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ANALYSIS OF FACTORS INFLUENCING THE USE, USER SATISFACTION AND NET BENEFITS FOR USERS OF ELECTRONIC MEDICAL RECORDS (EMR) AT RSIA SITTI KHADIJAH MAKASSAR

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A B S T R A C T

The successful implementation of Electronic Medical Record (EMR) systems is crucial for improving the efficiency and quality of healthcare services. This study analysis of factors influencing the use, user satisfaction and net benefits for users of electronic medical records (EMR) at RSIA sitti khadijah makassar, Indonesia, using the DeLone & McLean Information Systems Success Model. The research employed a quantitative approach with a cross-sectional design, involving 172 respondents selected through cluster sampling. Data were collected using a structured questionnaire and analyzed using regression analysis.

The results showed that Information Quality, Service Quality, and System Quality simultaneously had a significant influence on Use ($F=12.429$, $p<0.001$, $R^2=18.2\%$), with Information Quality being the strongest predictor ($\beta=0.203$, $p<0.001$). These variables, along with Use, also significantly influenced User Satisfaction ($F=10.766$, $p<0.001$, $R^2=20.5\%$), with Service Quality being the main contributor ($\beta=0.334$, $p=0.001$). Use and User Satisfaction significantly affected Net Benefits ($F=13.713$, $p<0.001$, $R^2=14\%$), with Use showing a stronger influence ($\beta=0.221$, $p=0.005$).

Information and service quality are important aspects that drive customer usage and happiness, and the RME implementation at RSIA Sitti Khadijah Makassar demonstrated a moderate level of success. Optimizing the system's benefits for the organization requires improvements in these areas as well as in infrastructure and user competencies.

INTRODUCTION

The implementation of Electronic Medical Records (EMR) has become crucial in improving healthcare service efficiency and quality. The Indonesian Ministry of Health Regulation no. 8 of 2024 regarding Health Data Standards emphasizes the standardization of data management, including electronic medical records implementation. However, comprehensive evaluation of EMR implementation success is necessary to ensure optimization of its benefits for healthcare organizations.

Recent studies indicate that successful EMR implementation can significantly impact hospital performance metrics. According to Li et al. (2022), quality information systems in healthcare can reduce Length of Stay (LOS), infection rates, and mortality rates while improving medical record completion and clinical documentation. However, Zhang et al. (2023) found that implementation challenges, including user resistance and infrastructure limitations, can significantly hinder the realization of these benefits.

At RSIA Sitti Khadijah Makassar, EMR implementation began in 2015, with significant optimization efforts conducted in 2020 through staff training programs. While adoption rates have increased from 46.76% in 2019 to 99.36% in 2023, preliminary research involving 17 EMR users in September 2023 revealed several challenges, including system response delays, feature limitations, and user adaptation issues, particularly among senior staff members.

The DeLone & McLean Information System Success Model provides a comprehensive framework for evaluating information system success through six dimensions: information quality, system quality, service quality, use, user satisfaction, and net benefits. Recent studies by Handayani et al. (2023) and Chen et al. (2022) have validated this model's effectiveness in evaluating healthcare information systems in developing countries.

This study aims to evaluate EMR implementation success at RSIA Sitti Khadijah Makassar using the DeLone & McLean model, with particular focus on analyzing the relationship between system quality dimensions, user response, and net benefits. Understanding these relationships is crucial for optimizing EMR implementation and improving healthcare service quality

Research methods

Methods

This study employed a quantitative approach with a cross-sectional design, conducted between November and December 2024 at RSIA Sitti Khadijah Makassar, a specialized maternal and child hospital in Indonesia. The hospital has been using an Electronic Medical Record (EMR) system since 2015, serving approximately 31,000 patients annually.

Population and Sample

From a total population of 300 EMR users at RSIA Sitti Khadijah Makassar, a sample of 172 respondents was determined using Slovin's formula with a 5% margin of error. To ensure comprehensive representation, cluster sampling was implemented across different user groups. The sample distribution included medical staff (50%), consisting of doctors (20%) and nurses (30%); non-medical staff (35%), including administrative staff (20%), pharmacy staff (10%), and laboratory and radiology staff (5%); and management and IT staff (15%), consisting of hospital management (5%) and IT support staff (10%).

