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Research paper

Digital Readiness and Innovation in Indonesian Hospitals: naviGating Challenges in Post-Pandemic Healthcare Management

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Abstract

This study aims to analyze digital readiness and innovation in Indonesian hospitals in the context of post-pandemic healthcare management using a Systematic Literature Review (SLR) approach. The literature search was conducted in Scopus, Web of Science, PubMed, and Google Scholar databases for the period 2019–2025 using the keywords digital readiness, hospital innovation, digital transformation, and post-pandemic healthcare. Of the 659 articles identified, 29 met the inclusion criteria for thematic analysis. The study results indicate that digital readiness in hospitals is significantly influenced by transformational leadership, adaptive organizational culture, human resource digi-tal competency, and national policy support. Innovation in healthcare management focuses on the development of telemedicine, the integra-tion of the Internet of Things (IoT), and the use of artificial intelligence (AI) to improve service efficiency. However, challenges such as limited digital infrastructure, resistance to change, and low interoperability of information systems remain major obstacles. Overall, these findings confirm that digital transformation is a strategic foundation for strengthening hospital resilience and competitiveness in the post-pandemic era. This study contributes to policy direction and managerial strategies for realizing a sustainable digital transformation oriented toward value-based healthcare in Indonesia.

Keywords: *Digital Readiness; Innovation; Hospital Management; Post-Pandemic Healthcare; Indonesia; Digital Transformation.*

1. Introduction

The rapid development of digital technology over the past decade has significantly influenced the healthcare sector, particularly as the COVID-19 pandemic accelerated the adoption of telemedicine, electronic medical records, big data, and artificial intelligence. In the post-pandemic era, digital transformation is no longer optional but essential for ensuring service continuity, efficiency, and patient safety. In this process, physicians play a central role as the primary users of digital technology in everyday clinical practice (Steenkamp et al., 2025). However, digital readiness in healthcare remains uneven and faces several challenges. Organizational factors, infrastructure, healthcare worker competencies, and policy support all shape the level of readiness. Alotaibi et al. (2025) found that although various interventions have been introduced to strengthen digital readiness, key barriers including limited resources, resistance to change, and insufficient training persist. This gap between the potential of digital technologies and their real-world implementation directly affects the quality of healthcare services.

For physicians, digital readiness involves not only technical abilities but also cognitive, emotional, and organizational readiness to integrate technology into clinical workflows. Common obstacles include low digital literacy, limited managerial support, and increased workloads caused by digital systems that remain difficult to use. Conversely, clear regulations, adequate infrastructure, and incentive systems can enhance technology adoption. These dynamics highlight the importance of understanding physicians' digital readiness as a key determinant of successful healthcare transformation (Nascimento et al., 2023).

At the hospital management level, digital readiness is closely linked to organizational capability development. Brommeyer and Liang (2022) emphasize that successful digital transformation requires a systematic approach integrating technological aspects with human re-source development, particularly for medical personnel. In Indonesia, challenges such as regional infrastructure disparities, limited physi-cian training, and weak coordination across service units indicate that without physician readiness, hospital digitalization strategies will face significant obstacles.

Previous studies also show that digital readiness is shaped by external factors such as national policies and global technological develop-ments. Bilgiç and Akdağ (2021) note that human, organizational, technological, and environmental elements interact to determine readiness for transformation. Although Indonesia has launched the SATUSEHAT digitalization initiative, issues related to interoperability, data security, and physician preparedness remain significant. This underscores the need for research specifically addressing physicians'

perspectives in developing countries, as most prior studies have focused on macro-policy or managerial aspects (Steenkamp et al., 2025; Alotaibi et al., 2025).

Addressing this gap, the present study aims to analyze physicians' digital readiness in Indonesian hospitals and examine its relationship with post-pandemic healthcare service innovation using a Systematic Literature Review (SLR) approach. By focusing on physicians the primary users of digital systems the study contributes theoretically to the literature on digital readiness and practically by offering recommendations for hospital managers and policymakers. Identifying both enabling and inhibiting factors can support more effective strategies to strengthen digital transformation in Indonesia's healthcare sector (Nascimento et al., 2023; Brommeyer & Liang, 2022; Bilgiç & Akdağ, 2021).

