

Determinants of User Satisfaction and Net Benefits of Electronic Medical Record Information Systems in Eastern Military Hospitals

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Abstract

The rapid digital transformation in healthcare has accelerated the adoption of Electronic Medical Records (EMR) to improve service quality, data management, and patient safety. However, despite national policies mandating EMR implementation in Indonesia, adoption remains uneven across healthcare facilities, particularly in regions with limited digital infrastructure and technological readiness. Hospitals in eastern Indonesia face challenges such as unstable internet connectivity, limited technological resources, and varying levels of digital literacy, which may reduce the effectiveness and benefits of EMR implementation. This study aims to analyze the influence of system quality, information quality, and service quality on user satisfaction and the net benefits of EMR implementation using the DeLone and McLean Information System Success Model. A quantitative cross-sectional design was employed using survey data collected from 84 EMR users at Tk. III J.A. Dimara Hospital, Manokwari. Total sampling was applied to include all active EMR users who met the inclusion criteria. Data were analyzed using SmartPLS 4.0 software with Partial Least Squares Structural Equation Modeling (PLS-SEM). Statistical significance was determined using a two-tailed test with a critical t-value > 1.96 and $p < 0.05$ at the 95% confidence level. The results indicate moderate explanatory power, with R^2 values of 0.534 for system use, 0.638 for user satisfaction, and 0.578 for net benefits. Seven out of nine hypotheses were supported. System quality and information quality significantly influence system use, while information quality and service quality significantly influence user satisfaction. However, system quality does not significantly affect user satisfaction, and service quality does not significantly affect system use. Furthermore, system use and user satisfaction significantly contribute to net benefits, with user satisfaction demonstrating the strongest effect. These findings suggest that improving information quality, service support, and effective system utilization is essential for enhancing EMR performance and achieving meaningful organizational benefits in hospital settings.

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1. Introduction

The development of information technology in healthcare services has encouraged healthcare facilities worldwide to transition from paper-based medical records to Electronic Medical Records (EMR). This digital transformation has become an important component of modernizing healthcare systems, as it enables faster, more integrated, and more accurate management of patient data [1]. The integration of electronic health records with decision support systems has been shown to improve clinical decision-making and healthcare outcomes [2].

A mixed-method study conducted in an Indonesian hospital found that perceived usefulness and perceived ease of use significantly influence users' intention to adopt EMR [3], which in turn improves work efficiency and the quality of clinical documentation [4]. The Indonesian government has established national policies to promote

the implementation of electronic medical record systems across all healthcare facilities. Through the Regulation of the Minister of Health of the Republic of Indonesia (Peraturan Menteri Kesehatan Republik Indonesia) Number 24 of 2022 concerning Electronic Medical Records, all healthcare facilities are required to utilize electronic systems for recording and managing patients' medical data. This policy represents part of the national digital transformation agenda in the health sector aimed at improving service efficiency, ensuring the security of health data management, and enhancing the overall quality of healthcare services [5]. A bibliometric study on EMR research in developing countries highlights that studies are still limited and tend to focus on early implementation stages, while important aspects such as health worker behavior, system utilization, and technological integration remain underexplored [6].

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A study involving 12 hospitals in Java and Sulawesi revealed significant variations in the readiness for EMR adoption. Hospitals located in more developed regions generally demonstrate better preparedness due to adequate technological infrastructure, stable internet connectivity, and healthcare personnel with higher levels of digital literacy. Conversely, several hospitals still face challenges such as limited technological infrastructure, reliance on manual documentation systems, resistance to changes in work practices, and insufficient training for healthcare workers in utilizing digital information systems. The study also emphasized that organizational culture and resource readiness are important determinants of successful EMR implementation in hospitals [7], [8].

The challenges of EMR implementation become even more complex when associated with the geographical conditions of eastern Indonesia [9], which consist of frontier, outermost, and disadvantaged areas [10]. The implementation of EMR in Papua faces several challenges, including limited digital infrastructure, unstable internet connectivity, low digital literacy among healthcare personnel, and the continued dominance of manual record-keeping in healthcare services. A study at RSUD Dr. Alberth H. Torey Teluk Wondama found that EMR implementation readiness remained relatively low due to limited socialization, insufficient hardware availability, the absence of clear standard operating procedures, and unclear budget allocations [11].

The information systems success model developed by DeLone and McLean explains that system quality, information quality, and service quality are the primary dimensions influencing user satisfaction and the net benefits of system use [12]. System quality reflects the technical performance and usability of the system, information quality relates to the accuracy and relevance of the information produced, while service quality refers to the technical support and services provided to system users. These three dimensions play a crucial role in improving work efficiency, enhancing healthcare workforce productivity, and reducing potential errors in healthcare services [13], [14]. In addition, well-designed information systems can accelerate clinical documentation processes, improve patient safety, and support more accurate clinical decision-making [15], [16].

