

Research Article

Determinants of Electronic Nursing Medical Record Implementation Success, Infrastructure Readiness, Digital Literacy, and Perceived Usefulness

Farida^{1*}, Munawar², Kemala Rita Wahidi³

¹ Master of Hospital Administration, Universitas Esa Unggul, Jakarta, Indonesia:

ffarida84@student.esaunggul.ac.id

² Master of Hospital Administration, Universitas Esa Unggul; Jakarta, Indonesia: munawar@esaunggul.ac.id

³ Master of Hospital Administration, Universitas Esa Unggul; Jakarta, Indonesia: kemala.rita@esaunggul.ac.id

* Corresponding Author: ffarida84@student.esaunggul.ac.id

Abstract: The implementation of Electronic Medical Records (EMR) is a key component of healthcare digital transformation, as mandated by the Minister of Health Regulation Number 24 of 2022. EMR is expected to enhance efficiency, accuracy, and the quality of nursing services. However, its implementation at M Hospital continues to face challenges, particularly in terms of infrastructure readiness and the digital literacy of nursing staff. This study aims to analyze the effects of infrastructure readiness and digital literacy on the implementation of nursing EMR, with perceived usefulness as an intervening variable. A quantitative cross-sectional design was employed, involving all nurses at M Hospital, with a total sample of 100 respondents using total sampling. Data were collected through structured questionnaires and analyzed using SEM-PLS. The results indicate that infrastructure readiness and digital literacy have both direct and indirect effects on EMR implementation through perceived usefulness ($p < 0.05$). Among the independent variables, infrastructure readiness demonstrates the strongest influence. These findings support existing theories and prior research. From a managerial perspective, the results highlight the importance of improving infrastructure to optimize EMR implementation. In conclusion, infrastructure readiness and digital literacy significantly influence the successful implementation of nursing EMR, with perceived usefulness acting as a key mediating factor.

Keywords: Digital Literacy; EMR; Implementation; Infrastructure Readiness; Perceived Usefulness.

1. INTRODUCTION

Electronic Medical Records (EMR) emerged as a response to the limitations of paper-based documentation systems, such as data loss, storage constraints, and slow information retrieval (Menachemi & Collum, 2011). Since the 1960s–1970s, healthcare institutions have gradually adopted computerized systems, including the Problem-Oriented Medical Record introduced by Weed (1968). Advances in information technology during the 1990s enabled the development of EMR, which later evolved into Electronic Health Records (EHR) supporting interoperability and data exchange across healthcare facilities (Blumenthal & Glaser, 2007). Today, EMR serves not only as a data repository but also as a strategic tool to enhance service quality and patient safety (Hakim et al., 2026).

In Indonesia, EMR implementation is regulated under the Minister of Health Regulation No. 24 of 2022, mandating all healthcare facilities to adopt electronic medical record systems. The policy aims to improve healthcare quality, ensure legal certainty, and promote integrated digital health services. EMR provides multiple benefits, including improved professionalism, operational efficiency, and better coordination across healthcare units (Prabawati & Purwito, 2025).

Despite regulatory support, EMR implementation remains uneven. Data from the Indonesian Hospital Association (PERSI) indicate that only about 50% of hospitals have adopted EMR, with only 16% achieving optimal implementation. Many facilities still operate hybrid systems due to limited readiness and resources (PERSI, 2022). Key barriers include

Received: February 18, 2026

Revised: March 20, 2026

Accepted: April 24, 2026

Published: May 25, 2026

Curr. Ver.: May 25, 2026



Copyright: © 2025 by the authors.

Submitted for possible open

access publication under the

terms and conditions of the

Creative Commons Attribution

(CC BY SA) license

([https://creativecommons.org/li](https://creativecommons.org/licenses/by-sa/4.0/)

[censes/by-sa/4.0/](https://creativecommons.org/licenses/by-sa/4.0/))

inadequate infrastructure, high implementation costs, limited human resource capacity, resistance to change, and insufficient training and technical support (Ali & Magalhaes, 2008).

Infrastructure readiness is a critical determinant of EMR implementation, encompassing hardware availability, network connectivity, software systems, and technical and organizational support (Heeks, 2006) Hung et al., 2020). Inadequate infrastructure can significantly hinder system effectiveness. Additionally, digital literacy among nurses plays a vital role, defined as the ability to access, understand, and use information technology to support clinical practice (McGonigle & Mastrian, 2024). Higher levels of digital literacy are associated with better acceptance and utilization of EMR (Ichwaniah et al., 2025).

Another important factor is perceived usefulness, defined as the degree to which individuals believe that using a system will enhance their job performance (Davis, 1989). Perceived usefulness has been shown to mediate the relationship between technology readiness and system usage, contributing to improved productivity and efficiency (Davis, 1989) Saputra et al., 2024). Therefore, successful EMR implementation depends not only on technical readiness but also on users' perceptions of its benefits.

At X Hospital, EMR implementation initiated in 2024 has not yet been fully optimized. Challenges include limited hardware availability, unstable internet connectivity, and insufficient training. Preliminary findings indicate low utilization rates and gaps in infrastructure readiness and digital literacy, although most nurses acknowledge the benefits of EMR. Therefore, this study aims to analyze the influence of infrastructure readiness and digital literacy on EMR implementation, with perceived usefulness as an intervening variable, to support the optimization of digital transformation in healthcare settings.

