Evaluation of Hospital Management Information System (HMIS) Implementation Using HOT-Fit Method in Rasyida Kidney Special Hospital Medan

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ABSTRACT

Implementation of HMIS in Rasyida Kidney Special Hospital Medan has been used since 2018 to support services in improvement, effectiveness, and work efficiency. However, there are problems such as unstable networks, sometimes errors when operating, and not being integrated directly with the BPJS system, resulting in delays in service from patient registration and data input to the patient discharge process. Evaluation is needed to measure successful implementation using the HOT-Fit (Human, Organization, and Technology Fit) method. The aim is to assess factors that positively influence HMIS's successful implementation by completing Google forms (56 respondents) and in-depth interviews (6 respondents). The mixed method is used with concurrent embedded strategy and PLS-SEM with SmartPLS v.4.1.0.6 to analyze. Results showed that user satisfaction has a 79.9% influence, showing that independent variables affect user satisfaction. The higher user satisfaction, the greater HMIS's use. Users have felt the ease of the system, despite an unstable network, frequent errors, and inadequate computer specifications. Increasing the bandwidth, initially 50mbps to 100mbps, so the network is stable, error problems can be overcome, and increasing computer specifications to run the application correctly if an update is necessary.

Keywords: HMIS, HMIS Evaluation, HOT-Fit, User Satisfaction

INTRODUCTION

High-quality patient care depends on good documentation of medical records, health status, current medical conditions, and treatment plans. Implementing a hospital management

information system (HMIS) is important to integrate various existing information during the service process. HMIS is an information system specifically designed to assist the management and planning of health programs (WHO, 2008).

One of the theoretical frameworks used to evaluate information systems in the healthcare sector is the HOT-Fit (Human, Organization, and Technology-Fit) Model (Yusof et al., 2008, p. 386). Like other hospitals, Rasyida Medan Special Kidney Hospital has implemented HMIS with the Dtech Telemedia vendor for 6 years starting in 2018. However, there are obstacles from users, systems, and organizational support. From complaints from HMIS users regarding system operational functions such as the HMIS application, where sudden errors often occur during use, HMIS does not respond when used, making the data insufficient to be input. Evaluation of HMIS implementation in Rasyida Kidney Special Hospital has never been measured in terms of its success.

This research evaluates the implementation of HMIS at the Rasyida Kidney Special Hospital in Medan using the HOT-Fit method with a quantitative and qualitative approach (mixed method). The general objective is to analyze what variables need to be evaluated in this implementation.

LITERATURE REVIEW

Rapid technological developments in the information sector have brought about significant changes in society, nation, and state life. In this regard, the role and function of data and information services in hospitals, as one of the data and information management units, should be able to keep up with various existing adjustments and changes.

Hospital management requires reliable, accurate, current, safe, and relevant information from both clinical and administrative perspectives (Glandon, Slovensky, and Smaltz, 2020). The HMIS implementation process involves technical and non-technical factors. It is important to understand that errors in managing and applying information technology and information systems can cause the failure of information technology and the business itself (O'Brien J, 2017).

Research conducted at the Outpatient Installation of RSD Dr. Soebandi Jember regarding the implementation of HMIS can be said to be not optimal. As the perception of administrative

officers in implementing HMIS shows, they still need guidance and additional supporting facilities (Anggraeni & Supriyadi, 2019, p. 42).

Another study analyzing the implementation of the hospital management information system (HMIS) at TPPRJ used the Utaut method at Tk.III Hospital Dr. Reksodiwiryo Padang found that the implementation was running smoothly, with the HMIS at TPPRJ very helpful and more efficient than a manual system. However, in its implementation, some officers are still not responsible and disciplined. This is because management has no support and motivation specifically for users (Putra & Vadriasmi, 2020, p. 65).

The benefits of information systems in an organization require in-depth evaluation. This is because the success of information system implementation is caused by many factors, not only by using the latest hardware, software, and sophisticated technology. Organizational and social issues are the main components of information systems that must be considered (Rumasukun, Akbar, Rismawati, and Hasan, 2022:20695).

