IV received the lowest ratings, with Data Usage and Quality at 3.0 and Big Data Analysis at 2.5. These sub-scores exposed critical deficiencies in the hospital's capacity to leverage data for operational improvement. Although data collection existed, analytical functions were limited, and predictive or big data capabilities were virtually absent. These gaps posed a significant barrier to evidence-based care and continuous improvement (Baihaqy & Subriadi, 2024; Duncan et al., 2022). Perera et al. (2022) emphasize that high-quality data is foundational for strategic decision-making (Perera et al., 2022). Without investment in analytical tools, staff training, and data governance, the hospital risks stagnating despite digital infrastructure investments (Gašperlin et al., 2021; Phiri et al., 2023).

In Component V, high scores in Encouragement to Use Information Systems (4.7) and Perceived Usefulness (4.4) indicated a supportive digital culture and positive user experiences. However, Digital Literacy (3.8) and Knowledge Management (4.0) showed that staff competencies remained uneven. The hospital's reliance on digital champions and monitoring mechanisms had encouraged usage, but broader capacity-building was still required. According to Duncan et al. (2022), digital engagement improves when systems are perceived as beneficial, while Strumann et al. (2024) stress that structured knowledge sharing is key to sustainability. These findings suggest the need for continuous, cross-unit digital training and leadership development (Burmann et al., 2022; Perera et al., 2022; Phiri et al., 2023).

Component VI recorded consistent scores (4.3) in both Security and Access to Patient Data and Security Procedure Implementation. The hospital had already established basic policies and maintained acceptable compliance. However, it had yet to invest in more advanced practices such as intrusion testing or automated detection. This limited technical readiness may become a liability as interoperability expands (Baihaqy & Subriadi, 2024; Krasuska et al., 2020). Security is more than a technical safeguard. It facilitates trust and enables safe information exchange (Duncan et al., 2022; Phiri et al., 2023).

Component VII was among the highest performing. The hospital achieved full scores in Patient-Centered Care and Personalized Services (5.0), and a strong score for EMR Utilization (4.8). These results indicated that the hospital had embedded EMRs across departments and tailored care to individual patients. However, EMR Functionality scored 4.1 due to weaknesses in multimedia data integration, especially digital imaging. While EMRs were well-used, their ability to fully support decision-making remained constrained. Park et al. (2019) emphasize that clinical decision support depends on rich, interoperable EMR functions. Moreover, the hospital's interpretation of "patient-centered care" appeared system-focused, rather than relational. True maturity involves empowering patients through access, transparency, and co-decision tools (Snowdon, Hussein, Danforth, et al., 2024; Lloyd et al., 2023; Chuang et al., 2019).

These sub-component findings suggested that Jember Klinik Hospital had successfully advanced in strategic planning, governance, and digital operations but remained limited in analytics, front-end digital services, and workforce development. This pattern is typical of

private hospitals where digital adoption is often driven by compliance or efficiency pressures rather than long-term capability-building (Putra et al., 2024; Snowdon et al., 2024; Woods et al., 2023). The hospital's readiness for external data exchange, aligned with national policy, was a notable strength. Yet, to sustain transformation, further attention must be given to cultivating digital culture, investing in people, and expanding EMR functionality.

To achieve higher digital maturity, hospitals need a balanced approach such as integrating infrastructure, interoperability, governance, and human capital (Baihaqy & Subriadi, 2024; Phiri et al., 2023). Tools such as regular maturity assessments (Abdulrahman et al., 2024; Burmann et al., 2022), digital literacy training (Sampaio et al., 2023; Strumann et al., 2024), and patient engagement mechanisms are crucial (Snowdon et al., 2024). Process automation and secure architecture can enhance efficiency and safety (Tran et al., 2023; von Wedel et al., 2022). Policy and public-private partnerships must also support this momentum with sustainable investment (Woods et al., 2023).

From a practical standpoint, the findings of this study provide actionable guidance for hospital managers, policymakers, and IT leaders in regional private healthcare settings. First, the strong performance in Standards and Interoperability, Governance, and EMR utilization demonstrates that structured planning, compliance with national regulations, and cross-departmental digital integration are attainable even with limited resources, provided committed leadership and targeted investment exist. Second, the identified weaknesses in Data Analytics, front-end digital services, and workforce digital literacy highlight priority areas where modest, incremental improvements—such as modular adoption of analytics tools, capacity-building programs, and gradual enhancement of patient-facing systems—can yield substantial benefits in service quality and operational efficiency. Finally, by presenting a structured digital maturity assessment model aligned with the Indonesian Ministry of Health's framework, this study offers a replicable approach that other regional private hospitals can adopt to benchmark their progress, inform resource allocation, and design context-specific digital transformation strategies.

At the policy level, the results support the need for national initiatives that prioritize funding for data analytics infrastructure, workforce training, and interoperability standards in regional private hospitals, ensuring equitable digital health development across Indonesia. For future research, multi-site longitudinal studies incorporating both quantitative metrics and qualitative insights are recommended to assess the long-term impact of targeted digital transformation interventions on healthcare quality, efficiency, and patient outcomes.

This study had limitations, including its single-site focus, restricting generalizability, reliance on internal stakeholder perceptions, potentially introducing biases, and a cross-sectional design that limited assessing changes over time or establishing causal relationships. Future studies should include multiple healthcare facilities across regions to enhance comparability, utilize external independent evaluations for improved objectivity, adopt longitudinal designs to explore causal impacts on healthcare quality, incorporate qualitative research to gain deeper insights from users and staff, and evaluate targeted interventions through experimental methods to effectively support evidence-based strategies for digital transformation in Indonesia's healthcare sector.

CONCLUSION

This study uncovered that Jember Klinik Hospital had achieved an advanced level of digital maturity, particularly in Standards and Interoperability and Governance and IT Management (each scoring 4.8), with strong performance also observed in EMR and Patient-Centered Care (4.7). These outcomes reflected effective strategic alignment, structured governance, and comprehensive EMR integration that supported clinical workflows and personalized services. In contrast, Data Analytics emerged as the most critical weakness (2.8), pointing to underdeveloped data quality, limited analytical tools, and insufficient technical capacity.

The findings highlight the importance of targeted efforts to strengthen data analytics capabilities, improve internal system integration, and enhance staff digital competencies. For hospitals with limited resources, practical short-term strategies may include modular adoption of analytics tools, focused training for key personnel, and optimization of existing digital infrastructure. These approaches can support incremental progress toward digital maturity, improve service quality, and prepare institutions for more advanced stages of digital transformation.

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