2. Method

This study employed a Systematic Literature Review (SLR) approach to rigorously analyze scholarly work related to digital readiness and innovation in the hospital sector, particularly within the context of post-pandemic healthcare management. This method was selected because it allows for a structured, evidence-based synthesis of the progress, challenges, and opportunities emerging from digital transformation efforts in hospitals (Brommeyer & Liang, 2022). All research procedures were conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency, replicability, and methodological rigor.

The SLR process consisted of four core stages: identification, screening, eligibility, and inclusion. In the identification stage, a comprehensive literature search was conducted using major scientific databases Scopus, Web of Science, and PubMed with supplementary searches on Google Scholar to capture potentially relevant but non-indexed publications. The search was restricted to the years 2019–2025 to reflect contemporary developments in digital transformation during and after the COVID-19 pandemic. The Boolean search strings used were as follows: ("digital readiness" OR "digital capability" OR "technology readiness") AND ("hospital" OR "healthcare management" OR "health system") AND ("innovation" OR "digital transformation" OR "post-pandemic").

During the screening stage, all identified articles were checked for duplicates and evaluated based on titles and abstracts. Articles were screened out if they did not focus on hospitals, healthcare management, digital transformation, or digital readiness. The inclusion criteria were: (1) peer-reviewed journal articles published in English; (2) empirical or conceptual studies addressing digital readiness, digital capability, innovation, or healthcare management; (3) relevance to hospital settings or national healthcare systems; and (4) publication date between 2019 and 2025. Exclusion criteria included opinion pieces, editorials, non–peer-reviewed reports, and studies lacking empirical or theoretical grounding.

The eligibility stage involved full-text assessment to determine alignment with the study's objectives. Articles that met the criteria were subjected to a systematic data extraction process. A coding sheet was developed to analyze each study across several dimensions: (1) definitions and conceptual frameworks of digital readiness; (2) innovation approaches in hospitals; (3) organizational, technological, and human resource factors influencing readiness; (4) digital transformation outcomes; and (5) post-pandemic contextual challenges. Coding and thematic categorization were performed using a directed content analysis approach. To enhance reliability, two independent reviewers coded the data, and interrater reliability was assessed using Cohen's kappa. Discrepancies were resolved through discussion until consensus was achieved.

Several influential studies formed the foundation of the thematic synthesis. Bilgiç and Akdağ (2021) identified key determinants of digital transformation readiness in hospitals, including leadership support, innovative organizational culture, and the strength of technological infrastructure. Brommeyer and Liang (2022) emphasized the importance of managerial readiness and demonstrated that successful digital transformation requires both capable technology systems and strengthened human resource competencies. Steenkamp et al. (2025) further illustrated that digital health readiness among hospital leaders is closely linked to internal policies and institutional support, while Alotaibi et al. (2025) highlighted the role of digital training interventions, adaptive leadership, and innovation-oriented cultures in improving digital capabilities.

Nascimento et al. (2023) revealed that psychological resistance, fear of change, and inadequate practical training are major barriers to the adoption of digital tools among healthcare workers. These findings correspond with Lahti et al. (2023), who developed the Innovation Readiness Inventory to measure the readiness of nursing organizations, emphasizing that innovation depends not only on the availability of digital systems but also on cultural and structural readiness. Likewise, Van den Hoed et al. (2022) argued that transformational leadership, interdisciplinary collaboration, and dynamic learning environments significantly shape innovation readiness.

In the broader context of smart hospital development, Ronaghi (2024) proposed a smart hospital readiness model based on Industry 4.0 principles, evaluating readiness across four dimensions: technological infrastructure, data management, digital skills of healthcare workers, and system integration. This model provides an important reference for understanding how Indonesian hospitals can progress toward digital transformation. Meanwhile, Dash et al. (2019) underscored the critical role of integrated digital ecosystems in enabling hospitals to achieve sustainable innovation.