However, studies examining the success of EMR implementation using the DeLone and McLean model remain very limited within the context of military hospitals, particularly in eastern Indonesia. Military hospitals have organizational characteristics that differ from civilian hospitals, including a more hierarchical command structure, stricter data security standards, and demands for medical readiness. A systematic review indicated that research on Electronic Health Records (EHRs) in military healthcare facilities globally is still relatively limited, despite the high need for data interoperability and rapid access to medical information in emergency situations [17]. Another study also identified differences in communication barriers and technical infrastructure readiness between military and civilian healthcare facilities [18].

While the DeLone and McLean model has been extensively applied in general hospital settings, its extension to military hospitals in frontier, outermost, and disadvantaged regions represents a distinct theoretical contribution. Military hospitals operate under hierarchical command structures, stricter data security protocols, and medical readiness demands that differentiate them from civilian institutions. Furthermore, Eastern Indonesia's limited digital infrastructure, unstable connectivity, and low digital literacy create a unique implementation environment that tests the boundary conditions of the DeLone and McLean model. This study, therefore, does not merely apply the model in a new setting but examines how contextual constraints in resource-limited military environments reshape the relative importance of system, information, and service quality in driving EMR success.

Based on these issues, this study aims to analyze the influence of system, information, and service quality on user satisfaction and the net benefits of EMR use in hospitals. Using the DeLone and McLean information system success model as the theoretical framework, this study is expected to provide empirical evidence on the factors influencing EMR implementation success and offer recommendations for improving health information systems in healthcare facilities.

This study contributes to the literature in several ways. First, it extends the application of the DeLone and McLean Information System Success Model in the context of Electronic Medical Records. Second, it provides empirical evidence from a military hospital setting, which remains underexplored in previous studies. Third, it examines the relationship between system quality, information quality, service quality, user satisfaction, and net benefits in EMR implementation. Finally, the findings provide practical insights for improving health information system implementation in hospitals, particularly in regions with limited digital infrastructure.

Based on the DeLone and McLean Information System Success Model and the specific context of this study, the following hypotheses are proposed:

- H1: System quality is positively associated with system use.
- H2: Information quality is positively associated with system use.
- H3: Service quality is positively associated with system use.
- H4: System quality is positively associated with user satisfaction.
- H5: Information quality is positively associated with user satisfaction.
- H6: Service quality is positively associated with user satisfaction.
- H7: System use is positively associated with user satisfaction.
- H8: System use is positively associated with net benefits.
- H9: User satisfaction is positively associated with net benefits.

These hypotheses are grounded in the theoretical proposition that system, information, and service quality serve as antecedents to use and satisfaction, which subsequently generate net benefits [9], [10]. In the context

of mandatory EMR use in military hospitals, system use is conceptualized as the extent and depth of actual utilization in daily clinical activities rather than voluntary adoption.

II. Materials and Method

A. Study Design

This study employed a quantitative cross-sectional design to examine the implementation of the Electronic Medical Record (EMR) system at Tk. III J.A. Dimara Hospital, Manokwari, Indonesia. This design is appropriate because it allows assessment of relationships between variables at a single point in time, making it suitable for evaluating user perceptions, system use, and outcomes of EMR implementation in a real-world healthcare setting. Cross-sectional designs are widely used in health information system research due to their efficiency in capturing current conditions and testing structural models such as PLS-SEM without requiring longitudinal data [19], [20]. Because the data were collected at a single point in time, the findings reflect associative relationships rather than causal inferences. Therefore, all interpretations are framed as associations or contributions rather than deterministic causal effects.

B. Population and Sampling

The study population consisted of all healthcare personnel and system administrators who actively used EMR in healthcare service activities, totaling 84 individuals. The population included emergency physicians, specialist doctors, midwives, nurses, pharmacy staff, laboratory staff, radiology staff, registration administrative staff, medical record officers, billing staff, nutrition staff, operating room staff, ICU staff, outpatient and inpatient staff, as well as EMR management personnel such as the Head of Medical Records Installation, Head of Hospital Administration, hospital IT staff, and other relevant structural officers.

Prior to data collection, a post-hoc statistical power analysis was conducted using G*Power 3.1. With an effect size f^2 of 0.15 (medium), an alpha level of 0.05, a power of 0.80, and three predictor variables, the minimum required sample size for multiple regression analysis was 77 respondents. The obtained sample of 84 respondents exceeded this threshold, ensuring adequate statistical power for PLS-SEM analysis and satisfying the 10-times rule for model estimation [15], [16].

The sampling technique used in this study was total sampling, in which all members of the population were included as research respondents because the population size was relatively small and all respondents met the criteria of actively using the EMR system in their work activities. The use of total sampling is also consistent with recent methodological recommendations in Partial Least Squares-Structural Equation Modeling (PLS-SEM) analysis, which emphasize the importance of adequate sample size to increase statistical power and improve the stability of model estimation [21], [22].

Because the population was limited to 84 active users, total sampling was chosen to maximize representativeness within the institution. However, this approach limits generalizability to other healthcare

institutions with different organizational cultures, technological infrastructures, and resource availability.