Inclusion- Exclusion Criteria

The study established clear inclusion criteria: participants must be permanent or contract employees with at least 6 months of work experience, minimum 3 months of EMR usage experience, and regular system usage (minimum 3 times per week). Additionally, participants were required to have official EMR access credentials and completed EMR training. Exclusion criteria encompassed staff on leave or study assignment, those in orientation/probation periods, staff without EMR access authorization, occasional users, and EMR development team members.

Based on the DeLone & McLean model, the study examined six key variables: Information Quality (IQ), System Quality (SysQ), Service Quality (ServQ), Use (U), User Satisfaction (US), and Net Benefits (NB) . Data collection utilized a structured questionnaire adapted from validated instruments in previous studies (Li et al., 2022; Zhang et al., 2023), consisting of demographic information and 24 items measuring the six research variables on a 5-point Likert scale.

The research instrument underwent rigorous validation processes. Content validity was established through review by three healthcare informatics specialists, while construct validity was confirmed through a pilot study

(n=30) using factor analysis. Reliability testing using Cronbach's alpha demonstrated strong internal consistency (all scales > 0.8).

Data Collection Procedure

Data collection followed a systematic procedure, beginning with initial coordination with hospital management, followed by direct distribution of questionnaires to respondents. Each participant received a brief explanation of research objectives and completed an informed consent process. Completed questionnaires underwent verification before data entry and quality control procedures.

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0, encompassing both descriptive and inferential analyses. Descriptive analysis included frequency distributions, measures of central tendency, and cross-tabulations. Inferential analysis employed multiple regression analysis and path analysis to examine relationships between variables and mediating effects, with significance level set at $p < 0.05$.

Ethical Considerations

The study received ethical approval from the Ethics Committee of Hasanuddin University (approval number: XXX/2024) and implemented comprehensive ethical considerations including informed consent, confidentiality measures, voluntary participation principles, and data security protocols. Quality control measures included standardized training for research assistants, double data entry verification, and systematic data cleaning procedures.

Study Limitations

The researchers acknowledged several limitations in the study design, including its single-site nature, reliance on self-reported data, cross-sectional observations, and potential response bias. However, these limitations were carefully considered in the analysis and interpretation of results to maintain research validity and reliability.
This methodology was designed to ensure comprehensive evaluation of EMR system success while maintaining high ethical standards and research quality. The approach accommodates various user perspectives and organizational contexts, providing a robust framework for understanding EMR implementation success factors

Research Ethics

This study was conducted in accordance with the principles of research ethics. Prior to data collection, ethical approval was obtained from the Ethics Committee of the Faculty of Public Health, Hasanuddin University . All respondents were given informed consent and explained that participation was voluntary and anonymous. The data collected were used only for research purposes and kept confidential.

Results

1. Frequency Distribution of Common Characteristics of Respondents

Table 1.5 Demographic Characteristics of Research Respondents at RSIA Sitti Khadijah Makassar

Characteristics	n	%
Gender		
Man	68	39.5
Woman	104	60.5
Age		
20-30	45	26.2
31-40	72	41.9
41-50	38	22.1
51-60	17	9.8
Last education		

Characteristics	n	%
D3/DA	48	27.9
S1	97	56.4
S2	24	14.0
S3	3	1.7
Years of service		
<1 Year	12	7.0
1-5 Years	43	25.0
6-10 Years	68	39.5
11-15 Years	34	19.8
16-20 Years	12	7.0
>21 Years	3	1.7
Total	**172**	**100.0**

Source: Primary Data, 2024

The table above shows the demographic characteristics of 172 respondents of the study at RSIA Sitti Khadijah Makassar. The majority of respondents were female (60.5%), aged between 31-40 years (41.9%), had a bachelor's degree (56.4%), and had a working period of between 6-10 years (39.5%).

Table 3.5 Evaluation of the Quality and Effectiveness of the Hospital Management Information System (SIMRS) at RSIA Sitti Khadijah Makassar

Variables	Good		Not good	
	n	%	n	%
Information Quality	100	58.1	72	41.9
Quality of Service	122	70.9	50	29.1
System Quality	94	54.7	78	45.3
Use	119	69.2	53	30.8
User Satisfaction	99	57.6	73	42.4
Net Benefits	106	61.6	66	38.4

Source: Primary Data, 2024

The table above shows the results of the evaluation of the quality and effectiveness of SIMRS at RSIA Sitti Khadijah Makassar based on 6 variables. Most respondents assessed the quality of service (70.9%), system use (69.2%), and net benefits (61.6%) as good. Meanwhile, the assessment of information quality (58.1%), user satisfaction (57.6%), and system quality (54.7%) was slightly lower but still tended to be positive.