3. Result and Discussion

Before proceeding to the thematic analysis, the literature search results were systematically filtered through several PRISMA-based stages to ensure that only studies meeting the predefined criteria were included in the final review. The identification process across Scopus, Web of Science, PubMed, and an additional Google Scholar search yielded a total of 659 publications. After removing duplicates, 575 records remained and were screened based on titles and abstracts to assess their relevance to digital readiness, hospital innovation, and post-pandemic healthcare management. A total of 203 articles met the initial relevance criteria and proceeded to the eligibility stage, where full-text assessments were conducted. Following this rigorous evaluation, 29 studies fulfilled all inclusion criteria and were incorporated into the final analysis. The detailed breakdown of the selection process for each database is presented in Table 1.

Table 1: Identification Results of Literature Search (2019–2025)

Database	Initial Search Results	After Removing Duplicates	Relevant after Title & Abstract Screening	Selected for Eligibility Review	Included in Final Analysis
Scopus	248	210	72	21	12
Web of Science	173	160	58	18	8
PubMed	102	95	40	14	6

Google Scholar (additional search)	136	110	33	10	3
Total	659	575	203	63	29

The identification stage is the initial step in the Systematic Literature Review (SLR) process, which aims to gather all literature relevant to the research topic, namely "Digital Readiness and Innovation in Indonesian Hospitals: Navigating Challenges in Post-Pandemic Healthcare Management." In this stage, researchers conducted a systematic search of scientific publications in various leading databases, namely Scopus, Web of Science, PubMed, and Google Scholar, deemed to have broad coverage and high credibility in the fields of healthcare management, digital technology, and organizational innovation.

This identification process was conducted to capture scientific articles discussing digital readiness and organizational innovation in the hospital context, particularly during the post-COVID-19 pandemic transition. The selection of the 2019–2025 timeframe was intended to ensure that the reviewed literature reflects the latest developments in the digital transformation of the healthcare sector, both during and after the pandemic. This period is also considered crucial because it marks the acceleration of the massive adoption of digital technology in the healthcare sector due to social restrictions and the need for remote healthcare services.

The initial search results in the four main databases yielded a total of 659 articles deemed potentially for further study. These included 248 articles from Scopus, 173 from Web of Science, 102 from PubMed, and 136 from Google Scholar. This number reflects the large number of studies related to digital transformation and innovation in healthcare over the past six years, in line with the increasing global focus on the digitalization of healthcare systems.

Scopus was the largest source for this search because its database indexes numerous international journals in management, information technology, and medicine. Meanwhile, Web of Science contributed significantly to providing articles with an interdisciplinary orientation that combined aspects of policy, innovation management, and hospital information systems. PubMed, while focusing on medical and clinical literature, also made significant contributions related to the adoption of digital technology in healthcare, particularly regarding electronic medical record systems, telemedicine, and digital patient management. Google Scholar was used as a supplement to find additional articles, including gray literature such as conference proceedings, which were not yet fully indexed in the main databases.

After all search results were collected, the next step was to eliminate duplicates. This process is crucial because many of the same articles can appear in more than one database. Of the 659 articles, 84 duplicate articles were identified and removed, leaving 575 unique articles for further analysis.

Next, a title and abstract screening was conducted to assess their initial relevance to the research topic. At this stage, researchers reviewed each title and abstract to ensure their relevance to the topic of hospital digitalization and innovation. Articles that did not address the hospital context, did not focus on healthcare management, or did not directly relate to digital readiness were excluded.

After this process, the number of relevant articles was reduced to 203. This figure indicates that more than half of the initial articles did not meet the initial relevance criteria because their topics tended to be purely technological (such as software systems or data security) without any discussion of healthcare organizations or management. The next stage was an eligibility review, in which the 203 articles were read in more depth based on their main content and methodology. The goal of this stage was to ensure that only articles that truly met the inclusion criteria were retained for further analysis.

The inclusion criteria used included:

1) Articles must be peer-reviewed scientific publications in English or Indonesian;
2) The primary focus must address digital readiness, innovation, or healthcare management;
3) The research context must be in a hospital or healthcare system;
4) Published between 2019 and 2025.