2. LITERATURE REVIEW

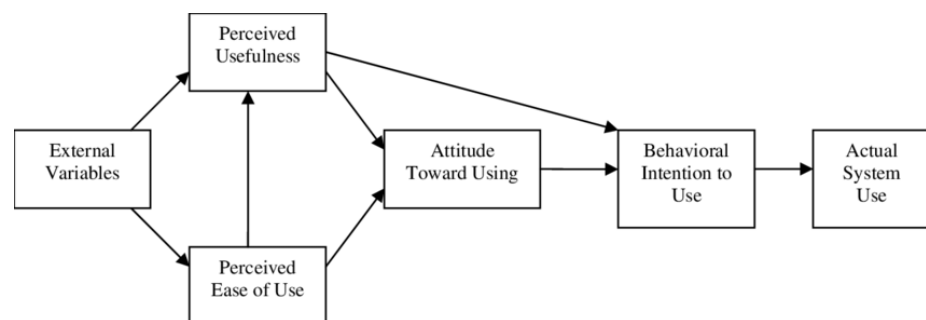


Figure 1. Technology Acceptance Model (TAM).

Technology Acceptance Model

The Technology Acceptance Model (TAM), introduced by Davis (1989), is a widely used theory to explain and predict user acceptance of information systems. TAM describes the causal relationship between individual beliefs, attitudes, intentions, and actual system use. It posits that technology adoption is primarily influenced by two key perceptions: perceived usefulness and perceived ease of use. Later, Venkatesh & Davis (2000) extended this framework into TAM 2, incorporating additional determinants of user acceptance while maintaining the core structure of the original model.

TAM consists of five main constructs: perceived usefulness, perceived ease of use, attitude toward using, behavioral intention to use, and actual system use, along with external variables as supporting factors. External variables such as subjective norms, self-efficacy, and facilitating conditions affect users' perceptions of usefulness and ease of use. These perceptions subsequently shape users' attitudes and intentions, which ultimately determine their actual use of the system (Venkatesh & Davis, 2000).

Perceived usefulness refers to the degree to which an individual believes that using a system will enhance job performance, including improving productivity, efficiency, and effectiveness (Davis, 1989). Perceived ease of use, on the other hand, reflects the extent to which a person believes that using a system will be free of effort, encompassing aspects such as ease of learning, understanding, and operation. These two constructs play a central role in forming users' attitudes toward technology, which are further influenced by cognitive, affective, and behavioral components (Ajzen, 2005).

Behavioral intention to use represents an individual's motivation and willingness to adopt a system, which strongly predicts actual system use. Actual system use is reflected in real behaviors, such as frequency and duration of use, type of interaction, and extent of feature utilization (Davis, 1989). In the context of EMR implementation, actual system use reflects the real adoption of the system by healthcare professionals, influenced by perceived usefulness, perceived ease of use, and external factors, which collectively shape attitudes and intentions toward using the system.

Implementation of Electronic Medical Records

Electronic Medical Records (EMR) are defined as electronic records of patients' health-related information that are created, stored, managed, and accessed by authorized healthcare professionals within a healthcare organization. EMR also represent a comprehensive repository of patient health information throughout the lifespan, designed to support multiple legitimate users (Krukowski et al., 2015). Furthermore, EMR function as an integrated health information system that captures data at the point of care, integrates data from multiple sources, and supports clinical decision-making (Amatayakul, 2007). In nursing practice, EMR are considered part of a broader health information system that enables efficient, integrated, and accessible patient care documentation (Adeniyi et al., 2024).

The implementation of EMR refers to the process of adopting electronic documentation systems into clinical nursing practice, including system design, workflow integration, user training, and evaluation of its effectiveness in improving documentation quality and healthcare services (McGonigle & Mastrian, 2024). It is also viewed as a digital transformation strategy replacing paper-based records to enhance interprofessional communication, reduce medical errors, and improve patient safety (Alsalah et al., 2024; Ball et al., 2013). Additionally, EMR implementation supports clinical decision-making, research, and healthcare management through the integration of information systems into nursing practice.

Several factors influence EMR implementation, including human, organizational, technological, workflow, and external factors (McGonigle & Mastrian, 2024). Key determinants include digital literacy, training, motivation, infrastructure readiness, system usability, and organizational support. The implementation of EMR can be assessed through four main dimensions: system design and suitability, integration into clinical workflow, user training and competence, and evaluation of its impact on service quality. These dimensions reflect how effectively EMR supports nursing documentation, improves efficiency, enhances coordination, and contributes to patient safety.

Infrastructure Readiness

Infrastructure readiness is defined as the extent to which an organization's physical and information technology infrastructure aligns with the requirements of an information system to be implemented (Heeks, 2006). Effective implementation requires adequate availability of hardware, software, telecommunications, and reliable power supply. Infrastructure readiness also encompasses broader organizational capabilities, including technological reliability, human resource competence, and supportive policies. Previous studies emphasize that strong infrastructure enhances system usefulness perception, user trust, and workflow integration, while inadequate infrastructure may lead to adoption barriers, low utilization, and higher risk of system failure (Boddy et al., 2008). Furthermore, IT infrastructure can be categorized into technical infrastructure, human infrastructure, and managerial capability, which collectively support successful system implementation (Byrd & Turner, 2000).