Table 4.5 Results of Regression Analysis of the Influence of Information Quality, Service Quality, and System Quality on Use at RSIA Sitti Khadijah Makassar

Use	Coefficient	Partial		Simultan		R^2
		t	p-value	F	p-value	
IQ	0.203	3,692	0.000	12,429	0.000	0.182
ServQ	0.186	2.378	0.019			
SysQ	0.180	3.160	0.002			

Table 4.5 shows that information quality, service quality, and system quality simultaneously have a significant effect on usage ($F=12.429$; $p<0.001$) with a contribution of 18.2%. Information quality has the strongest effect ($\beta=0.203$; $p<0.001$).

Table 5.5 Results of Regression Analysis of the Influence of Information Quality, Service Quality, System Quality, and Use on User Satisfaction at RSIA Sitti Khadijah Makassar

User Satisfaction	Coefficient	Partial		Simultan		R^2
		t	p-value	F	p-value	
IQ	0.162	2.285	0.024	10,766	0.000	0.205
ServQ	0.334	3.371	0.001			
SysQ	0.143	1,960	0.052			
U	0.198	2,068	0.040			

Table 5.5 shows that the four variables simultaneously have a significant effect on user satisfaction (F=10.766; p<0.001) with a contribution of 20.5%. Service quality has the strongest influence (β=0.334; p=0.001).

Table 6.5 Results of Regression Analysis of the Influence of Use and User Satisfaction on Net Benefit at RSIA Sitti Khadijah Makassar

Net Benefits	Coefficient	Partial		Simultan		R^2
		t	p-value	F	p-value	
U	0.221	2,833	0.005	13,713	0.000	0.140
US	0.207	3.326	0.001			

Table 6.5 shows that usage and user satisfaction simultaneously have a significant effect on net benefits (F=13.713; p<0.001) with a contribution of 14%. Usage has a slightly stronger effect (β=0.221; p=0.005) than user satisfaction (β=0.207; p=0.001).

Discussion

The evaluation of the Electronic Medical Record (EMR) system at RSIA Sitti Khadijah Makassar using the DeLone & McLean model revealed several significant findings. The results demonstrate the complex interplay between information quality, system quality, service quality, system use, user satisfaction, and net benefits in determining the overall success of the EMR implementation.

The analysis showed that information quality, service quality, and system quality collectively had a significant influence on system use (F=12.429; p<0.001), explaining 18.2% of the variation. Information quality emerged as the strongest predictor (β=0.203; p<0.001), underscoring the crucial role of accurate, timely, and relevant data in driving system adoption. This aligns with the findings of Li et al. (2022), who emphasized the importance of information quality in sustaining the use of health information systems. Handayani et al. (2023) further corroborated that data accuracy and relevance are critical factors in the adoption of hospital information systems.

Service quality significantly influenced system use (β=0.186; p=0.019), with users appreciating the security in accessing and inputting data (49.4%) and the ease of system access (44.2%). This echoes the findings of Kim et al. (2022), who highlighted the importance of service quality in driving the continuous use intention of hospital information systems. Nguyen et al. (2023) further noted that responsive technical support and system security significantly contribute to system usage levels.

System quality also showed a significant positive influence on system use (β=0.180; p=0.002). Users rated the system as easy to understand and operate (51.2%), easily accessible (48.3%), and reliable (54.1%). This is consistent with Mardiana et al. (2023), who identified ease of use and system reliability as crucial factors in the adoption of hospital information systems.

The four variables - information quality, service quality, system quality, and system use - collectively had a significant impact on user satisfaction (F=10.766; p<0.001), explaining 20.5% of the variation. Service quality emerged as the strongest predictor (β=0.334; p=0.001), followed by system use (β=0.198; p=0.040) and information quality (β=0.162; p=0.024). impressively, system quality showed a positive but non-significant influence (β=0.143; p=0.052). Li et al. (2023) similarly found that service quality was a key determinant of user satisfaction in healthcare information systems.

Finally, system use and user satisfaction significantly influenced net benefits (F=13.713; p<0.001), explaining

14% of the variation. System use had a slightly stronger influence (β=0.221; p=0.005) compared to user satisfaction (β=0.207; p=0.001). This finding is supported by Mardiana et al. (2023), who confirmed that system use intensity positively correlates with operational efficiency, with 55.2% of respondents reporting increased work efficiency and 50.6% experiencing time savings in service delivery. Zhang et al. (2023) added that optimal system use significantly contributes to improved healthcare service quality.