Evaluation of an information system is a real effort to determine the actual conditions of implementation. HOT-Fit has three important components: the human component, which consists of system users and user satisfaction; the organizational component, which consists of structure and environment; and the technological component, which consists of system quality, information quality, and service quality. The last component is a net benefit (Yusof et al., 2008).

Research conducted by Abda'u, Winarno, and Henderi (2018:48) and Adila and Dahtiah (2020:849) also used a modified HOT-Fit Model. The HOT-Fit model can evaluate the system based on these three main factors. It can answer what variables influence the success of implementing HMIS and make it an assessment criterion carried out at Rasyida Kidney Special Hospital; then, problems can be found.

METHODS

This research was conducted from January 2024 to August 2024 at Rasyida Kidney Special Hospital, Medan. The research used mixed methods with a Concurrent Embedded Strategy, a cross-sectional research design using a survey approach, and a qualitative descriptive research design with a focused interview approach. The research sample used in this study was nonprobability sampling using total sampling, the total sample was 56 respondents who filled out the questionnaire and six representative respondents from the Head of Cashier Unit

(I1), Head of Pharmacy Unit (I2), Deputy Head II of Internal Medicine (I3), Registration Staff (I4), Inpatient Executive Nurse (I5) and IT Staff (I6) for interviews.

The research instruments used were a Likert scale, Google Forms questionnaire, and in-depth interviews. This research variable is divided into three endogenous variables (System Usage (SU), User Satisfaction (US) and Net Benefit (NB)) and seven exogenous variables (System Quality (SQ), Information Quality (IQ), Service Quality (SQ), Organizational Structure (OS), Organizational Environment (OE), Facility Condition (FC) and Leadership Support (LS)).

The analysis used in this research uses Structural Equation Modeling (SEM) based on Partial Least Square (PLS) for quantitative data analysis. Data analysis is using testing tools with SmartPLS software version 4.1.0.6. At the same time, the data produced from interviews is descriptive in the form of words. The data results were collected, and analysis was conducted to combine and compare so qualitative data could strengthen, expand, and invalidate quantitative data.

RESULTS

Respondent Characteristics

Table 1. Respondent Characteristics

Characteristics	Amount	Percentage
Gender		
Male	17	30.4%
Female	39	69.6%
Age		
20-25	12	21.4%
26-30	24	42.8%
31-35	16	28.6%
36-40	2	3.6%
41-45	1	1.8%
< 50	1	1.8%

Table 2. Respondent Characteristics (continued)

Characteristics	Amount	Percentage
Education level		
High School	0	0%
Diploma (D1/D3)	22	39.3%
Bachelor Degree (S1)	32	57.1%
Master Degree (S2)	1	1.8%
Other	1	1.8%

Table 1. shows that 69.6% of HMIS users are female. The age of HMIS users was 26-30 years old with a percentage of 42.8% and 31-35 years old (8.6%). The education level of respondents was dominated by Bachelor's Degree (S1) at 57.1%, D1/D3 at 39.3%, 1.8% of respondents had a Master's degree, and none had a high school education.

Quantitative Data Analysis

Measurement Model Test Results (Outer Model)

The tests carried out two tests, namely the validity test and the reliability test.

Convergent Validity

Loading Factor and Average Variance Extracted (AVE) values were checked to verify convergent validity. Table 2 presents the results of the convergent validity test.

Table 3. Convergent Validity Test Results

Variable	Code	Loading Factor	Description
System Quality (SQ)	SO1	0.917	Valid
	SQ2	0.951	Valid
	SQ3	0.813	Valid
	SQ4	0.851	Valid
Information Quality (IQ)	IQ1	0.880	Valid
	IQ2	0.928	Valid
	IQ3	0.867	Valid
	IQ4	0.883	Valid
	IQ5	0.848	Valid
Service Quality (SQ)	SO1	0.827	Valid
	SQ2	0.886	Valid
	SQ3	0.942	Valid
System User (SU)	SU1	0.868	Valid
	SU2	0.891	Valid
	SU3	0.922	Valid
	SU4	0.956	Valid
User Satisfaction (US)	US1	0.864	Valid
	US2	0.902	Valid
	US3	0.877	Valid
	US4	0.906	Valid
	US5	0.886	Valid
Organizational Structure (OS)	OS1	0.850	Valid
	OS2	0.901	Valid
	OS3	0.866	Valid
	OS4	0.897	Valid
	OS5	0.772	Valid
Organizational Environment (OE)	OE1	0.866	Valid
	OE2	0.811	Valid
	OE3	0.899	Valid