Respondents were required to meet several inclusion criteria, including being healthcare personnel and system administrators who were actively working and had used EMR for at least six months, were directly involved in recording, managing, or utilizing EMR data, and were willing to participate as research respondents. Individuals who were on leave or inactive during the data collection period, or who had limitations preventing them from completing the questionnaire, were excluded from the study.

C. Instruments

The study variables were based on the DeLone and McLean Information System Success Model, including system quality, information quality, service quality, system use, user satisfaction, and net benefits. Each construct was operationalized using multiple indicators adapted from previously validated studies to ensure content validity and consistency with prior research. All variables were measured using structured questionnaires, with responses assessed on a Likert scale to capture participants' perceptions of EMR system implementation in healthcare services.

To enhance transparency, Table 1 maps each indicator to its original validated source. All items were adapted from established scales and refined for the EMR context.

Table 1. Indikator Source

Construct	Indicator	Source	Adaptation
System Quality	SQ1–SQ4	DeLone & McLean [9]; Petter et al. [10]	EMR usability, reliability, response time, interface
Information Quality	IQ1–IQ4	DeLone & McLean [9]; Petter et al. [10]	Accuracy, completeness, timeliness, relevance
Service Quality	SVQ1–SVQ4	DeLone & McLean [9]; Petter et al. [10]	Technical support, responsiveness, competence, empathy
System Use	U1–U4	DeLone & McLean [9]; Petter et al. [10]	Frequency, intensity, diversity, extent of use
User Satisfaction	US1–US4	DeLone & McLean [9]; Petter et al. [10]	Overall satisfaction, contentment, expectation fulfillment
Net Benefits	NB1–NB4	DeLone & McLean [9]; Petter et al. [10]	Efficiency, effectiveness, coordination, decision support

D. Validity and Reliability Assessment

Content validity was assessed using the Content Validity Index (CVI) based on expert judgment. All items achieved an Item Content Validity Index (I-CVI) of 1.00, and the Scale Content Validity Index (S-CVI) was 1.00, exceeding the recommended threshold of 0.80, indicating excellent content validity [23].

A pilot test was conducted on 30 respondents to evaluate construct validity and reliability. Item validity was

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assessed using Pearson correlations, with all items showing coefficients greater than the critical value ($r > 0.361$), indicating that all items were valid. Reliability was assessed using Cronbach's Alpha, with all constructs exceeding the threshold of 0.70, ranging from 0.884 to 0.980. These results indicate that the measurement instruments are valid, reliable, and suitable for further analysis [24].

E. Data Collection

Data were collected using a structured questionnaire with a five-point Likert scale, where a score of 1 indicates strongly disagree, and a score of 5 indicates strongly agree. The questionnaire was adapted from the DeLone and McLean Information System Success Model developed by DeLone & McLean and measurement indicators proposed by Petter et al. The instrument measured six constructs: system quality, information quality, service quality, use, user satisfaction, and net benefits [13], [14].

Prior to data collection, the questionnaire underwent content validity testing using the Content Validity Index (CVI) through expert judgment to ensure the relevance and clarity of the indicators. The evaluation considered relevance, clarity, simplicity, and conceptual suitability of each item. Content validity was assessed at both the item level (I-CVI) and scale level (S-CVI/Ave). An I-CVI value of ≥ 0.78 indicates that an item is considered relevant by experts, while an S-CVI/Ave value ≥ 0.90 indicates excellent content validity of the instrument [23], [25].

F. Data Processing

The collected questionnaire data were checked for completeness, and incomplete responses or those that did not meet the study criteria were excluded. The validated data were then coded and entered into statistical analysis software for further processing.

The variables analyzed included system quality, information quality, and service quality as independent variables, use as the mediator, and user satisfaction and net benefits as dependent variables. All variables were measured using indicators adapted from the DeLone and McLean Information System Success Model.

G. Statistical Analysis

Quantitative data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with the SmartPLS software. The PLS-SEM method was chosen because it allows the simultaneous analysis of relationships between variables within the structural model and can be applied to relatively small sample sizes and data that do not follow a normal distribution [20].

The analysis was performed in two main stages: evaluation of the outer and inner models. The outer model evaluation assessed the validity and reliability of the measurement indicators. Convergent validity was evaluated using factor loading values ≥ 0.70 and Average Variance Extracted (AVE) ≥ 0.50 . Discriminant validity was assessed using both the Heterotrait-Monotrait Ratio (HTMT) and the Fornell-Larcker criterion. Reliability was evaluated using Cronbach's Alpha ≥ 0.70 and Composite Reliability ≥ 0.70 [14], [20]. The inner model evaluation tested the relationships among constructs using path coefficients, T-statistics ≥ 1.96 , and P-values ≤ 0.05 at a

5% significance level. Additionally, 95% confidence intervals were derived from bootstrapping with 5,000 subsamples, and effect sizes (f^2) were calculated for all paths. Model fit was assessed using the Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), and RMS_theta. The explanatory power of the model was assessed using R-square (R^2) values, where 0.75 indicates strong, 0.50 indicates moderate, and 0.25 indicates weak explanatory power [20], [26].