Infrastructure readiness can be assessed through several key dimensions (Heeks, 2006), including hardware availability, such as computers, servers, and reliable electricity supply; software accessibility, particularly the availability and usability of EMR systems across units; and internet connectivity, ensuring stable and uninterrupted network access. Additional dimensions include technical support and maintenance, reflected in the availability of IT personnel and regular infrastructure budgeting, as well as system security, including data backup, recovery procedures, and network protection mechanisms. These dimensions collectively determine the organization's capacity to effectively implement and sustain EMR systems.

Digital Literacy

Digital literacy in nursing refers to the competency of nurses to access, understand, and use information technology and electronic systems, including Electronic Medical Records (EMR), to support clinical practice, documentation, communication, and decision-making (McGonigle & Mastrian, 2024). It encompasses the ability to effectively utilize digital information to improve patient safety and service quality. More broadly, digital literacy includes the skills to access, manage, integrate, evaluate, and create information using digital technologies. It also involves cognitive and ethical dimensions, such as critical evaluation of information, effective communication, and responsible use of digital resources (Bawden & Robinson, 2009). Higher levels of digital literacy are associated with greater acceptance and ease of using new technologies, including EMR, making it a fundamental factor in successful system implementation.

Digital literacy can be assessed through four main dimensions (McGonigle & Mastrian, 2024). First, computer literacy refers to basic skills in operating digital devices and applications. Second, information literacy involves the ability to search, evaluate, and use credible health information effectively. Third, health technology literacy reflects the ability to use healthcare information systems, including EMR features such as data entry, retrieval, and interpretation of clinical information. Fourth, digital awareness and ethics emphasize responsible and professional use of technology, including maintaining patient confidentiality and adhering to organizational policies. These dimensions collectively reflect nurses' readiness to effectively adopt and utilize EMR in clinical settings.

Perceived Usefulness

Perceived usefulness is defined as the degree to which an individual believes that using a particular system will enhance their job performance (Davis, 1989). It reflects users' subjective belief that technology can improve work outcomes, increase productivity, and enhance effectiveness in daily tasks. In a broader perspective, perceived usefulness is also associated with the concept of utility, referring to the level of satisfaction or benefit gained from using a product or system. It can be viewed as a user's evaluation of how a system contributes to efficiency, decision-making, and overall job performance (Bausch & Schwenker, 2009). Higher perceived usefulness tends to strengthen users' acceptance and continued use of technology.

Perceived usefulness can be measured through three main dimensions (Davis, 1989). First, job performance, which reflects the extent to which technology helps users complete tasks faster, improves work quality, and supports better decision-making. Second, productivity, which indicates the ability of the system to increase work output, such as enabling users to handle more tasks within the same time. Third, work effectiveness, which refers to how technology improves efficiency, reduces errors, and supports daily work activities. These dimensions are widely used to assess users' perceptions of the benefits of systems such as Electronic Medical Records (EMR).

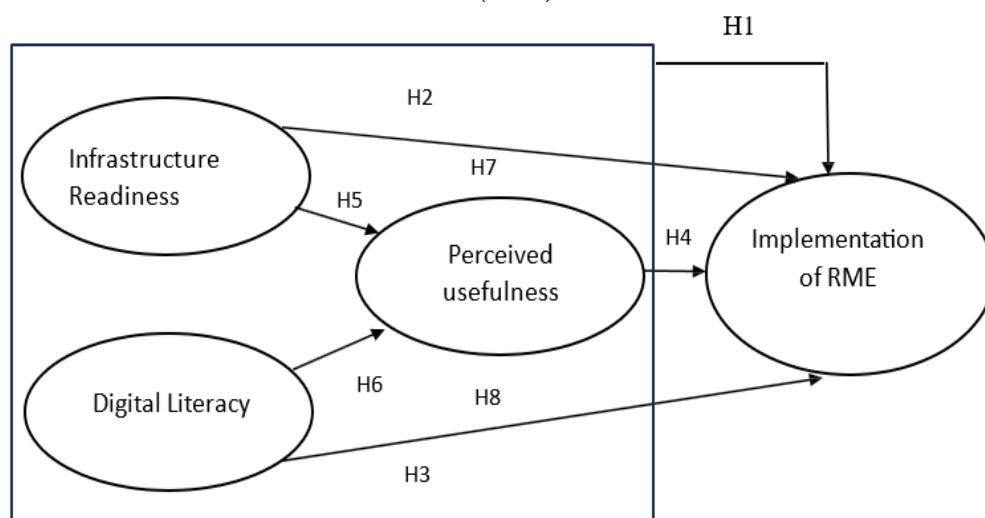


Figure 2. Research Constellation.

