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Hospital Management Information System Implementation Assessment Using HOT-FIT Model in Langsa General Hospital Aceh, Indonesia

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Abstract

In providing the best health care to the community, hospitals as health care facilities utilize technologies that are influenced by developments and advances in medical sciences and technologies. One of such technologies is the information management technology. Since the quality of information processing is an essential factor for succesful medical care of patients, Regulation of the Minister of Health of the Republic of Indonesia Number 82 of 2013 requires all hospitals to implement a hospital information management system (HIMS). To assess the successful implementation of HIMS, various models and frameworks have been developed, including the HOT-FIT model. This study aimed to analyze the implementation of the hospital management information system at Langsa General Hospital, Aceh, Indonesia, using the HOT-FIT model which applied the SEM-PLS method. This quantitative study was performed in approximately three months using the HOT-FIT (company, technology-FIT human,) framework that includes nine variables of system quality, information quality, service quality, organization structure, facility situations, support from leadership, system usage, user satisfaction, and net benefits. Data analysis was performed using the SEM-PLS analysis in SmartPLS application (V.3.2.9). Results showed that human, organization, and technology supports were factors that influence the successful implementation of HIMS. To conclude, the HOT-FIT model can be used to identify the factors that influence the successful implementation of HIMS to inform the HIMS improvement in the hospital that will eventually improve the hospital's quality system, information, service quality, and user satisfaction.

Keywords: HOT-FIT, hospital, SIMRS

Introduction

A computerized system called the Hospital Management Information System (SIMRS) is known to run data quickly and accurately, creating a variety of relevant information available to managers at all levels of the hospital.[1,2] The implementation, management, and development of SIMRS must be able to improve and support the health service process in hospitals, which includes: speed, integration accuracy, service improvement, efficiency improvement, and ease of reporting in operational implementation.[3] In general, the purpose and advantage of SIMRS are to provide accurate and timely information for decision-making at all management levels in hospital planning, implementation, monitoring, control, and evaluation.[4,5]

SIMRS is needed in supporting health services and is essential in producing information that hospital managers use for decision-making. Therefore, it is crucial to pay attention to and further study the success of implementing SIMRS.

In assessing the success of SIMRS, various methods can be used, one of which is the HOT-FIT method. One of the theoretical frameworks used to judge the effectiveness of medical information systems is the HOT-FIT technique.[1] The HOT-FIT approach targets the adequacy of relationships between the core components of information systems: humans, organizations, technology, and the three parts. The human who evaluates based on an information system (system use) is associated with those who apply the information system, who accepts or rejects the training, experience, knowledge, expectations, and attitudes. Organizations evaluate organizational structure and environmental systems regarding organizing, administration, system control, top management support, and financing. Technology that evaluates system quality, information quality, and service quality[6]

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Langsa General Hospital Aceh is a type B hospital in Langsa City, Aceh, established in 1915. Langsa General Hospital has a vision of the Langsa City General Hospital becoming the leading hospital in the eastern region of Aceh. The information technology management unit in Langsa General Hospital has a vision of making technology fast, accurate, and accurate complete information as a supporting facility for hospital health services. Langsa General Hospital Acehl already has a SIMRS application developed by a third party (SIMRS developer). It was assisted by a foreign NGO (GTZ-Health) in 2006 and managed directly by the Langsa General Hospital IT team. The SIMRS application has been used in hospital operations.

Based on information from the IT unit, the Langsa General Hospital SIMRS is still valid in the administration section. The SIMRS of Langsa General Hospital is in the Independent Online Website Development stage by the IT Unit of Langsa General Hospital Aceh. The reason for developing SIMRS Mandiri is that the old version of SIMRS still has a lot of bugs and errors. Also, the implementation of SIMRS at Langsa Hospital has never been evaluated, so in this study, it is necessary to evaluate the implementation of SIMRS at Langsa Hospital.

SIMRS evaluation at Langsa General Hospital Aceh should be performed when evaluating, measuring, improving, or completing a hospital management information system to find potential problems facing users and organizations. The results of this study may shed light on the successful implementation of SIMRS at Langsa General Hospital Aceh.

This study analyzed the fruitfulness of implementing a hospital management information system at Langsa General Hospital Aceh.