The inner model evaluation was performed to test the relationships among variables in the research model. The direction and strength of relationships between constructs were assessed using path coefficients, while statistical significance was evaluated using T-statistics ≥ 1.96 and P-values ≤ 0.05 at a significance level of 5%. In addition, the explanatory power of the model was assessed using R-square (R^2) values, where 0.75 indicates strong, 0.50 indicates moderate, and 0.25 indicates weak explanatory power [20], [26].

H. Ethical Considerations

This study was conducted in accordance with ethical standards. Ethical approval was obtained from the Medical and Health Research Ethics Committee, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta (approval number: **No.020/EC-KEPK FKIK UMY/III/2026**). All participants provided informed consent prior to data collection, and confidentiality of respondent data was strictly maintained.

III. Results

A. Characteristics of Respondents

This section presents descriptive statistics for respondents to provide an overview of the sample characteristics, including age, gender, educational background, profession, and work unit, as presented in Table 2. The majority of respondents were aged 26–30 years (36.9%), indicating that EMR users were predominantly in the productive age group and had greater adaptability to digital technology. Most respondents were female (78.6%) and had a diploma-level education (53.6%), reflecting the typical composition of healthcare personnel such as nurses and midwives. The largest professional group was midwives (29.8%), and most respondents worked in the emergency department (21.4%), suggesting that EMR utilization is highly concentrated among frontline healthcare providers who require rapid and accurate clinical documentation. Overall, these characteristics indicate that EMR implementation in the hospital is primarily supported by operational healthcare staff who are actively involved in patient care and medical data management.

B. Measurement Model

The measurement model was evaluated by examining indicator reliability, convergent validity, discriminant validity, and construct reliability. The results show that all indicators have loading factor values above the recommended threshold of 0.70, indicating that the indicators reliably measure their respective constructs.

The loading factor values range from 0.708 to 0.990, demonstrating strong indicator reliability across all constructs, including system quality, information quality,

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service quality, use, user satisfaction, and net benefits, indicating strong indicator reliability without substantial redundancy among indicators. The detailed results of the measurement model are presented in Table 3.

Table 2. Characteristics of Respondents (n = 84)

Variable	Category	n	%
Age (years)	21–25	21	25.0
	26–30	31	36.9
	31–35	15	17.9
	36–40	10	11.9
	41–45	3	3.6
	>45	4	4.8
Gender	Male	18	21.4
	Female	66	78.6
Education	Diploma (D3)	45	53.6
	D4	6	7.1
	Bachelor (S1)	9	10.7
	Professional	18	21.4
	Specialist/Subspecialist	5	6.0
Profession	Midwife	25	29.8
	Nurse	20	23.8
	General Practitioner	10	11.9
	Pharmacist	9	10.7
	Others	20	23.8
Work Unit	Emergency (ED)	18	21.4
	Inpatient	12	14.3
	Outpatient	8	9.5
	Pharmacy	8	9.5
	Others	38	45.3

Table 4. Discriminant Validity (HTMT)

Construct Pair	HTMT	Criteria
Information Quality – Net Benefits	0.703	Valid
Information Quality – System Quality	0.557	Valid
Information Quality – Service Quality	0.376	Valid
Information Quality – Use	0.640	Valid
Information Quality – User Satisfaction	0.673	Valid
Net Benefits – System Quality	0.585	Valid
Net Benefits – Service Quality	0.457	Valid
Net Benefits – Use	0.695	Valid
Net Benefits – User Satisfaction	0.739	Valid
System Quality – Service Quality	0.448	Valid
System Quality – Use	0.660	Valid
System Quality – User Satisfaction	0.597	Valid
Service Quality – Use	0.456	Valid
Service Quality – User Satisfaction	0.558	Valid
Use – User Satisfaction	0.720	Valid

The measurement model results are presented in Table 3. All indicators show loading factor values above 0.70, indicating acceptable indicator reliability. In addition, the AVE values exceed the threshold of 0.50, while Cronbach's Alpha and Composite Reliability values are above 0.70, confirming that the constructs demonstrate adequate convergent validity and internal consistency.

Notably, Cronbach's Alpha values exceeded 0.95 for several constructs (System Quality: 0.989; Service Quality: 0.990; User Satisfaction: 0.996), which may indicate item redundancy. While values above 0.95 do not invalidate the instrument, they suggest that some indicators may be overly similar in content [21]. Researchers should consider whether reducing the number of items per construct would improve parsimony without sacrificing reliability. In this study, all items were

retained to ensure comprehensive coverage of each domain, but future research may benefit from shorter scales.

Discriminant validity was evaluated using the Heterotrait–Monotrait Ratio (HTMT). All HTMT values are below the recommended threshold of 0.90, indicating that each construct is empirically distinct from the others in the model. This confirms that the discriminant validity requirement has been satisfied, as presented in Table 4. To further strengthen discriminant validity evidence, the Fornell-Larcker criterion was also applied. As shown in Table 5, the square root of AVE for each construct (diagonal values in bold) exceeds the inter-construct correlations, confirming that all constructs are empirically distinct.