3. RESEACRH METHODS

This study employed a quantitative method with a cross-sectional design, collecting data at a single point in time to examine the effects of infrastructure readiness and digital literacy on EMR implementation, with perceived usefulness as an intervening variable at C Hospital. The population consisted of all nurses involved in EMR implementation, and the sample included 100 nurses selected using a total sampling (census) technique (Sugiyono, 2018). Inclusion criteria were nurses who were willing to participate, had completed their orientation period, and provided informed consent, while those on leave were excluded. Data were collected using a validated and reliable questionnaire distributed directly to respondents over one month (August 2025). Measurement was conducted using a six-point Likert scale to assess the degree of agreement with each statement, and the collected data were verified and analyzed using SEM-PLS.

4. RESULTS AND DISCUSSION

Respondent Characteristics

Based on gender, respondents are dominated by female gender, namely 79%, based on their education level, most respondents still have a D3 Nursing education, namely 56%. Based on age, 47% of respondents are aged 21-30 years, and those aged > 50 years are only 8%. Meanwhile, according to length of work, the majority of respondents are in the range of 0-5 years, namely 56%.

Convergent Validity Test

Based on the convergent validity test, the loading factor values for RME implementation ranged from 0.868 to 0.924. Infrastructure Readiness had a loading factor value between 0.775 and 0.902. Digital Literacy had a loading factor between 0.780 and 0.850, and perceived benefits had a loading factor between 0.844 and 0.918. Therefore, all items in the table above were declared valid.

Table 1. Average Variance Extracted Test Result.

Variabel	Average Variance Extracted (AVE)	Validitas
Implementation RME	0.805	Valid
Infrastructure Readiness	0.691	Valid
Digital Literacy	0.682	Valid
Perceived Usefulness	0.755	Valid

Source: Results of Primary Data Analysis, 2025

An AVE value >0.5 indicates that the research variables are valid. All variables in this study are considered valid and can be processed in further analysis. The AVE (Average Variant Extracted) value is presented because it indicates the validity of each variable, such as RME implementation, Infrastructure Readiness, Digital Literacy, and Perceived Benefits.

Realibility Test

Reliability testing is conducted to ensure that the research instrument used has a good level of internal consistency in measuring each construct. Reliability indicates the extent to which the items within a variable are able to produce stable and consistent results when measurements are repeated. In this study, reliability is assessed by examining the values of Cronbach's Alpha, rho_A, and Composite Reliability (CR). A construct is considered reliable if the values of Cronbach's Alpha and Composite Reliability are greater than 0.70 (Hair et al., 2022).

Table 2. Realibility Test.

Variable	Cronbacch's Alpha	Rho_A	Composite Reliability	Description
Infrastructure Readiness	0.950	0.954	0.957	Reliabel
Digital Literacy	0.933	0.936	0.945	Reliabel
Perceived Usefulness	0.954	0.956	0.961	Reliabel
Implementation RME	0.978	0.978	0.980	Reliabel

Source: Results of Primary Data Analysis, 2025

The table above shows that the variables EMR Implementation, Infrastructure Readiness, Digital Literacy, and Perceived Benefits have composite reliability and Crombach's alpha values >0.70, thus concluding that all constructs are reliable.

Based on the overall results of the validity and reliability tests on the outer model, it was concluded that all indicators are valid and reliable in measuring their constructs, allowing for the next stage, namely testing the inner model.

Hypotesis Test

Hypothesis Testing Results – The research data were processed using SmartPLS.

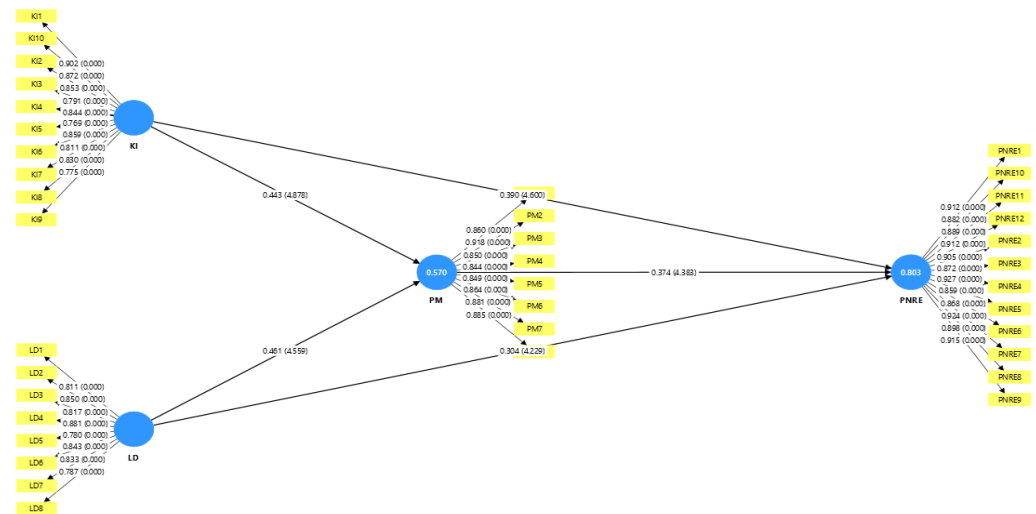


Figure 3. Bootstrapping Analysis Results.

The image above contains valid item results with a P value > 0.05. This shows that there is a significant influence of infrastructure readiness, digital literacy, and perceived benefits on the implementation of RME.

Simultaneous Test

Table 3. Simultaneous Effects Test Results.