Table 4. Convergent Validity Test Results (continued)

Variable	Code	Loading Factor	Description
Facility Condition (FC)	FC1	0.905	Valid
	FC2	0.823	Valid
	FC3	0.900	Valid
Leadership Support (LS)	LS1	0.938	Valid
	LS2	0.937	Valid
	LS3	0.967	Valid
Net Benefits (NB)	NB1	0.882	Valid
	NB2	0.906	Valid
	NB3	0.875	Valid
	NB4	0.782	Valid
	NB5	0.940	Valid

The conclusion from the convergent validity test shows that the variable indicators in Table 2. are declared valid or suitable for use as research instruments.

Table 5. AVE Value Test Results

Variable	AVE Value	Description
System Quality	0.897	VALID
Information Quality	0.769	VALID
Service Quality	0.777	VALID
System User	0.785	VALID
User Satisfaction	0.787	VALID
Organizational structure	0.817	VALID
Organizational	0.739	VALID
Facility Condition	0.772	VALID
Leadership Support	0.828	VALID
Net Benefits	0.737	VALID

In Table 3. it can be seen that the AVE value test results for all question indicators on this variable are declared valid or suitable for use as research instruments.

Discriminant Validity

It can be tested by testing the cross loading Fornell-Larcker criterion as shown in Table 4.

Table 6. Discriminant Validity Test Results (Cross Loading Fornell-Larcker's)

	LS	FC	IQ	SQ	US	SQ	OE	NB	SU	OS
LS	**0.947**									
FC	0.747	**0.877**								
IQ	0.659	0.658	**0.882**							
SO	0.577	0.725	0.840	**0.886**						
US	0.747	0.697	0.852	0.787	**0.887**					
SQ	0.492	0.486	0.761	0.647	0.587	**0.904**				
OE	0.625	0.623	0.586	0.761	0.669	0.464	**0.859**			
NB	0.799	0.696	0.754	0.700	0.805	0.626	0.775	**0.879**		
SU	0.588	0.430	0.635	0.585	0.783	0.423	0.607	0.713	**0.910**	
OS	0.716	0.757	0.807	0.760	0.840	0.528	0.710	0.782	0.606	**0.858**

Table 4. shows that AVE root value is greater than the correlation between the construct and other constructs. Based on this, the result is there are no problems in the discriminant validity test.

Reliability Test

The value is considered reliable and passes the reliability test if the Cronbach's alpha and composite reliability test values are greater than 0.70.

Table 7. Reliability Test Results

Variable	Cronbach's alpha	Composite reliability (rho_c)	Description
LS	0.943	0.963	RELIABLE
FC	0.853	0.909	RELIABLE
IQ	0.928	0.946	RELIABLE
SQ	0.861	0.916	RELIABLE
US	0.932	0.949	RELIABLE
SQ	0.926	0.947	RELIABLE
OE	0.826	0.894	RELIABLE
NB	0.925	0.944	RELIABLE
SU	0.930	0.951	RELIABLE
OS	0.910	0.933	RELIABLE

The test results seen in Table 5. show that each variable has a Cronbach's alpha and composite reliability value greater than 0.70. It can be concluded that all question are reliable or suitable.

Structural Model Test Results (Inner Model)

It was carried out by testing the R-Square value and the relevance of effects between research constructs by testing the path coefficient value.

R-Square

R-Square explain the influence of the independent variable on the dependent variable if it has a significant effect (Ghozali, 2021). The results of R-Square test are shown in Table 6.

