Impact of Information and System Quality on User Satisfaction with Outpatient EMRs at RSKIA Sadewa, Indonesia

Dela Astia Putri*, Trismianto Asmo Sutrisno

Department of Health Information Management, STIKes Mitra Husada Karanganyar, Jl. Brigjen Katamso Barat, Gapura Papahan Indah, Papahan, Tasikmadu, Karanganyar, Jawa Tengah, Indonesia
*Corresponding author: delaastia2210@gmail.com

Abstract: The use of electronic medical records (EMR) in outpatient services continues to increase, however, many hospitals still face challenges in ensuring optimal adoption and user satisfaction. Previous research suggests that issues related to information quality and system stability may hinder the effective use of EMRs, but not many studies have specifically analyzed these two factors in the context of regional hospitals. This study aimed to evaluate the effect of information and system quality on EMR user satisfaction in RSKIA Sadewa, Yogyakarta, and identify strategic improvement steps. Primary data were collected from 42 questionnaires distributed to EMR users, and 37 responses were analyzed using multiple linear regression. Results showed that system quality ($\beta = 0.213$, $p < 0.05$) and information quality ($\beta = 0.199$, $p < 0.05$) had a significant influence on user satisfaction, with a joint contribution of 81.1% ($R^2 = 0.811$). Although the system provided sufficient features, system reliability constraints and incomplete information negatively affected user experience. System menu optimization and regular training are proposed as strategic measures to improve operational effectiveness. The findings provide important insights for hospital managers and policymakers regarding the importance of strengthening IT infrastructure and data validation to support more effective EMR implementation. Further research is recommended to involve various hospitals in different contexts to expand external validity and provide more comprehensive recommendations for the healthcare sector.

Keywords: INFORMATION QUALITY; SYSTEM QUALITY; USER SATISFACTION; ELECTRONIC MEDICAL RECORDS; DELONE AND MCLEAN MODEL

1. Introduction

1.1 Background and importance of the study

Digital transformation in the healthcare sector has become a global priority to improve service efficiency and health information quality. In Indonesia, the implementation of electronic medical records (EMR) is driven by Minister of Health Regulation No. 24 of 2022, which requires health facilities to provide EMR to improve the traceability and accuracy of patient data and to support telemedicine services (Amalia et al., 2021; Committee, 2017). However, EMR implementation does not always go smoothly. According to a recent report, only 35% of Indonesian hospitals have managed to implement EMR effectively, with barriers such as lack of staff training and system instability (Santoso et al., 2022).

RSKIA Sadewa Yogyakarta has developed an in-house EMR system for outpatient services. However, an initial study in November 2022 found some problems with its implementation, such as incomplete menus and staff member preferences for third-party systems. This suggests that EMR adoption depends not only on the availability of technology, but also on the quality of user-perceived information and systems (Putra Pradnyantara et al., 2022).

1.2 Theoretical framework and research gap

To evaluate the success of EMR implementation, information system success model is often used. This model identifies six key dimensions: (1) system quality, (2) information quality, (3) usage, (4) user satisfaction, (5) individual impact, and (6) organizational impact (Delone & McLean, 2014). Hendaryanti and Deharja (2020) found that information quality plays an important role in increasing user satisfaction with large hospitals in Indonesia. However, previous studies have focused more on inpatient services, and research related to EMR in outpatient services is still limited.

In the outpatient context, users often require quick and accurate access to medical information, which increases the reliability of the information quality and system.

Therefore, this study fills a gap in the literature by focusing on user experience in outpatient services and exploring how system and information quality affect user satisfaction. This is expected to provide practical and scientific insights for hospital managers in improving their digital services.