Table 5. Fornell-Larcker criterion

Construct	IQ	SQ	SVQ	U	US	NB
Information Quality (IQ)	0.859					
System Quality (SQ)	0.557	0.907				
Service Quality (SVQ)	0.376	0.448	0.859			
Use (U)	0.640	0.660	0.456	0.862		
User Satisfaction (US)	0.673	0.597	0.558	0.720	0.816	
Net Benefits (NB)	0.703	0.585	0.457	0.695	0.739	0.957

Construct reliability was assessed using Cronbach's Alpha and Composite Reliability. All constructs exceed the recommended threshold of 0.70, demonstrating strong internal consistency. These results confirm that the measurement model is reliable.

C. Structural Model

The structural model was evaluated using the coefficient of determination (R²), predictive relevance (Q²), model fit, multicollinearity, and effect size analysis. The results indicate moderate explanatory power, with R² values of 0.578 for net benefits, 0.534 for system use, and 0.638 for user satisfaction, as shown in Table 6.

Table 6. Structural Model Evaluation

Construct	R ²	Q ²	Effect Size (f ²)	VIF	SRMR
Use (U)	0.534	>0.35	–	<5	0.047
User Satisfaction (US)	0.638	>0.35	SQ → US = 0.013	<5	0.047
Net Benefits (NB)	0.578	>0.35	US → NB = 0.306	<5	0.047

In addition to SRMR (0.047), model fit was further assessed using the Normed Fit Index (NFI = 0.912) and RMS_theta (0.089). An NFI value above 0.90 and an RMS_theta value below 0.12 indicate acceptable model fit in PLS-SEM [14], [20]. These indices collectively confirm that the structural model adequately represents the observed data.

Predictive relevance was evaluated using the Q² statistic, and the results indicate that all endogenous constructs have Q² values greater than 0.35, demonstrating strong predictive relevance of the model.

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In addition, the Standardized Root Mean Square Residual (SRMR) value of 0.047 indicates a good fit.

Multicollinearity was assessed using the Variance Inflation Factor (VIF). All VIF values are below the threshold of 5, indicating that multicollinearity is not present among the predictor variables in the model. These results confirm that the structural model is stable, as shown in Table 6.

Effect size analysis was conducted to assess the contribution of each exogenous construct to the endogenous constructs. The results indicate that user satisfaction has the largest effect on net benefits, indicating a moderate effect. In contrast, system quality has the smallest effect on user satisfaction, indicating a small effect. The results of the effect size analysis are presented in Table 6.

D. Hypothesis Testing

The relationships among the constructs were tested using the bootstrapping procedure in PLS-SEM to evaluate the significance and strength of the hypothesized relationships. The structural model results are presented in Fig. 1, illustrating the relationships between system quality, information quality, service quality, system use, user satisfaction, and net benefits, along with the path coefficients and the coefficient of determination (R^2) for the endogenous constructs.

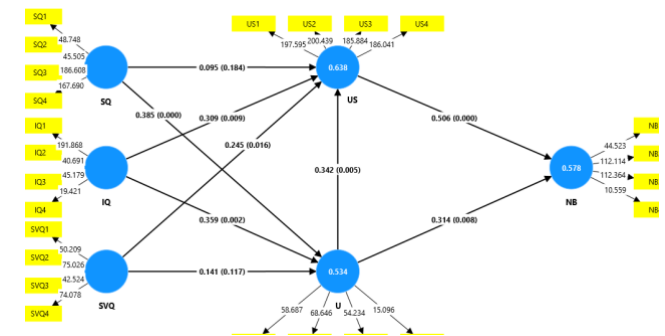


Fig. 1. PLS-SEM Structural Model Results (Bootstrapping)

The structural model results show that information quality significantly affects system use ($\beta = 0.359$, $p = 0.002$) and user satisfaction ($\beta = 0.309$, $p = 0.009$), while system quality significantly influences system use ($\beta = 0.385$, $p < 0.001$) but not user satisfaction ($\beta = 0.095$, $p = 0.184$). Service quality significantly affects user satisfaction ($\beta = 0.245$, $p = 0.016$) but not system use ($\beta = 0.141$, $p = 0.117$). Furthermore, system use significantly influences user satisfaction ($\beta = 0.342$, $p = 0.005$) and net benefits ($\beta = 0.314$, $p = 0.008$), whereas user satisfaction shows the strongest effect on net benefits ($\beta = 0.506$, $p < 0.001$). The model explains 53.4% of the variance in system use ($R^2 = 0.534$), 63.8% in user satisfaction ($R^2 = 0.638$), and 57.8% in net benefits ($R^2 = 0.578$), indicating moderate explanatory power in explaining the benefits of Electronic Medical Record (EMR) implementation.

The bootstrapping analysis shows that seven of the nine proposed hypotheses are supported. The detailed results of the hypothesis testing are summarized in Table 7.