Methods

This type of research is quantitative research by method descriptive research that is finding a deeper picture of the utilization of management information systems Hospital (SIMRS) at Langsa General Hospital. Research subjects where the number overall research subjects were 70 respondents from several units' services and objects to be researched/evaluated by researchers in this research. Data collection using data collection techniques In-depth interviews (in-depth interviews), namely conducting in-depth interviews with 70 respondents at the Langsa General Hospital Aceh. The research was conducted at Langsa Hospital in January-April 2022. In this research, the technique of sampling used researcher is purposive sampling, and the research subjects became a sample of 70 respondents from several service units and objects to be researched/evaluated by researchers. The sample was selected using inclusion criteria, where the sample was SIMRS users at Langsa General Hospital Aceh. The respondent criteria data: age (20–50) years; gender (male and female); education (senior high school, diploma, bachelor degree); working period (1–3 or more) years.

This study uses the HOT-FIT method. HOT-FIT is a theoretical framework used to evaluate or assess an information system's success in health services. This assessment approach describes the whole information system's components.[1,7] A semi-structured questionnaire was adapted from a questionnaire by Abda'u and Winnarno, which was developed in the Indonesian version, and the results were then translated into English. The questionnaire consists of 41 indicators divided into nine variables; top support management, user satisfaction, facility condition, information quality, service quality, system quality, net benefit, system use, and organization structure. This study scored each item with a Likert scale (1 to 5). The research analysis of data used SEM-PLS modeling. PLS can describe variables that are not directly measured (latent variables) and are calculated using indicators. PLS is used because the data is not hypothetical, does not have to be regularly distributed, nor is the number of samples required. PLS is also used in information system research to study technology adoption.[8]

Two sub-models make up the SEM-PLS analysis: a model of measurement or an outer model and a structural model. The model of measurement or usually called the outer model is used to evaluate each indicator's reliability and validity. In comparison, the reliability test was carried out with two events: Crobanch's Alpha and Composite Reliability. The structural or inner model determines if there is an impact between the variables/correlations between the components measured using the PLS's t-test. The R-Square Model value, which depicts the degree of interaction between model variables, can be used to gauge the inner model. The estimation of the path coefficient, which comes after that, is in the following stage. This is the estimated value for the path connection in the structural model acquired by the bootstrapping technique (significance level 5 percent).[9]

Table 1 Convergent Validity

Variable	Indicator	Loading Factor	Description
Top management support	DP1	0.860	Valid
	DP2	0.845	Valid
	DP3	0.850	Valid
Facility condition	KF1	0.795	Valid
	KF2	0.847	Valid
	KF3	0.902	Valid
Information quality	KI1	0.773	Valid
	KI2	0.884	Valid
	KI3	0.862	Valid
	KI4	0.798	Valid
	KI5	0.781	Valid
Service quality	KL1	0.905	Valid
	KL2	0.832	Valid
	KL3	0.881	Valid
User satisfaction	KP1	0.759	Valid
	KP2	0.865	Valid
	KP3	0.848	Valid
	KP4	0.807	Valid
	KP5	0.818	Valid
	KP6	0.830	Valid
System quality	KS1	0.797	Valid
	KS2	0.840	Valid
	KS3	0.793	Valid
	KS4	0.820	Valid
	KS5	0.820	Valid
Net benefit	MK1	0.810	Valid
	MK2	0.847	Valid
	MK3	0.811	Valid
	MK4	0.836	Valid
	MK5	0.830	Valid
	MK6	0.854	Valid
System use	PS1	0.759	Valid
	PS2	0.773	Valid
	PS3	0.852	Valid
	PS4	0.831	Valid
	PS5	0.789	Valid
Organization structure	SO1	0.810	Valid
	SO2	0.826	Valid
	SO3	0.874	Valid
	SO4	0.847	Valid
	SO5	0.833	Valid

Table 2 Discriminant Validity (√AVE)

Variable	√AVE	Description
Top support management	0.726	Valid
User satisfaction	0.676	Valid
Facility condition	0.721	Valid
Information quality	0.674	Valid
Service quality	0.763	Valid
System quality	0.663	Valid
Net benefit	0.691	Valid
System use	0.643	Valid
Organization structure	0.703	Valid

AVE=average variance extracted

The study received approval from the University of Prima Indonesia's Health Research Ethics Committee with the number 012/KEPK/UNPRI/XII/2021.