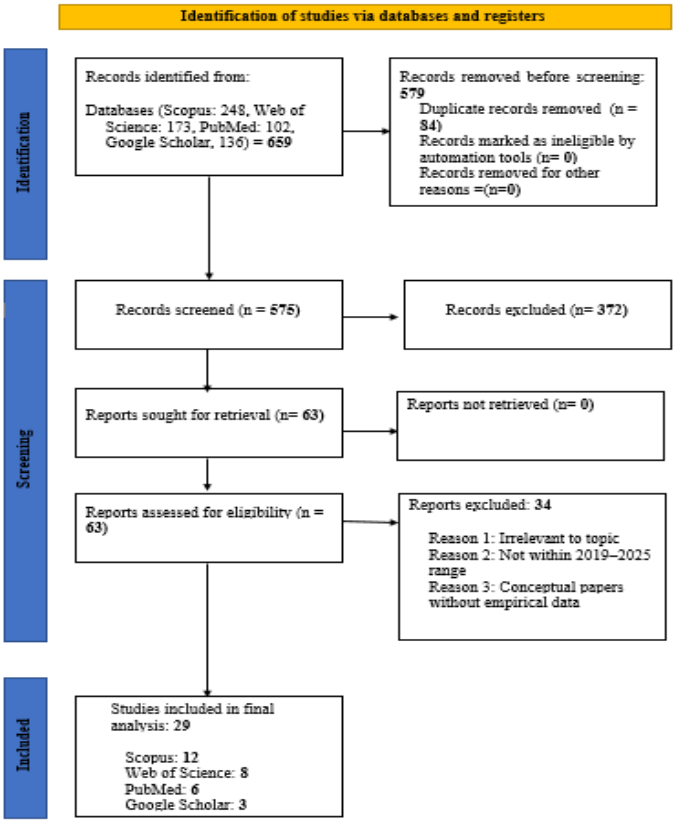

Fig. 1: PRISMA Flow.

From the initial identification results, it was found that the topics frequently appearing in the literature encompass four major themes:

1) Definition and conceptual framework of digital readiness: discussing how digital readiness is measured in hospitals, including technological infrastructure, human resource competencies, and managerial support.
2) Hospital managerial and organizational innovation: covering business process restructuring, digital-based service systems, and leadership strategies in the digital era.
3) Human and organizational factors in technology adoption: covering digital culture, resistance to change, and the need for digital capacity development for healthcare workers.
4) Post-pandemic challenges in digitalizing the healthcare system: covering aspects of sustainable technology implementation, patient data security, and system integration between hospital units.

These themes demonstrate that digital readiness is not merely technical readiness, but also organizational readiness and work culture. In the context of hospitals in Indonesia, the literature identification results show that many studies emphasize the importance of digital leadership and organizational agility as key prerequisites for successful digital innovation. The identification process, which yielded 29 final articles, provides a solid foundation for understanding research directions in hospital digital transformation; however, this relatively small number (approximately 4.4% of the initial search) also reflects typical SLR limitations, such as database bias and publication bias that may exclude relevant but non-indexed grey literature. This finding highlights that although digitalization in the healthcare sector is widely discussed, not all studies focus specifically on hospitals or healthcare management, and even fewer examine readiness in the Indonesian context.

Furthermore, these results also show that most research is still conducted in developed countries, while studies specifically addressing the context of developing countries like Indonesia remain relatively limited. This geographical imbalance reduces the generalizability of global conceptual frameworks, especially given the socioeconomic, infrastructural, and regulatory characteristics unique to Indonesia. This gap presents an opportunity for more contextualized research that compares pre- and post-pandemic digital readiness dynamics, as very few existing studies explicitly differentiate the trajectory of digital transformation before and after COVID-19. Understanding these temporal shifts is essential for capturing how the pandemic catalyzed cultural, managerial, and technological changes in hospitals.

Thus, the identification stage not only serves to select relevant articles but also provides a foundation for understanding the existing research landscape, identifying research gaps, and formulating the focus for further analysis in the next phase of the SLR. Importantly, this SLR contributes uniquely by mapping the conceptual evolution of digital readiness across the pandemic timeline and by synthesizing insights from the limited Indonesian studies available, which often highlight structural barriers such as fragmented data systems, low digital literacy, and weak governance alignment across hospital units.