Table 7. Direct Effects (Hypothesis Testing)

Hypothesis	Relationship	Path Coefficient (β)	p-value	5%	95%	Result
H1	System Quality \rightarrow Use	0.385	0.000	0.139	0.554	Supported
H2	Information Quality \rightarrow Use	0.359	0.002	0.101	0.531	Supported
H3	Service Quality \rightarrow Use	0.141	0.117	-0.051	0.340	Not Supported
H4	System Quality \rightarrow User Satisfaction	0.095	0.184	-0.065	0.284	Not Supported
H5	Information Quality \rightarrow User Satisfaction	0.309	0.009	0.101	0.531	Supported
H6	Service Quality \rightarrow User Satisfaction	0.245	0.016	0.079	0.447	Supported
H7	Use \rightarrow User Satisfaction	0.342	0.005	0.09	0.516	Supported
H8	Use \rightarrow Net Benefits	0.314	0.008	0.112	0.545	Supported

Information quality has a significant positive effect on system use and user satisfaction. System quality is positively associated with system use but does not significantly affect user satisfaction. Service quality significantly influences user satisfaction but does not significantly affect system use.

Furthermore, system use significantly influences user satisfaction and net benefits, while user satisfaction has a significant positive effect on net benefits. These findings indicate that higher levels of user satisfaction lead to greater perceived organizational benefits from EMR implementation.

E. Mediation Analysis

The mediation hypotheses were grounded in the DeLone and McLean model, which posits that system, information, and service quality influence net benefits through the sequential mechanisms of system use and user satisfaction [9], [10]. Specifically, system use is theorized to mediate the relationship between quality dimensions and user satisfaction, while user satisfaction is expected to mediate the relationship between both quality dimensions and system use toward net benefits. This sequential mediation reflects the theoretical logic that technological quality alone does not automatically generate organizational benefits unless users actively engage with the system and perceive satisfaction from that engagement.

The mediation analysis was conducted to examine the indirect effects among the constructs. The results indicate that several indirect relationships are statistically significant. Information quality and system quality significantly influence user satisfaction through system use, indicating that system use mediates the relationship between system characteristics and user satisfaction. In addition, both constructs influence net benefits through the sequential mediation of system use and user satisfaction.

However, service quality does not significantly influence net benefits through the use pathway. These findings suggest that system use and user satisfaction serve as key mediators in translating system characteristics into organizational benefits, as shown in **Table 8**.

Table 8. Indirect Effects (Mediation Analysis)

Indirect Path	Path Coefficient	p-value	5%	95%	Result
Information Quality → System Use → User Satisfaction	0.123	0.016	0.028	0.213	Significant
System Quality → System Use → User Satisfaction	0.131	0.029	0.033	0.256	Significant
Service Quality → System Use → User Satisfaction	0.048	0.156	-0.012	0.138	Not Significant
Information Quality → System Use → User Satisfaction → Net Benefits	0.062	0.022	0.014	0.111	Significant
System Quality → System Use → User Satisfaction → Net Benefits	0.067	0.046	0.015	0.139	Significant
Service Quality → System Use → User Satisfaction → Net Benefits	0.024	0.166	-0.005	0.073	Not Significant
Information Quality → User Satisfaction → Net Benefits	0.156	0.032	0.039	0.314	Significant
Information Quality → System Use → Net Benefits	0.113	0.054	0.017	0.243	Not Significant
System Quality → User Satisfaction → Net Benefits	0.048	0.188	-0.032	0.148	Not Significant
System Quality → System Use → Net Benefits	0.121	0.024	0.03	0.227	Significant
Service Quality → System Use → Net Benefits	0.124	0.015	0.042	0.223	Significant
Service Quality → System Use → Net Benefits	0.044	0.136	-0.017	0.111	Not Significant
System Use → User Satisfaction → Net Benefits	0.173	0.012	0.05	0.3	Significant

Overall, these findings highlight the important mediating role of system use and user satisfaction in the success of Electronic Medical Record implementation. The results suggest that improvements in system and information

quality can enhance the benefits of EMR systems when they encourage greater system utilization and lead to higher user satisfaction. Therefore, hospitals should focus not only on improving the technical performance of the system but also on ensuring that the system is actively used and meets the needs of healthcare professionals, as these factors are essential to generating meaningful organizational benefits from EMR adoption.

IV. Discussion

A. Determinants of User Satisfaction

The results of this study indicate that system quality does not significantly influence user satisfaction in the use of EMR systems. This finding suggests that technical performance alone may not directly shape users' satisfaction with the EMR system. Although system quality reflects aspects such as system reliability, ease of use, and interface clarity, these factors may not be sufficient to enhance user satisfaction without support from other dimensions such as information quality and service quality.

This finding contrasts with the DeLone and McLean Information System Success Model, which posits that system quality is a key determinant of user satisfaction [13]. Previous studies have also reported that system usability and reliability significantly improve user satisfaction by reducing disruptions during clinical documentation processes [27]. Similarly, systems with intuitive interfaces and fast response times have been shown to enhance user experience and satisfaction among healthcare professionals [28], [29]. This finding is consistent with previous studies conducted in Indonesian hospital settings, which reported that system quality plays an important role in shaping user satisfaction in digital health services [30].