Table 8. R-Square Results

Variable	R-Square
User Satisfaction	0.799
System User	0.615
Organizational structure	0.577
Organizational Environment	0.503
Net Benefits	0.762

Table 6 shows that the R-Square value of the user satisfaction variable has the highest influence, with a percentage of 79.9%, which shows that the independent variable influences user satisfaction, while the remaining 20.1% is influenced by factors outside the research model.

Interview Results

Question : What are the obstacles when using the HMIS application? (HUMAN)

I1's answer : Errors often occur starting from the basics to the bookkeeping stage

I2's answer : The network usually disappears and sometimes the program errors

I3's answer : When patient volume increases, loading time is take a long process

I4's answer : The problem with the network

I5's answer : Sometimes the application closes by itself

I6's answer : Network, because bandwidth does not match needs

Question : Have regular evaluations been carried out regarding the use of HMIS? (ORGANIZATION)

I1's answer : There is no regular evaluation

I2's answer : There isn't any yet

I3's answer : Do not know

I4's answer : Sometimes the vendor comes, but there is no regular evaluation

I5's answer : There isn't any yet

I6's answer : The vendor comes once or twice a month, if there are problems

Question : Does network instability often occur when using HMIS? (TECHNOLOGY)

I1's answer : Network stability is also sometimes an obstacle when using HMIS

I2's answer : The network is not always stable

I3's answer : The network is unstable, resulting in long loading times

I4's answer : Yes, often

I5's answer : Sometimes it used to take a long time

I6's answer : Yes, because there is not enough bandwidth

Question : How do you think the speed of HMIS can help complete work? (Fit)

I1's answer : This is quite helpful too, but sometimes human error can slow down work

I2's answer : Compared to manual method, it is definitely faster

I3's answer : It has helped, but there are still problems with the things mentioned before

I4's answer : Apart from errors and the need for other applications, HMIS is great

I5's answer : It has helped, because it feels faster and easier

I6's answer : Good enough, but bandwidth needs to be increased

Hypothesis Test Results

The results of the hypothesis test are shown in Table 7.

Table 9. Hypothesis Test Results

Hypothesis	Path	P-Value	Description
H1	SQ → SU	0.277	REJECTED
H2	SQ → US	0.209	REJECTED
H3	IQ → US	0.024	ACCEPTED
H4	SQ → US	0.221	REJECTED
H5	SQ → OS	0.000	ACCEPTED
H6	US → SU	0.000	ACCEPTED
H7	OS → US	0.038	ACCEPTED
H8	OS→ OE	0.000	ACCEPTED
H9	LS → SU	0.463	REJECTED
H10	US → NB	0.041	ACCEPTED
H11	FC → NB	0.196	REJECTED
H12	OS → NB	0.332	REJECTED
H13	OE → NB	0.017	ACCEPTED

The significance value used if the p-value ≤ significance level (alpha= 5%), then the results are proven to be significant. The results of hypothesis test in Table 7. shows that: (1) system quality has a positive effect on system users with a p-value of 0.277 > 0.05, which means the hypothesis is rejected. (2) System quality has a positive effect on user satisfaction with a p-value of 0.209 > 0.05 (rejected). (3) Information quality has a positive effect on user satisfaction with a p-value of 0.024 < 0.05 (accepted). (4) Service quality has a positive effect on user satisfaction with a p-value of 0.221 > 0.05 (rejected). (5) Service quality has a positive effect on organizational structure with a p-value of 0.000 < 0.05 (accepted). (6) User

satisfaction has a positive effect on system users with a p-value of 0.000 < 0.05 (accepted). (7) Organizational structure has a positive effect on user satisfaction with a p-value of 0.038 < 0.05 (accepted). (8) Organizational structure has a positive effect on the organizational environment with a p-value of 0.000 < 0.05 (accepted). (9) Leadership support has a positive effect on system users with a p-value of 0.463 > 0.05 (rejected). (10) User satisfaction has a positive effect on net benefits with a p-value of 0.041 < 0.05 (accepted). (11) Facility conditions have a positive effect on net benefits with a p-value of 0.196 > 0.05 (rejected). (12) Organizational structure has a positive effect on net benefits with a p-value of 0.332 > 0.05 (rejected). (13) The organizational environment has a positive effect on net benefits with a p-value of 0.017 < 0.05 (accepted).