Results

Validity of convergent, validity of discriminant, and reliability were three indicators used to assess the evaluation of the measurement model. The convergence validity is done by examining the standardized load factor. It represents the magnitude of the correlation between each indicator and its components by looking at the load factor value. The indicator is valid if the indicator load factor is positive and more significant than 0.5. A high load factor indicator indicates that the indicator is the strongest (dominant) variable that measures the variable. Table 1 shows the load factor values.

The validity of the discriminant is performed by testing if the value of √AVE is more than 0.5. This study conclude that the variables have excellent discriminative validity. The √AVE value for each variable is in Table 2.

Cronbach alpha and Composite reliability values are used in PLS to measure reliability. If Cronbach's alpha is indicated to be above 0.6 and the Composite reliability value is above 0.7, the data is considered reliable. Table 3 contains Cronbach's alpha and composite reliability values.

Structural model analysis or the inner model is carried out to see the relationship between the research model's construct, significance value, and R-square.

Table 4 indicates that the value of adjusted R-Square from the User Satisfaction variable of 0.898; it shows that the variables of information quality, service quality, system quality, and organization structure can explain 89.8 percent of the User Satisfaction variable, while the remaining 10.2 percent can be described by

Table 3 Reliability

Variable	Composite	Cronbach Alpha	Description
Top support management	0.888	0.811	Reliable
User satisfaction	0.926	0.904	Reliable
Facility condition	0.885	0.805	Reliable
Information quality	0.912	0.878	Reliable
Service quality	0.906	0.844	Reliable
System quality	0.908	0.873	Reliable
Net benefit	0.931	0.911	Reliable
System use	0.900	0.860	Reliable
Organization structure	0.922	0.894	Reliable

Table 4 Quality of FIT Test

Variable	R-Square	R-Square Adjusted
User satisfaction	0.903	0.898
Net benefit	0.760	0.753
System use	0.847	0.841

other variables not examined in this study. The net benefit variable's adjusted r-square value is 0.753, indicating that 75.3 percent of the net benefit variable can be accounted for by the facility condition and user satisfaction variable, and the remaining 24.7 percent by variables not examined in this study. The system uses the variable's adjusted r-square value is 0.841, which shows that 84.1 percent of the variance can be accounted for by the support of top management, the quality of a system, and also user satisfaction, and the remaining 15.9 percent is becoming able to get accounted for by variables not examined in this study. The system uses the variable's adjusted r-square value is 0.841, which shows that 84.1 percent of the variance can be accounted for by the support of top management, the quality of a system, and also user satisfaction, and the remaining 15.9 percent is becoming able to get accounted for by variables not examined in this study.

The methodology applied to test the hypothesis directly is if the p-value <0.05 (level of significance =5%) states that there reveals such a significant effect of exogenous variables on the endogenous variables.[10]

The figure of research hypotheses and Table 5 above can explain the results of hypothesis testing in this study: (1) the p-value of 0.035 and a t-statistical effect on system use of 2.111, the top management support variable is significant. These findings show that top management's support positively, significantly, and directly influences system use. (2) User satisfaction variable showed a t-statistic influence towards the net benefit of 6.425 with a p-value of 0.000. These findings suggest that user satisfaction also directly, positively, and considerably influences the net benefit. (3) User Satisfaction variable has a t-statistic influence on the system use of 2,416 with p-values of 0.016. These results indicate that user satisfaction gives such a positive and also significant influence on the use of the system