Model	Sum of Squares	df	Mean square	F	Sig
Regresion	13,657	3	4,552	59,937	0,000
Residual	3,494	46	0,76		
Total	17.151	49			

Based on the table above, it shows the results of the hypothesis of the variables of infrastructure readiness, digital literacy, and perceived benefits on the implementation of RME with a p-value of 0.000. It can be concluded that there is a positive and significant influence between the variables of infrastructure readiness, digital literacy, and perceived benefits on the implementation of RME.

Partial Hypothesis

Table 4. Partial Hypotesis Test (Direct Effect).

	Original Sample	T Statistics	P Values	Description
IR -> PU	0.443	4.878	0.000	H2 Accepted
IR -> IRME	0.390	6.600	0.000	H3 Accepted
DL -> PU	0.461	4.559	0.000	H4 Accepted
DL -> IRME	0.304	4,229	0.000	H5 Accepted
PU -> IRME	0.374	4.383	0.000	H6 Accepted

Source: Results of Primary Data Analysis, 2025

The results indicate that infrastructure readiness (X1), digital literacy (X2), and perceived usefulness (Z) each have a positive and statistically significant effect on EMR implementation (Y). Infrastructure readiness shows the strongest direct effect ($\beta = 0.390$; $T = 6.600$; $p < 0.05$), followed by perceived usefulness ($\beta = 0.374$; $T = 4.383$; $p < 0.05$) and digital literacy ($\beta = 0.304$; $T = 4.229$; $p < 0.05$). This implies that improvements in these variables are associated with increased levels of EMR implementation, assuming other variables remain constant.

In addition, infrastructure readiness ($\beta = 0.443$; $T = 4.878$; $p < 0.05$) and digital literacy ($\beta = 0.461$; $T = 4.559$; $p < 0.05$) both have significant positive effects on perceived usefulness. These findings suggest that better infrastructure and higher digital literacy enhance users'

perceptions of the usefulness of EMR, which in turn contributes to stronger implementation. Overall, the results support the mediating role of perceived usefulness in strengthening the relationship between the independent variables and EMR implementation.

Indirect Effect Hypothesis Test

Tabel 5. Indirect Effect Hypothesis Test.

	Original Sample	T Statistics	P Values	Description
IR → PU → IRME	0.165	3.302	0.001	H7 Accepted
DL → PU → IRME	0.172	3.332	0.001	H8 accepted

The results indicate that perceived usefulness (Z) plays a significant partial mediating role in the relationship between infrastructure readiness (X1) and digital literacy (X2) on EMR implementation (Y). Infrastructure readiness has a significant indirect effect on EMR implementation through perceived usefulness ($\beta = 0.165$; $T = 3.302$; $p < 0.05$), while digital literacy also shows a significant indirect effect ($\beta = 0.172$; $T = 3.332$; $p < 0.05$). These findings suggest that improvements in infrastructure readiness and digital literacy not only directly enhance EMR implementation but also indirectly strengthen it by increasing users' perceived usefulness of the system, assuming other variables remain constant.

Discussion

The results of the simultaneous hypothesis test demonstrated that infrastructure readiness, digital literacy, and perceived usefulness significantly influenced the implementation of Electronic Medical Records (EMR). These findings indicate that the integration of adequate technological infrastructure, strong digital competencies, and positive user perceptions creates a supportive environment for EMR adoption in hospitals. Statistical analysis confirmed that improvements in infrastructure preparation, nurses' digital literacy, and perceptions regarding EMR benefits contributed positively to the effectiveness of EMR implementation in healthcare services. This finding supports the Technology Acceptance Model (TAM), which explains that external factors influence technology adoption through perceived usefulness and perceived ease of use (Davis, 1989). Organizational readiness and technological preparedness are important determinants of successful digital transformation in healthcare institutions. These findings highlight that EMR implementation cannot rely solely on technology, but also requires human readiness and strong organizational support.

The descriptive analysis using the Three Box Method showed that infrastructure readiness at X Hospital was generally categorized as high. The strongest dimension was system security, indicating that the hospital already has relatively good protection systems for digital medical data. However, the hardware dimension remained in the moderate category, particularly regarding the availability of computers, servers, routers, printers, and scanners in sufficient quantities. This suggests that although the hospital has prepared its infrastructure adequately, additional investment in hardware resources is still required to optimize EMR implementation. Heeks (2006) explained that infrastructure readiness reflects the extent to which organizational technological conditions match the requirements of information systems. Weak infrastructure can create barriers to adoption and increase the risk of project failure (Boddy et al., 2008). Therefore, strengthening hardware and network capacity is essential to ensure sustainable EMR utilization in healthcare settings.

The findings also revealed that digital literacy among nurses was categorized at a high level. The highest index was found in health literacy, indicating that nurses understood the importance of technology in improving healthcare services. However, computer literacy remained the weakest dimension, especially regarding the ability to evaluate the credibility of digital information sources. This condition suggests that healthcare workers are familiar with the benefits of digital systems but still require stronger technical competencies to maximize EMR utilization. McGonigle & Mastrian (2024) emphasized that digital literacy in nursing includes the ability to access, interpret, and apply digital information in clinical practice, communication, and decision-making. Computer access, technical support, and digital competency are essential factors influencing EMR implementation. Therefore, continuous digital training programs are needed to improve nurses' confidence and technical skills in operating electronic systems.