1.3 Research objectives and hypotheses

a. Research objective

This study has the following main objectives:

- Assessing the effect of information quality on EMR user satisfaction in RSKIA Sadewa outpatient services. The information quality includes the accuracy, relevance, completeness, and timeliness of the information provided by the system. This analysis will provide insights into the extent to which information quality plays a role in improving user experience and influencing user satisfaction when using EMR.
- Analyzing the impact of system quality on user satisfaction. The system quality includes various aspects, such as ease of use, access speed, reliability, flexibility, and system security. This study evaluates how these elements can improve user comfort and effectiveness when performing daily administrative and clinical tasks.
- Identify improvement recommendations to increase EMR adoption and effectiveness. Based on the research results, improvement strategies will be developed that focus on the information and system quality aspects to increase users' motivation to use EMR optimally. This is expected to support the improvement of the overall efficiency and accuracy of hospital services.

b. Research hypotheses

This study is designed to test the following hypotheses:

1. H_0 (null hypothesis): There is no significant influence between information and system quality on EMR user satisfaction in RSKIA's Sadewa outpatient services. Therefore, the quality of information and systems does not play an important role in determining user satisfaction.
2. H_a (alternative hypothesis): There is a significant influence between information and system quality on EMR user satisfaction in RSKIA's Sadewa outpatient services. Therefore, the quality of information and systems plays an important role in influencing user perceptions and experiences and thus user satisfaction.

2. Methods

2.1 Research design and approach

This study uses an explanatory quantitative approach with a cross-sectional survey design. An explanatory design was chosen to identify and analyze the relationship between information and system quality on electronic medical record (EMR) user satisfaction in RSKIA's Sadewa outpatient services. The cross-sectional survey allows data collection from respondents at a single point in time to test the causality hypothesis.

In addition, this study follows the principles of evaluative research, where the focus is on measuring information system effectiveness and user satisfaction from the perspective of success model (Delone & McLean, 2014).

2.2 Population and sampling techniques

The study population included 42 EMR users at RSKIA Sadewa, consisting of medical staff (doctors, nurses) and non-medical staff (administration, IT). Users are involved in the operation of the EMR system in various departments, such as pharmacy, registration, and polyclinics.

This study used stratified random sampling to ensure proportionality and adequate representation between medical and non-medical staff. Each stratum group was randomly selected, with 42 respondents selected as the study sample. This number met the requirements based on Slovin's as calculation in Eq. (1).

$$n = \frac{N}{1 + N*e^2} \tag{1}$$

where n is the number of samples, N is population (82), and e is margin of error (0.05).

The following flowchart illustrates the sample recruitment and selection process:

1. Identification of the population by user type (medical and non-medical).
2. Division of the population into strata based on user roles.
3. Random selection within each stratum to ensure proportional representation.
4. Online questionnaire distribution using Google Form.

2.3 Research instruments and validation

a. Structured questionnaire

The main instrument of this study was a questionnaire with a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The questionnaire consisted of three main sections:

1. Respondent demographics: Age, gender, and type of employment.
2. Information Quality and System Quality: Questions related to accuracy, completeness, reliability, flexibility, and access speed.
3. User Satisfaction: Measured by items related to the effectiveness and efficiency of using the EMR system.

b. Validation and reliability

The instrument was tested for validity using Pearson's correlation and reliability with Cronbach's alpha. An alpha value of 0.87 indicates high internal consistency, and values greater than 0.70 are considered reliable.

2.4 Data collection

Data were collected over a 1-month period using an online questionnaire to facilitate the distribution and collection of responses. All respondents were informed of the purpose of the study and were given the option to participate voluntarily. Anonymity was maintained to minimize social *desirability* bias.