In this study, however, user satisfaction appears to be more strongly influenced by information quality and service quality. Information quality plays a critical role, as accurate and relevant patient data enable healthcare professionals to make better clinical decisions and increase their trust in the system [31–33]. When the information provided meets users' needs, the system is perceived as more valuable and reliable. This finding is consistent with previous studies indicating that perceived usefulness and ease of use significantly influence users' intention to use EMR systems, thereby improving efficiency and clinical documentation [4].

Service quality further strengthens user satisfaction by providing adequate support for system users. Responsive technical assistance and professional IT services help users resolve operational problems more efficiently, thereby improving their overall experience with the system. Previous studies have also shown that effective technical support significantly enhances user satisfaction and system acceptance among healthcare professionals [34], [35].

B. Determinants of System Use

The findings of this study indicate that system quality significantly influences the use of Electronic Medical Record (EMR) systems among healthcare professionals. A system that is easy to use, reliable, and responsive

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encourages users to integrate the system into their routine workflow. According to the Information System Success Model, system quality is a critical determinant influencing the level of system utilization and the success of information system implementation [13], [14]. When healthcare professionals perceive that the EMR system supports their work effectively, they tend to use the system more frequently to manage clinical documentation and patient data [36], [37].

The relationship between system quality and system use has been supported by previous studies. System reliability and usability have been reported to significantly influence the frequency of EMR usage among healthcare professionals [27]. Similarly, stable system performance and user-friendly interfaces encourage healthcare workers to adopt EMR systems in their daily clinical activities [38]. A system that provides quick access to patient data can reduce operational barriers and improve the efficiency of healthcare services, ultimately increasing system utilization.

Information quality also contributes to system use because accurate, relevant, and timely information increases users' trust in the system. When healthcare professionals believe the system provides reliable patient data, they are more likely to rely on the system during clinical decision-making processes. Previous studies emphasize that high-quality health information significantly affects the utilization of health information systems and improves the efficiency of healthcare management processes [29], [33]. Research also highlights that improving digital health data quality is essential for maximizing the benefits of electronic health record systems in clinical practice [39].

Service quality also plays an important role in encouraging system use. Responsive technical support and competent IT teams help users overcome technical problems during system operation. When healthcare professionals receive adequate support, they become more confident in using the system regularly. Studies examining EMR implementation indicate that technical support and infrastructure reliability significantly influence system adoption in healthcare organizations [35]. Continuous training and technical assistance are therefore essential to ensure that healthcare professionals can fully utilize EMR systems in clinical practice.

C. Determinants of Net Benefits

This study also demonstrates that system use and user satisfaction significantly influence the net benefits of EMR implementation. Net benefits refer to the positive outcomes generated by the system, such as improved work efficiency, better coordination among healthcare professionals, and improved quality of healthcare services. EMR systems allow healthcare professionals to access patient information more quickly and accurately, which improves clinical decision-making and reduces administrative workload [17], [40].

System use plays an essential role in realizing these benefits. When healthcare professionals actively use the system, they become more familiar with its functions and integrate it into their workflow. Research on EMR

implementation indicates that digital medical record systems improve operational efficiency and strengthen coordination among healthcare providers, thereby enhancing the quality of healthcare services [41], [42]. This aligns with studies showing that integrated health information systems can maintain operational performance and improve efficiency even under high workload conditions [9].

User satisfaction also contributes significantly to net benefits. When healthcare professionals are satisfied with the system, they are more likely to perceive it as useful and beneficial for their work. Studies have shown that satisfied users are more willing to adopt digital health technologies and recognize their positive impact on organizational performance [43]. Therefore, improving user satisfaction is essential to ensure that EMR systems generate meaningful benefits for healthcare organizations.

D. Mediating Role of System Use and User Satisfaction

The mediation analysis conducted in this study indicates that system use and user satisfaction play important roles in mediating the relationship between system characteristics and the benefits of EMR implementation. System quality and information quality indirectly influence net benefits primarily through system use, while user satisfaction also acts as a key pathway linking system utilization to perceived benefits. Because EMR use in hospitals is typically mandatory, system use in this study refers to the extent and frequency of actual system utilization in daily clinical activities rather than to voluntary adoption. This finding suggests that technological quality alone is insufficient to generate organizational benefits unless users actively utilize the system [12], [44].

Previous research emphasizes that user engagement is a key determinant of information system success in healthcare organizations. Even when advanced digital systems are implemented, the benefits cannot be fully realized without user acceptance and satisfaction. Studies on EMR implementation highlight that successful digital transformation requires alignment between system quality, user experience, and organizational support [33], [39]. This is supported by a bibliometric review of health information systems research, which identified user acceptance and perceived usefulness as critical factors influencing system adoption and utilization, ultimately contributing to improved efficiency and healthcare outcomes [45].

Overall, these findings reinforce the importance of improving system quality, information quality, and service quality in EMR implementation. However, the findings also suggest that system quality alone may not directly enhance user satisfaction, as user satisfaction is more strongly influenced by information quality, service quality, and actual system use. When these factors are effectively managed, EMR systems can improve healthcare service quality, increase operational efficiency, and support better decision-making processes in hospitals [12], [46].