Perceived usefulness was also categorized as high, particularly in the dimension of work effectiveness. Nurses generally believed that EMR systems improved efficiency, reduced documentation errors, and facilitated healthcare services. However, the lowest score was identified in the dimension related to clinical decision-making support, indicating that the system still lacked advanced features to assist healthcare professionals in making more accurate clinical decisions. According to Davis (1989), perceived usefulness refers to the degree to which users believe that a technology improves job performance. These findings indicate that although EMR systems are already perceived positively, hospitals still need to optimize decision-support features to increase clinical effectiveness and strengthen user trust in digital healthcare systems.

The study further demonstrated that infrastructure readiness had a positive and significant influence on EMR implementation. Hospitals with stronger infrastructure showed higher levels of EMR utilization, proving that technological readiness is a prerequisite for digital transformation in healthcare organizations. The descriptive analysis indicated that security systems were well established, but hardware limitations still constrained optimal implementation. These findings align with Heeks (2006), who argued that successful information systems require adequate physical and technological infrastructure. In the context of TAM, infrastructure readiness acts as an external factor influencing both perceived usefulness and perceived ease of use. Hospitals with strong technological infrastructure tend to demonstrate higher EMR adoption rates. In addition, infrastructure readiness is considered a critical determinant of successful EHR implementation in healthcare institutions.

Digital literacy was likewise found to have a positive and significant effect on EMR implementation. Nurses with stronger digital competencies were more capable of operating the EMR system effectively and integrating it into clinical practice. The Three Box Method analysis showed that health literacy was relatively high, while technical computer literacy remained lower, particularly in evaluating digital information critically. This finding indicates the importance of strengthening nurses' technical skills to improve technology adoption. McGonigle & Mastrian (2024) stated that digital literacy is essential for effective clinical documentation, communication, and patient care management. Computer literacy and access to EHR-related training significantly improve EMR implementation. Therefore, enhancing digital competency through regular education and technical assistance is necessary to support sustainable digital healthcare transformation.

The results also showed that perceived usefulness significantly influenced EMR implementation. Nurses who believed that EMR systems improved work effectiveness, reduced workload, and increased efficiency were more likely to adopt the technology consistently in clinical practice. However, some respondents still perceived weaknesses in the system's ability to support clinical decision-making. According to TAM, perceived usefulness is one of the most important predictors of technology acceptance (Davis, 1989). Positive perceptions of EMR usefulness significantly increase healthcare workers' willingness to use electronic systems. In addition, perceived usefulness and perceived ease of use are strongly associated with EMR adoption behavior. These findings suggest that improving user perceptions through system optimization and user-friendly features is crucial to increasing the success of EMR implementation.

Infrastructure readiness was also proven to have a significant influence on perceived usefulness. This means that better infrastructure conditions increase healthcare workers' confidence in the benefits provided by EMR systems. The study showed that strong security systems enhanced trust in digital healthcare systems, while hardware limitations weakened user perceptions regarding system effectiveness. Heeks (2006) emphasized that sufficient IT infrastructure supports successful system implementation and increases user satisfaction. In TAM theory, external conditions such as infrastructure directly shape perceived usefulness and perceived ease of use (Davis, 1989). Adequate computer infrastructure and IT support can improve healthcare workers' perceptions of EHR usefulness. Therefore, improving technological readiness is essential not only for operational performance but also for strengthening positive attitudes toward digital healthcare systems.

The study additionally confirmed that digital literacy significantly influenced perceived usefulness. Nurses with stronger digital competencies were more likely to perceive EMR systems as beneficial for improving work performance and healthcare quality. Although

digital literacy was generally high, weaknesses in computer literacy indicated that some nurses still lacked confidence in evaluating and utilizing digital information effectively. Digital competency is essential for improving patient safety, communication, and healthcare quality.. In line with TAM, users with better digital literacy are more capable of recognizing the advantages of technology, thereby strengthening perceived usefulness (Davis, 1989). Computer literacy positively influences healthcare workers' perceptions of eHealth systems. Therefore, strengthening digital competency can simultaneously improve perceived usefulness and acceptance of EMR systems.

The findings further revealed that perceived usefulness partially mediated the relationship between infrastructure readiness and EMR implementation. This means that infrastructure not only directly affects implementation but also indirectly influences it by shaping users' perceptions regarding the benefits of EMR systems. Hospitals with better infrastructure create more positive experiences for healthcare workers, which strengthens their willingness to adopt digital systems. Although the direct influence of infrastructure readiness was stronger than the indirect influence through perceived usefulness, the mediation effect remained significant. This result supports TAM theory, which positions perceived usefulness as a key mediator between external variables and technology acceptance (Davis, 1989).

The analysis also demonstrated that perceived usefulness partially mediated the relationship between digital literacy and EMR implementation. Nurses with stronger digital literacy not only possessed better technical capabilities but also developed stronger beliefs regarding the usefulness of EMR systems. This positive perception subsequently encouraged higher levels of EMR adoption in clinical practice. Although the direct effect of digital literacy on implementation was greater, the mediation effect of perceived usefulness remained important in explaining the relationship. According to Davis (1989), perceived usefulness acts as a psychological mechanism linking external factors to behavioral intentions toward technology use. Computer literacy positively influences healthcare workers' perceptions of eHealth systems. Strengthening digital competency can improve perceived usefulness and increase acceptance of EMR systems. These findings suggest that improving digital literacy can strengthen both technological competence and positive user attitudes.