2.5 Data analysis and statistical techniques

The collected data were analyzed using SPSS version 26 software in the following stages, such as descriptive statistical analysis, statistical assumption test, multiple linear regression analysis, and hypothesis testing.

a. Descriptive statistical analysis

Descriptive statistics are used to describe the characteristics of respondents, such as age, gender, and job type. The descriptive results are presented as tables and diagrams to facilitate interpretation.

b. Statistical assumption test

- Normality Test using Kolmogorov-Smirnov to ensure normal data distribution.
- Multicollinearity Test to detect the correlation between independent variables, using VIF (Variance Inflation Factor) values with a VIF threshold of <10.
- Outlier Identification: Outliers are detected using the Z-score, and if found, they are analyzed to determine whether they need to be removed from the dataset.

c. Multiple linear regression analysis

To test the hypotheses, multiple linear regression analysis was used with the Eq. (2).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + e \qquad (2)$$

where Y is user satisfaction, X_1 is information quality, X_2 is system quality, β_0 is a constant, β_1, β_2 is regression coefficient, and e is residual error.

d. Hypothesis testing

- Null hypothesis (H₀). There is no significant influence of information and system quality on user satisfaction.
- Alternative hypothesis (Hₐ). There is a significant influence of information and system quality on user satisfaction.

2.6 Research limitations

This study has several limitations that need to be considered:

- Limited sample: Data were collected from one hospital; thus, the generalizability of the results may be limited.
- Respondent bias: There is a possibility of social bias because respondents may provide answers that are considered socially "correct".
- Time limitations: Data collection was conducted over a short period of time, so responses may not have been optimal.

Mitigation efforts were made by ensuring voluntary participation and maintaining anonymity to minimize bias.

3. Results and Discussion

3.1 Overview of respondents

Out of 42 questionnaires distributed, 37 were eligible for analysis (88.1% of total responses). The respondents consisted of 29 medical officers (78%) and 8 non-medical officers (22%), with 62% of the respondents being female and an average age of 35.4 years (SD = 5.8). This distribution ensures that the findings represent the perspectives of users involved in various operational functions at RSKIA's Sadewa.

3.2 Information quality analysis

The assessment of EMR information quality was based on five indicators: accuracy, completeness, format, timeliness, and relevance. The results are shown in Table 1.

Table 1.Information quality of electronic medical records.

No	INDICATOR	SCORE	AVERAGE	TCR (%)	CATEGORY
(1)	Accuracy	325	2,93	73,20	Good
(2)	Completeness	112	3,03	75,68	Good
(3)	Format	350	3,15	78,83	Good
(4)	Timeliness	230	3,11	77,70	Good
(5)	Relevance	232	3,14	78,38	Good
	TOTAL	6164	3,06	76,61	Good

Table 2. Quality of electronic medical record systems.

No	INDICATOR	SCORE	AVERAGE	TCR (%)	CATEGORY
(1)	Ease of use	427	3,19	79,73	Good
(2)	Ease of learning	230	3,11	77,70	Good
(3)	Access speed	338	3,05	76,13	Good
(4)	Reliability	402	2,72	67,91	Enough
(5)	Flexibility	222	3,00	75,00	Good
(6)	Usability of System Features and Functions	237	3,20	80,07	Good
(7)	Security	112	3,03	75,53	Good
	TOTAL	3554	3,02	75,53	Good

Table 3. Electronic medical record user satisfaction.

No	INDICATOR	SCORE	AVERAGE	TCR (%)	CATEGORY
(1)	Efficiency	236	3,19	79,73	Satisfied
(2)	Effectiveness	113	3,05	76,53	Satisfied
(3)	Satisfaction	345	3,11	77,70	Satisfied
	TOTAL	1152	3,11	77,87	Satisfied

Table 4. Multiple linear regression coefficients results.

No	INDEPENDENT VARIABLE	COEFFICIENT	STD. ERROR	BETA	T	SIG.
(1)	Constant	0,457	1,553	-	0,294	0,770
(2)	System Quality	0,213	0,052	0,601	4,058	0,000
(3)	Information Quality	0.199	0,090	0,328	2,215	0,034

Table 5. Regression model summary results.