The moderate R^2 values (ranging from 14% to 20.5%) suggest the presence of other factors influencing the dependent variables beyond the model. Park et al. (2022) identified additional factors such as organizational digital maturity, technology infrastructure, and management policies that can affect the realization of system benefits. Wu et al. (2023) emphasizes the importance of a comprehensive approach in optimizing system benefits, considering aspects of organizational culture, user competence, and management support.

The practical implications of these findings highlight the need for a holistic strategy in optimizing the EMR system. Kim et al. (2022) recommended an approach that balances increasing system use with efforts to maintain user satisfaction. Nguyen et al. (2023) suggested ongoing training programs and responsive technical support to ensure effective and sustained system use.

For RSIA Sitti Khadijah Makassar, these findings underscore the need to focus on enhancing system use effectiveness while maintaining user satisfaction levels. Alsharif et al. (2023) emphasizes the importance of continuous monitoring of system use and user satisfaction to identify areas for improvement. Xu et al. (2023) also advised the development of clear metrics to measure system benefits more comprehensively.

In conclusion, while system use and user satisfaction have been shown to significantly influence net benefits, there remains substantial potential for optimizing system benefits through a more holistic and sustained approach. Lee et al. (2023) stressed the importance of periodic evaluation and adjustment of implementation strategies to ensure the system continues to deliver added value to the organization and improve the overall quality of healthcare services.

Conclusions and Implications

This study evaluated the success of the Electronic Medical Record (EMR) system implementation at RSIA Sitti Khadijah Makassar using the DeLone & McLean model. The findings reveal the significant influence of information quality, service quality, and system quality on system use and user satisfaction, which in turn impacts the net benefits realized from the EMR system.

Information quality emerged as the strongest predictor of system use, underscoring the critical importance of ensuring data accuracy, timeliness, and relevance. Service quality and system quality also significantly influence system use, highlighting the need for reliable technical support, system security, ease of use, and system reliability.

User satisfaction was most strongly influenced by service quality, followed by system use and information quality. Remarkably, system quality had a positive but non-significant effect, suggesting that users place more emphasis on the service aspects and information usefulness than on technical system characteristics.

System use and user satisfaction were found to significantly influence net benefits, with system use having a slightly stronger effect. This underscores the importance of not only encouraging system adoption but also ensuring that the system is used effectively to realize organizational benefits.

The moderate explanatory power of the model suggests the presence of additional factors influencing the success of EMR implementations. Future research could explore the role of organizational, individual, and contextual factors to develop a more comprehensive understanding of EMR success in the context of developing countries.

The findings have several practical implications for healthcare organizations implementing EMR systems. First, there is a need for strategies that focus on enhancing information quality, such as data validation mechanisms and real-time data updating processes. Second, investing in responsive technical support and ongoing user training is crucial for driving system adoption and user satisfaction. Third, organizations should develop clear metrics to measure and communicate the realized benefits of the EMR system to all stakeholders.

For RSIA Sitti Khadijah Makassar specifically, the findings suggest prioritizing efforts to improve information quality, strengthening the technical support team, and institute regular user satisfaction surveys to guide system enhancements. Integrating EMR use into staff performance evaluations and providing a platform for sharing best practices across departments can further drive system adoption and optimize benefits realization.

In conclusion, this study contributes to the growing body of literature on the successful implementation of EMR systems in developing countries. The findings highlight the complex interplay of system, information, and

service quality factors in driving EMR success. Healthcare organizations can leverage these insights to develop targeted strategies for enhancing EMR system effectiveness and ultimately improving the quality of healthcare services delivered.

Conflict of Interest Statement

The author declares that there is no conflict of interest in the implementation and reporting of this research. This research was conducted independently without any influence or intervention from any party that could affect the objectivity of the research results.

This research was independently funded by the author without receiving financial assistance from institutions or other parties who have an interest in the research results. RSIA Khadijah Makassar, as the research location, did not provide financial support and had no role in the research design, data collection, analysis, data interpretation, report writing, or decision to publish the research results.

The authors have no financial, professional, or personal relationships that could influence or be perceived to influence the objectivity of this research. All data collected and analyzed in this study were treated confidentially and anonymously, in accordance with approved research ethics protocols.

The authors are committed to maintaining scientific integrity and transparency throughout the research process and reporting of results. Any potential conflicts of interest that may have arisen during the research process have been openly disclosed and handled in accordance with applicable research ethics standards

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