Overall, the study confirms that EMR implementation in hospitals is influenced by the interaction of technological readiness, human competency, and psychological acceptance. Infrastructure readiness provides the technical foundation necessary for system operation, while digital literacy equips healthcare workers with the competencies required to utilize EMR systems effectively. At the same time, perceived usefulness functions as a psychological driver that encourages consistent use of digital healthcare systems. These findings strongly support TAM theory, which explains that external factors influence technology adoption through user perceptions (Davis, 1989). Therefore, successful EMR implementation requires a balanced strategy involving infrastructure development, workforce digital training, and system optimization to improve user satisfaction and perceived benefits.

The findings also emphasize the importance of organizational support in ensuring sustainable digital transformation in healthcare institutions. Hospitals must continuously improve infrastructure quality, provide sufficient hardware resources, and strengthen cybersecurity systems to maintain user trust. In addition, regular training programs are necessary to improve nurses' computer literacy, digital communication skills, and ability to evaluate digital information critically. McGonigle & Mastrian (2024) highlighted that continuous digital education is essential for preparing healthcare workers to adapt to evolving healthcare technologies. Without adequate organizational support, healthcare workers may struggle to fully utilize EMR systems despite recognizing their potential benefits. Therefore, hospital management plays a critical role in creating an environment that supports digital innovation and technology acceptance.

Another important implication of this study is the need to improve clinical decision-support functions within EMR systems. Although nurses generally perceived EMR systems as useful, some respondents still believed that the system was insufficient in assisting clinical decision-making. This finding suggests that hospitals should integrate advanced clinical support tools, data analytics, and evidence-based recommendations into EMR platforms. Effective EMR systems should not only facilitate documentation processes but also improve

decision accuracy and patient safety. Enhancing these system features can strengthen healthcare workers' perceptions of EMR usefulness, which may increase acceptance and support long-term system utilization. Consequently, hospitals should focus not only on technical implementation but also on improving system functionality and clinical relevance.

In conclusion, the study demonstrates that infrastructure readiness, digital literacy, and perceived usefulness are significant determinants of EMR implementation in hospitals. Infrastructure readiness and digital literacy both directly influence EMR adoption while also indirectly affecting implementation through perceived usefulness as a partial mediating variable. The findings confirm that hospitals require adequate technological infrastructure, competent healthcare workers, and positive user perceptions to ensure successful digital transformation. These results support the Technology Acceptance Model and reinforce previous studies emphasizing the importance of organizational readiness, human competency, and perceived usefulness in healthcare technology adoption (Davis, 1989; Heeks, 2006; McGonigle & Mastrian, 2024). Therefore, healthcare institutions should prioritize integrated strategies involving infrastructure strengthening, digital literacy improvement, and system optimization to maximize the effectiveness and sustainability of EMR implementation.

5. COMPARISON

The comparison results in this study highlight the different roles of internal and external factors in supporting the implementation of Electronic Medical Records (EMR). Simultaneously, infrastructure readiness, digital literacy, and perceived usefulness significantly influence EMR implementation, indicating that successful adoption depends on the integration of technological preparedness, user competency, and positive perceptions toward the system. However, infrastructure readiness and digital literacy demonstrate stronger direct effects on EMR implementation compared to perceived usefulness alone. Infrastructure readiness reflects the availability of hardware, software, network systems, and security support that enable smooth EMR operations, while digital literacy represents nurses' ability to access, understand, and utilize digital technology effectively. These findings are consistent with the Technology Acceptance Model (TAM) proposed by Fred Davis, which explains that external factors such as infrastructure and user competence shape technology acceptance by influencing perceived usefulness and ease of use. Previous studies by Richard Heeks (2006), Kathleen McGonigle and Toni Hebda also confirm that adequate infrastructure and digital competencies are essential determinants of successful healthcare technology adoption.

In contrast, perceived usefulness acts as both a direct determinant and a partial mediating variable in strengthening EMR implementation. The findings reveal that nurses with better infrastructure support and higher digital literacy are more likely to perceive EMR as beneficial for improving work effectiveness, documentation accuracy, communication, and clinical decision-making. Nevertheless, the mediation effect is partial, meaning that infrastructure readiness and digital literacy still exert stronger direct influences than indirect influences through perceived usefulness. This comparison suggests that EMR implementation is not solely dependent on positive perceptions, but also on the organization's actual technological readiness and the technical competence of healthcare workers. Studies by Fred Davis (1989), similarly emphasize that digital literacy enhances perceived usefulness, which subsequently increases the intention and actual use of EMR systems. Therefore, the comparison confirms that sustainable EMR implementation requires not only positive user perceptions but also strong infrastructure support and continuous improvement of healthcare workers' digital competencies.