MODEL	R	R^2	Adjusted R	Std. Error in Estimate
1	0.900	0,811	0,800	1,073

As shown in Table 1, the overall information quality was rated good, with an average TCR value of 76.61%. The format indicator received the highest score (78.83%), indicating that the information in the EMR was easy to understand and presented well. These findings are consistent with the first research objective, which assesses how information quality affects user satisfaction. In addition, this finding is also in line with Saputra et al. (2022), which reported that a good information format accelerates clinical decision-making.

However, accuracy had the lowest score (73.20%), which indicates inaccuracies or data entry errors. Information errors can impact clinical processes and reduce user confidence; thus, management should improve data validation and training related to input procedures to increase user confidence in the system.

3.3 System quality analysis

The system quality assessment included seven indicators: ease of use, ease of learning, speed of access, reliability, flexibility, feature usability, and security, the results of which are presented in Table 2.

As shown in Table 2, the quality of the EMR system is good, with an average TCR of 75.53%. The usefulness of the features and functions obtained the highest value (80.07%), which indicates that the system features are in accordance with user needs. However, the reliability indicator scored the lowest (67.91%), indicating that the system still experiences technical disruptions and downtime during peak operational hours. These disruptions reduce productivity and cause user dissatisfaction; thus, management must strengthen the IT infrastructure capacity and conduct regular performance monitoring.

3.4 User satisfaction analysis

User satisfaction was measured using three indicators: efficiency, effectiveness, and overall satisfaction. The results are shown in Table 3.

As shown in Table 3, the overall user satisfaction is in the satisfied category, with a TCR of 77.87%. Efficiency had the highest score (79.73%), indicating that the system helps speed up data search and patient information management. However, some respondents stated that the effectiveness of the system could still be improved, especially in terms of handling technical constraints that affect system performance.

3.5 Multiple linear regression test results

This study used multiple linear regression tests to test the effects of system and information quality on user satisfaction. The results are presented in Tables 4 and 5.

As presented in Tables 4 and 5, the regression analysis reveals that both system quality ($\beta = 0.601$, $p < 0.05$) and information quality ($\beta = 0.328$, $p < 0.05$) significantly impact user satisfaction, indicating that a one-point improvement in either variable leads to a proportional increase in satisfaction. Moreover, the R² value of 0.811 suggests that 81.1% of the variance in user satisfaction is accounted for by these two factors, underscoring their critical role in shaping user perceptions. The remaining 18.9% of variability, however, is likely influenced by external factors not captured in the model, such as user experience and management support, highlighting the importance of a holistic approach to enhancing user satisfaction.

3.6 Implications and recommendations

These findings confirm the hypothesis that both information and system quality significantly influence user satisfaction, which is consistent with the Delone and McLean (2014) model. However, to optimize the adoption of the electronic medical record (EMR) system at RSKIA's Sadewa, improvements in the reliability of the system are imperative. Strengthening the IT infrastructure, ensuring regular maintenance, and reducing system downtime are crucial steps toward achieving stability. In addition, management should prioritize user training to enhance user familiarity with the

system features and functions, thereby facilitating seamless use. Furthermore, efforts to improve data validation and information quality control are essential to maintain the accuracy and consistency of the system data, fostering greater user confidence and encouraging wider EMR adoption.

3.7 Limitations and future directions of the research

Although the proposed system provides valuable insights into the effects of information and system quality on user satisfaction, some limitations should be noted. A sample limited to one hospital limits the generalizability of the findings. Future research should include more hospitals with different operational contexts to increase external validity.

4. Conclusion

This study successfully demonstrated that information and system quality have a significant influence on EMR user satisfaction at RSKIA Sadewa. Based on the regression analysis, these two variables collectively explain 81.1% of the variation in user satisfaction (R^2 = 0.811). System quality proved to have the strongest influence, with a beta coefficient of 0.601 ($p < 0.05$), indicating that reliability and ease of use are critical factors that influence user experience. In addition, information quality also plays an important role (β = 0.328, $p < 0.05$), especially regarding the format and relevance of information that supports work efficiency and effectiveness.