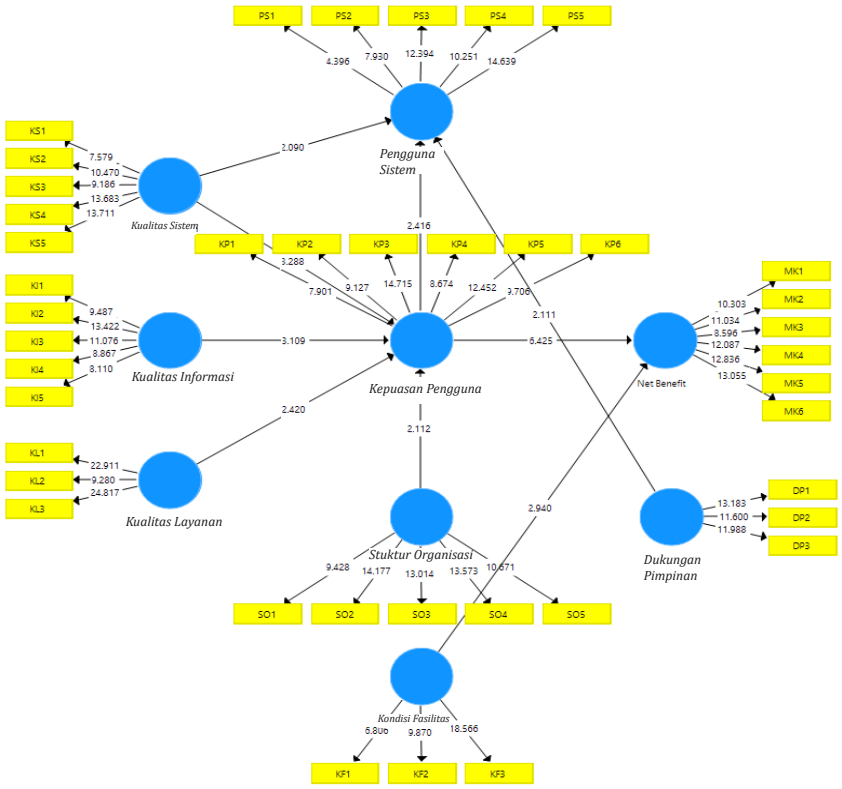

Figure Research Hypotheses

Table 5 Results of Hypotheses Testing

Variable	Sample Original (O)	Mean (M)	Deviation Standard (STDEV)	T-Statistic	P-Value
DP → PS	0.199	0.196	0.094	2.111	0.035
KP → NB	0.644	0.630	0.100	6.425	0.000
KP → PS	0.414	0.398	0.171	2.416	0.016
KF → NB	0.279	0.273	0.095	2.940	0.003
KI → KP	0.269	0.270	0.086	3.109	0.002
KL → KP	0.169	0.169	0.070	2.420	0.016
KS → KP	0.358	0.372	0.109	3.288	0.001
KS → PS	0.343	0.351	0.164	2.090	0.037
SO → KP	0.220	0.207	0.104	2.112	0.035

directly. (4) The facility condition variable has a t-statistic effect on the net benefit of 2,940 with a p-value of 0.003. These results indicate that the facility condition directly, significantly, and positively influences net benefit. (5) With a p-value of 0.002, the information quality variable has a 3.109 t-statistic influence on user satisfaction. The study results recommend that information quality directly impacts user satisfaction positively and significantly. (6) The service quality variable influences user satisfaction with a p-value of 0.016 and a t-statistic effect of 2,420. The results also suggest that service quality directly influences User Satisfaction with a positive and significant effect. (7) The t-statistic effect of the system quality variable on user satisfaction is 3.288, having a p-value of 0.001. the results add that system quality directly influences user satisfaction positively and significantly. (8) The system quality variable has a t-statistic effect on system use of 2,090 with a p-value of 0.037. These results indicate that the system's quality has a positive and significant influence on the use of the system directly. (9) The organization structure variable positively impacts user satisfaction with a p-value of 0.035 and a t-statistic of 2.112. The facts revealed from the research said that the organization structure directly influences user satisfaction with a positive and significant effect.

Discussion

HOT-FIT variables consist of Humans, namely user satisfaction and system use; organization, namely organizational structure, condition facility, and top management support; technology, namely the system quality, quality of information, and quality of service.[8]

The convergence validity is done by examining the standardized load factor. The indicator is valid if the indicator load factor is positive and more significant than 0.5. This study concludes that the variables top support management, user satisfaction, condition of facilities, information quality, service quality, system quality, net profit, system utilization, and organizational structure have excellent convergence validity. The load factor value for each variable is more than 0.5.

The validity of the discriminant is performed by testing if the value of $\sqrt{}$ave is more than 0.5. we can conclude that the variables top support management, user satisfaction, condition of facilities, information quality, service quality, system quality, net profit, system utilization, and organizational structure have excellent discriminative validity.

The reliability is considered reliable if Cronbach's alpha is indicated to be above 0.6 and the Composite reliability value is above 0.7. The variables top support management, user satisfaction, condition of facilities, information quality, service quality, system quality, net profit, system utilization, and organizational structure have reliability.