6. CONCLUSIONS

The results of this study indicate that infrastructure readiness, digital literacy, and perceived usefulness simultaneously have a significant effect on the implementation of Electronic Medical Records (EMR) at X Hospital. Partially, infrastructure readiness, digital literacy, and perceived usefulness also showed positive effects on EMR implementation. Adequate infrastructure, including internet networks, hardware, and supporting systems, facilitates the implementation process of EMR, while strong digital literacy enables nurses to better understand and utilize digital technologies in healthcare services. In addition, the higher

the healthcare workers' perception of the usefulness of EMR in improving efficiency, accuracy, and service quality, the greater the level of EMR implementation within the hospital.

The study also demonstrates that infrastructure readiness and digital literacy positively influence perceived usefulness. Well-prepared infrastructure allows the EMR system to operate more effectively, making its benefits easier to recognize, while higher digital literacy improves nurses' understanding of the value and advantages of EMR in supporting healthcare delivery. Furthermore, perceived usefulness partially mediates the relationship between infrastructure readiness and EMR implementation, as well as between digital literacy and EMR implementation. Therefore, EMR adoption can be optimized not only by improving technological infrastructure and digital competencies, but also by strengthening healthcare workers' beliefs that EMR provides tangible benefits in enhancing the effectiveness and quality of healthcare services.

REFERENCES

- Adeniyi, A. O., Arowoogun, J. O., Chidi, R., Okolo, C. A., & Babawarun, O. (2024). The impact of electronic health records on patient care and outcomes: A comprehensive review. *World Journal of Advanced Research and Reviews*, 21(2), 1446–1455.
- Ajzen, I. (2005). *Attitudes, Personality and Behaviour*. McGraw-Hill Education. <https://books.google.co.id/books?id=dmJ9EGEy0ZYC>
- Ali, G. E., & Magalhaes, R. (2008). Barriers to implementing e-learning: a Kuwaiti case study. *International Journal of Training and Development*, 12(1), 36–53.
- Alsalah, Y. S., Hameem, S. M. H. B., Al-Salloum, A. M. N., & Al, S. A. A. A.-B. (2024). Administrative And Medical Documentation Efficiency, Nursing, Physiotherapy, And Laboratory Practices And Their Influence On Patient Safety In Internal Medicine Units. *The Review of Diabetic Studies*, 534–549.
- Amatayakul, M. K. (2007). *Electronic health records: A practical guide for professionals and organizations*. American Health Information Management Association.
- Ball, M. J., Weaver, C., & Kiel, J. (2013). *Healthcare information management systems: Cases, strategies, and solutions*. Springer Science & Business Media.
- Bausch, A., & Schwenker, B. (2009). *Handbook utility management*. Springer.
- Bawden, D., & Robinson, L. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies. *Journal of Information Science*, 35(2), 180–191.
- Blumenthal, D., & Glaser, J. P. (2007). Information technology comes to medicine. In *New England Journal of Medicine* (Vol. 356, Number 24, pp. 2527–2534). Mass Medical Soc.
- Boddy, D., Boonstra, A., & Kennedy, G. (2008). *Managing information systems: Strategy and organisation*. Pearson Education.
- Byrd, T. A., & Turner, D. E. (2000). Measuring the flexibility of information technology infrastructure: Exploratory analysis of a construct. *Journal of Management Information Systems*, 167–208.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Hair, J. F., Babin, B. J., Anderson, R. E., & Black, W. C. (2022). *Multivariate Data Analysis*. Cengage Learning. <https://books.google.co.id/books?id=PONXEAAAQBAJ>
- Hakim, C. B., Pornomo, J., Aryani, I. N., & Wijayanti, T. D. (2026). Evaluation of Electronic Medical Records Risk Management in Kudus Hospitals: A Comparative Qualitative Study. *Intelligent Hospital*, 100056. <https://doi.org/10.1016/j.inhs.2026.100056>
- Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International Journal of Medical Informatics*, 75(2), 125–137.

- Ichwaniah, W., Nugroho, M. N., & Mulyani, E. Y. (2025). Digital Literacy Knowledge as an Intervening Variable Strengthens the Relationship between Perceived Ease and Usefulness and Intention to Use EMR at Koja Hospital. *Jurnal Medika Nusantara*, 3(2), 36–48.
- Krukowski, A., Barca, C. C., Rodríguez, J. M., & Vogiatzaki, E. (2015). Personal health record. In *Cyberphysical Systems for Epilepsy and Related Brain Disorders: Multi-Parametric Monitoring and Analysis for Diagnosis and Optimal Disease Management* (pp. 205–238). Springer.
- McGonigle, D., & Mastrian, K. (2024). *Nursing informatics and the foundation of knowledge*. Jones & Bartlett Learning.
- Menachemi, N., & Collum, C. (2011). Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy*, 47. <https://doi.org/10.2147/RMHP.S12985>
- Prabawati, A. Y., & Purwito, D. (2025). Optimization of Electronic Medical Records: Challenges, Benefits, and Strategies for More Efficient Healthcare Services. *Proceedings Series on Health & Medical Sciences*, 8, 236–245.
- Sugiyono. (2018). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta. <https://inlisite.uin-suska.ac.id/opac/detail-opac?id=22862>
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204.
- Weed, L. L. (1968). Medical Records That Guide and Teach. *New England Journal of Medicine*, 278(11), 593–600. <https://doi.org/10.1056/NEJM196803142781105>