However, the information accuracy and system reliability indicators received the lowest scores, which indicates that data errors and system instability are significant obstacles to effective daily operations.

Based on these findings, several strategic measures are suggested to improve user satisfaction and EMR adoption:

- Improved System Reliability. Hospital management should invest in more reliable IT infrastructure and implement automated monitoring to detect and address disruptions before they affect operations. Strengthening the system reliability is essential for minimizing downtime during peak hours.
- Periodic User Training. Regular training for medical and non-medical personnel is required to improve their understanding of EMR features and functions, especially to ensure that the system's menus and features are used optimally. This may also reduce user resistance to the new system.
- Validation and Information Quality Control. The implementation of quality control mechanisms is necessary to ensure accurate and consistent input data. Periodic validation should be implemented periodically to prevent input errors that can reduce system trust.

This study makes an important contribution to understanding the effect of information and system quality on user satisfaction; however, there are still some limitations. Future research could explore external factors that influence adoption and implementation success, such as the following:

- Management Support and Hospital Budget. Further exploration of budget availability and management priorities when supporting IT system development is necessary to understand the sustainability factors of EMR adoption.
- Organizational Culture and Staff Training. Future research can identify the influence of organizational culture and staff competency on healthcare technology adoption. These factors can be key to ensuring that EMR systems are well integrated into daily workflows.
- Comparative Studies and Wider Populations. To increase external validity, future research should include hospitals with different operational contexts in both urban and rural areas. This comparative approach may provide additional insights into user experiences in different environments.

Overall, this study reinforces the importance of system and information quality in influencing EMR user satisfaction. By addressing challenges related to data reliability and accuracy and providing adequate training and support to users, hospitals can significantly improve their operational effectiveness and efficiency. The findings are expected to provide insights for policy makers and hospital management when designing sustainable health technology development strategies that are more sustainable and responsive to user needs

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Amalia, N., Rustam, M. Z. A., Rosarini, A., Wijayanti, D. R., & Riestiyowati, M. A. (2021). The Implementation of Electronic Medical Record (EMR) in The Development Health Care System in Indonesia. *International Journal of Advancement in Life Sciences Research*, *4*(3). https://doi.org/10.31632/ijalsr.2021.v04i03.002

Committee, I. H. T. A. (2017). Ministry of Health of the Republic of Indonesia. *Health Technology Assessment (HTA) Guideline. Available from: Http://Adphealth. Org/Upload/Resource/FINAL_HTA_ENG_-1. Pdf. Published.*

Delone, W. H., & McLean, E. R. (2014). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, *19*(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748

Putra Pradnyantara, I. G. A. N., Murti, B., & Tamtomo, D. (2022). Readiness of Application of Electronic Medical Records in Bethesda Lempuyangwangi Hospital, Yogyakarta. *Journal of Health Policy and Management*, *7*(2), 149–157. https://doi.org/10.26911/thejhpm.2022.07.02.06

Santoso, D. B., Nuryati, & Rokhman, N. (2022). *Experience of Electronic Medical Records Adoption in Primary Health Care in Indonesia*. 121–126. https://doi.org/10.4028/p-j260sd

Saputra, Y., Noor Ashila, M., & Muliarini, P. (2022). Readiness and Acceptance of Electronic Medical Records Among Health Professionals in Indonesia. *Proceedings of International Conference of Graduate School on Sustainability*. https://doi.org/https://doi.org/10.26905/icgss.v7i1.9274

Tri Hendaryanti, R. A., & Deharja, A. (2020). Analisis Kepuasan Pengguna Electronic Health Record (EHR) dengan

Menggunakan Metode Delone and Mclean di Unit Rekam Medis RSUPN dr. Cipto Mangunkusumo. *J-REMI : Jurnal Rekam Medik Dan Informasi Kesehatan*, *1*(3), 357–363. https://doi.org/10.25047/j-remi.v1i3.2102