This indicates that the value of the adjusted r-square from the user satisfaction variable of 0.898; it shows that the variables of information quality, service quality, system quality, and organization structure can explain 89.8 percent of the user satisfaction variable, while the remaining 10.2 percent can be described by other variables not examined in this study.

With a p-value of 0.002, the information quality variable has a 3.109 t-statistic influence on

user satisfaction. The study's results recommend that information quality directly impacts user satisfaction with a positive and significant effect. This is consistent with the study findings of Putra.[14] User satisfaction is positively impacted by information quality. This is consistent with the studies of Pawirosumarto and Pawirosumarto[15] using a statistical procedure to draw conclusions or hypothesis testing. Analytical methods used generalized structured component analysis information (GSCA) quality focuses on the information generated by the system. The quality of information also means determining the success of the design of a system. This means the information system can succeed if users easily understand a system design.[15] These results indicate that User Satisfaction gives such a positive and also significant influence on the use of the system directly.

The service quality variable influences user satisfaction with a p-value of 0.016 and a t-statistic effect of 2,420. The results also suggest that service quality directly influences user satisfaction with a positive and significant effect. User satisfaction is positively impacted by service quality. This is consistent with the study conducted by Erlirianto et al.[4] Information technology is known as a technology that had such rapid growth during this time. Supporting information technology advances, access to available data or information can occur quickly and accurately. Technology impacts SIMRS because higher-quality systems, information, and services will boost system utilization and user satisfaction.[16]

The t-statistic effect of the system quality variable on user satisfaction is 3.288, having a p-value of 0.001. the results add that system quality directly influences user satisfaction positively and significantly. The system quality variable has a t-statistic effect on system use of 2,090 with a p-value of 0.037. These results indicate that the system's quality has a positive and significant influence on the use of the system directly. On the human factor, user satisfaction is positively related to using the system. This is consistent with studies by Krisbiantoro, which found that user satisfaction had a beneficial impact on system use. With a p-value of 0.035 and a t-statistic of 2.112, the organization structure variable positively impacts user satisfaction. The facts revealed from the research are said that the Organizational factors, namely organizational structure, positively correlate with user satisfaction. An organization is a formal group of people and their inseparable resources to achieve a goal or several goals.[12] The system used is influenced positively by top management support. It is also revealed by the study of Mkonya et al., where evidence was obtained that top management support significantly influences the system and users.[13]

These results imply that the technology element significantly and positively influences system use and user satisfaction. To explicitly accept the concept that system quality affects the system to use and that information, service, and system quality all impact user satisfaction. This is consistent with Putra's studies.[14] Good technology support will benefit the organization and staff. The use of technology in work is beneficial for the users and the hospital.[12,17]

The net benefit variable's adjusted r-square value is 0.753, which indicates that the facility condition and user satisfaction variable can account for 75.3 percent of the net benefit variable. The remaining 24.7 percent are by variables not examined in this study. The facility condition variable has a t-statistic effect on Net Benefit of 2,940 with a p-value of 0.003. These results indicate that the facility condition directly, significantly, and positively influences net benefit. The user satisfaction variable showed a t-statistic influence towards the net benefit of 6.425 with a p-value of 0.000. These findings suggest that user satisfaction also directly, positively, and considerably influences the net benefit. Additionally, user satisfaction is a strong predictor of net benefits. According to Astria dan Nugroho's study, this is accurate.[3] User satisfaction is a general assessment of the user's interaction with the information system and its possible effects. Personal traits, perceived advantages, and user attitudes toward information technology determine user satisfaction. While using the system must precede user satisfaction in processes, a positive experience with using the system will encourage greater user satisfaction in terms of causality. In this case, increasing user satisfaction will encourage increasing the intensity of using information systems.[11]

The system uses the variable's adjusted r-square value is 0.841, which shows that 84.1 percent of the variance can be accounted for by the support of top management, the quality of a system, and also user satisfaction, and the remaining 15.9 percent is becoming able to get accounted for by variables not examined in this study. The top management support variable is significant. These findings show that the support of top management gives such a positive,

significant, and direct influence on system use.

The SIMRS of angsa General Hospital Aceh with the SEM-PLS method using the HOT-FIT framework shows that the SIMRS of Langsa General Hospital Aceh is quite good. The limitations of the researchers are that there are still variables that have not been studied, so future researchers should examine other variables that were not examined in this study to find out more about the quality of SIMRS at Langsa General Hospital Aceh, Indonesia.

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