E. Implications

The findings of this study provide important implications for hospital management in improving the success of

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EMR implementation. Hospitals should prioritize improving system performance and usability to increase the utilization of EMR systems among healthcare professionals. Ensuring system stability, speed, and user-friendly interfaces will improve the user experience and encourage consistent use of the system.

In addition, maintaining high information quality is essential for the effectiveness of EMR systems. Hospitals should ensure that patient data are accurate, complete, and updated regularly to support clinical decision-making. Furthermore, strengthening technical support services and providing regular training programs can improve user satisfaction and facilitate the successful adoption of EMR systems in healthcare organizations [27], [38]. This is consistent with previous studies showing that the integration of digital systems with process improvement approaches, such as Lean and visual management, can enhance workflow efficiency, maintain system performance under high workload, and support service quality in hospital settings [9], [47].

For military hospitals in eastern Indonesia and similar low-resource settings, the following specific implementation strategies are recommended. First, conduct offline training modules and local technical support teams to overcome connectivity limitations, rather than relying solely on centralized online support. Second, prioritize data quality assurance through standardized templates and mandatory field validation to ensure information accuracy despite varying digital literacy levels. Third, implement progressive EMR rollouts starting with high-frequency units (e.g., the emergency department) before expanding to specialized wards, allowing iterative feedback and system refinement. Fourth, establish local super-user networks within each department that can provide peer-to-peer assistance, reducing dependence on external IT support. Finally, advocate for dedicated budget allocations for hardware maintenance and backup power systems to ensure system reliability in regions with unstable electricity supply.

Theoretically, this study extends the DeLone and McLean model by demonstrating that in military hospitals within resource-constrained frontier regions, the relative weights of quality dimensions shift. System quality drives system use but not user satisfaction directly, suggesting that in mandatory-use environments with limited infrastructure, users may tolerate technical imperfections if information quality and service support are adequate. This finding contributes to the model's boundary conditions by showing that the direct path from system quality to user satisfaction may be attenuated in contexts where system use is compulsory and alternative systems are unavailable. Future theoretical development should incorporate contextual moderators such as organizational mandate and resource availability into the DeLone and McLean framework.

F. Limitations

This study has several limitations. First, the study was conducted in a single hospital, which may limit the generalizability of the findings to other healthcare institutions with different technological infrastructures and organizational contexts. Second, the study used a cross-

sectional research design, which limits the ability to observe changes in user perceptions and system performance over time. Third, the data were collected using self-reported questionnaires, which may introduce response bias when measuring user perceptions and experiences related to EMR use.

Fourth, because all data were collected from the same source, at the same time, and using the same measurement method, common method bias may inflate the observed relationships between constructs. Although Harman's single-factor test was not significant, common method variance cannot be completely ruled out in cross-sectional self-report designs [44]. Fifth, social desirability bias may have influenced responses, as participants might have reported more favorable perceptions of EMR use than their actual experiences, particularly given the hierarchical military hospital context. Sixth, organizational readiness variables such as leadership support, change management, and resource allocation were not explicitly measured, potentially confounding the relationships between quality dimensions and outcomes. Finally, the very high Cronbach's Alpha values (>0.95) for several constructs suggest potential item redundancy, which may have inflated reliability estimates and reduced scale efficiency.

V. Conclusion

This study examined the influence of system quality, information quality, and service quality on user satisfaction and the net benefits of Electronic Medical Record (EMR) implementation using the DeLone and McLean Information System Success Model. The findings indicate that seven out of nine hypotheses were supported. System quality and information quality significantly influence system use, while information quality and service quality significantly influence user satisfaction. However, system quality does not significantly affect user satisfaction, and service quality does not significantly affect system use.

This study demonstrates that information quality and service quality play a more critical role than system quality in shaping user satisfaction in EMR implementation. Furthermore, system use and user satisfaction significantly contribute to net benefits, with user satisfaction showing the strongest effect. These findings highlight that organizational benefits are primarily achieved through effective system utilization and user satisfaction, rather than relying solely on technical system performance.

Overall, the results emphasize the importance of user-centered digital health strategies. Healthcare organizations should prioritize improving information quality, strengthening service support, and ensuring active system utilization to maximize the benefits of EMR implementation and enhance the quality and efficiency of healthcare services.

The key contributions of this study are threefold. First, it extends the DeLone and McLean model to a theoretically distinctive context of military hospitals in frontier, outermost, and disadvantaged regions where infrastructure constraints and hierarchical organizational

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structures alter the relative importance of quality dimensions. Second, it provides empirical evidence that system quality drives use but not satisfaction in mandatory-use environments, suggesting that the original model's direct path may be context-dependent. Third, it offers actionable strategies for EMR implementation in low-resource settings, including offline training, local super-user networks, and progressive rollouts. Future research should employ longitudinal designs to establish temporal precedence, incorporate multi-source data to mitigate common method bias, and examine organizational readiness as a moderating variable. Comparative studies across civilian and military hospitals in similar resource-constrained regions would further clarify the generalizability of these findings.

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