1) Conceptualization and framework of digital readiness in hospitals

Digital readiness in the hospital context is not only related to the availability of technological infrastructure, but also encompasses the readiness of human resources, organizational governance, and a culture of innovation that supports sustainable digital transformation. According to Kickbusch et al. (2021), future healthcare will be largely determined by the institution's ability to adapt to the rapidly evolving digital world through strong digital policies, interoperable data systems, and the digital literacy of healthcare workers. However, definitions of digital readiness across studies remain heterogeneous some focus on infrastructure, others on skills, governance, or socio-technical alignment making cross-study comparisons difficult and highlighting the need for a more unified conceptual model.

The conceptualization of digital readiness also requires integrating digital capability with organizational adaptability. Akinola and Telukdarie (2023) explain that sustainable digital transformation must balance technological innovation with operational efficiency and resource sustainability, especially within value-based care. Meanwhile, Sari et al. (2023) emphasize that Indonesian hospitals require a resilience domain that includes technological readiness, adaptability, and collaborative leadership to face post-pandemic disruptions. These fragmented conceptualizations strengthen the argument for a more robust integration of established theories such as the Technology-Organization-Environment (TOE) Framework, the Unified Theory of Acceptance and Use of Technology (UTAUT), and digital capability maturity models an integration which remains limited across the reviewed literature.

In a global context, Mosadeghrad et al. (2024) outlined that digital readiness is a core component of health system resilience, demonstrating that institutions with higher readiness were better able to maintain primary care quality during COVID-19 through telemedicine and integrated information systems. Xu et al. (2024) further found that productivity efficiency in healthcare systems is strongly influenced by technological heterogeneity and uneven digital readiness across regions. Meanwhile, Kodali (2023) highlighted that in developing countries, the main constraints are not purely technological but include policy fragmentation and low digital literacy. These findings underscore the need for Indonesian frameworks to incorporate socio-cultural and regulatory complexities, especially given the fragmented nature of data systems across healthcare institutions..

2) Innovation and digital transformation in hospital management

The post-pandemic digital transformation of hospitals marks a paradigm shift in healthcare management. Various studies show that digital innovation drives efficiency, strengthens inter-unit coordination, and expands patient access to remote services. Anggo et al. (2025) emphasized the role of telemedicine as a key innovation enabling virtual consultations during and after the pandemic. Galvin et al. (2024) demonstrated how sustainable digital systems can expand access to critical services findings that are highly relevant for Indonesia, where disparities between urban and rural areas remain a persistent challenge.

In the Indonesian context, Usman et al. (2024) found that IoT-based information architecture has strong potential to enhance monitoring systems, particularly for chronic patients. Meanwhile, Anggara et al. (2023) proposed a digital public service transformation framework emphasizing interoperability, process efficiency, and data security elements that are essential but still inconsistently implemented across Indonesian hospitals. Moreover, Reisen et al. (2021) highlighted the importance of FAIR (Findable, Accessible, Interoperable, Reusable) principles, which are rarely applied comprehensively in Indonesia. Ensuring that health information systems are not siloed but aligned with national platforms such as SATUSEHAT remains a major challenge.

Beyond technology, the success of innovation is influenced by organizational culture and leadership. Uy and Bautista (2025) found that transformational leadership significantly enhances innovation and employee performance, as leaders act as catalysts of change through empowerment and future-oriented communication. These findings are essential in a context where Indonesian hospitals often demonstrate hierarchical and siloed management practices that hinder agility.

3) The Role of Human Resources and Leadership in Digital Readiness

Human resources (HR) are the most crucial determinant of hospital digital readiness. Without adequate capacity, digital technologies risk being underutilized even when infrastructure is available. Mabaso et al. (2025) showed that nurses' attitudes and readiness significantly affect transformation outcomes, reinforcing the need for continuous training and inclusive implementation approaches. Adinda et al. (2024) demonstrated that HR functions recruitment, training, and performance appraisal directly influence service quality and that digitalization without parallel human capacity-building creates misalignment between systems and users.