DISCUSSION

HOT-Fit has three important components. By using the HOT-Fit model, the system can be evaluated based on these three main factors (Yusof et al., 2006). The HOT-Fit model can answer what variables influence the success of HMIS implementation and use it as an assessment criterion to find problems faced by HMIS users so that it runs optimally.

In this study, all of the variables pass the convergent validity test and discriminant validity test. The reliability test results for each variable concluded that all question indicators are reliable. The inner model was carried out by testing the R-squared value. The R-Square value for the user satisfaction variable influences 0.799 or 79.9%, which shows that the variables of system quality, information quality, service quality, and organizational structure in this study influence the dependent variable, namely user satisfaction, of 79.9%, while factors outside the research model influence the remaining 20.1%. Information quality positively affects user satisfaction with a p-value of 0.024 < 0.05.

This is to research conducted by Nasution SW et al. (2023:18), Vantissha et al. (2022:43), and Febrita et al. (2021:7), who state that information quality has a positive effect on user satisfaction. The quality of information from HMIS can provide satisfaction to users because it can make it easier for users to carry out daily tasks related to filling in HMIS. According to Yusof et al. (2006), the criteria to assess the quality of information are completeness, accuracy, timeliness, availability, relevance, consistency, and data entry. If the information quality criteria meet the requirements mentioned, then the information quality of an

information system can be good. The quality of HMIS at Rasyida Kidney Special Hospital is quite satisfying for users because information such as data entry is in line with the final stage if there is no human error.

Organizational structure positively affects user satisfaction with a p-value of 0.038 < 0.05. The results are based on research conducted by Nasution SW et al. (2023:19) and Adila and Dahtiah (2020:850). Each leader has planned the implementation of HMIS at the Rasyida Kidney Special Hospital well, and related staff have received support.

The net benefit variable influences the net benefit, with an R-Square value of 0.762, indicating that user satisfaction, facility conditions, organizational structure, and organizational environment in this study influence the net benefit of 76.2%, while the remaining 23.8% is influenced by factors outside the scope of the model study.

User satisfaction positively affects net benefits with a p-value of 0.041 < 0.05. This is by research conducted by Nasution SW et al. (2023:19), Adila and Dahtiah (2020:849), and Abda'u et al. (2018:54). The user's attitude towards the information system is a subjective criterion about how much the user likes the system used. The research results at the Rasyida Kidney Special Hospital show that users get direct benefits from user satisfaction in using HMIS, such as increased effectiveness and efficient service, which has a good influence. Hence, it will increase the quality of the hospital in the public eye.

The organizational environment positively affects net benefits with a p-value of 0.017 < 0.05. The results are from research conducted by Khotimah and Lazuardi (2018:24), which states that the organizational environment positively affects net benefits. Everything that has a relationship with organization and information technology planning should be in line with each other to ensure that technology development is supported by the vision and mission of the organization itself (Khotimah, 2018, p. 24). Rasyida Kidney Special Hospital, in this case, has been good at resolving problems that occur, especially regarding HMIS, by providing IT staff who are always on standby to help HMIS users with specific problems. This benefit is felt directly by HMIS users and also speeds up the user's work.

CONCLUSION

The success of implementing HMIS at the Rasyida Kidney Special Hospital in Medan is influenced by factors such as information quality, service quality, user satisfaction,

organizational structure, and organizational environment. The user satisfaction variable has an influence of 79.9% (R-square 0.799), which shows that the independent variables in this research affect user satisfaction. The higher user satisfaction, the more it will affect the use of HMIS.

Based on the results that have been described previously, suggestions that can be given for Rasyida Kidney Special Hospital include increasing bandwidth by 50mbps, from initially only 50mbps to 100mbps, so that the network is stable. Error problems can be overcome, and the current computer specifications can be increased. Hence, users can run the HMIS application properly if an application update is necessary. The results of this research can be used as a reference for future improvements and development of HMIS to improve service performance. Further research is needed on other factors that influence the implementation of HMIS to improve the quality of information systems.

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