Indonesian studies such as Fatimah (2022) and Ali et al. (2022) reveal persistent HR challenges including limited digital training, the absence of data-based evaluation systems, and coordination gaps between units. Gurning et al. (2021) and Handayani et al. (2020) further illustrate how organizational relationships and task misalignment affect service quality and readiness for digitalization. These findings suggest that leadership and HR strategies must evolve in tandem with technology adoption.

Globally, Uddin et al. (2024) introduced agile methodology for digital health development, emphasizing cross-functional collaboration and rapid iteration. Its application in Indonesia could accelerate system integration and user adoption. Studies by Herdilah et al. (2023) and Dewa et al. (2024) confirm that inclusive and digitally competent leadership strengthens employee engagement and retention in technology-based environments, further reinforcing that digital readiness is a socio-organizational transformation rather than a purely technical shift..

4) Post-pandemic challenges and strategies in digital health transformation

The COVID-19 pandemic accelerated digitalization but also exposed gaps in system resilience and policy sustainability. Khatri et al. (2023) emphasized that preparedness for health crises requires integrated, data-driven systems capable of rapid response an area where many Indonesian hospitals still face interoperability and governance challenges. Kuzior et al. (2022) added that digital resilience must balance technological, sustainability, and social equity dimensions, including worker well-being and ethical data use.

Megbowon and David (2023) showed that digital divides correlate with health inequalities an issue highly relevant to Indonesia's geographic and socioeconomic disparities. Mosadeghrad et al. (2024) recommended strengthening system interoperability, digitizing supply chains, and integrating public and private services to enhance pandemic resilience. In Indonesia, Anurogo et al. (2023) emphasized strengthening public digital literacy 5.0 to ensure widespread acceptance of digital health services.

Sulistyowati et al. (2022) highlighted financing constraints and proposed waqf-based models as innovative alternatives for supporting digital health investments an approach that could have strategic value in regions with limited budgets. Overall, findings indicate that Indonesian hospitals are transitioning toward more mature digitalization, but success depends on three strategies: strengthening human capacity, developing integrated data systems guided by FAIR principles, and improving digital governance through adaptive leadership and coherent regulation.

The results of this systematic review indicate that digital readiness and innovation in post-pandemic hospitals are multidimensional issues involving technological, managerial, and sociocultural aspects. Readiness cannot be achieved through infrastructure investment alone; it requires shifts in organizational mindset, competence-building, and visionary leadership. In Indonesia, studies such as those by Sari et al. (2023) and Adinda et al. (2024) highlight the need to strengthen digital resilience and HR systems to adapt to future disruptions. Importantly, this SLR contributes uniquely by integrating cross-pandemic comparisons, mapping theoretical frameworks, and synthesizing limited Indonesian evidence to offer a more grounded understanding of digital transformation pathways. Thus, post-pandemic digital transformation must be seen as a long-term, strategic journey toward a more resilient, competitive, and inclusive healthcare system, aligned with the "Health Futures 2030" vision proposed by Kickbusch et al. (2021), where digital progress is achieved without compromising core human values in healthcare.

4. Conclusion

The identification phase of this systematic review highlights three key findings: (1) a significant rise in research on digital readiness following the COVID-19 pandemic, particularly in developing countries such as Indonesia; (2) growing recognition that digital readiness is shaped not only by technological infrastructure but also by organizational culture, leadership, and human resource capabilities; and (3) the increasing integration of theoretical frameworks such as TOE, UTAUT, and digital maturity models to explain hospitals' transformation processes. These findings imply that successful digital innovation in hospitals requires a balanced focus on both technological and human dimensions, as well as strong policy and managerial support. However, the current literature remains limited by the lack of Indonesia-specific models and the predominance of descriptive studies that do not fully capture socio-cultural or managerial complexities unique to the national healthcare system. Future research should develop context-sensitive frameworks, conduct longitudinal assessments of digital readiness, and explore more deeply the role of physician-specific competencies in driving sustainable digital transformation in Indonesian hospitals.

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