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Success Analysis of Hospital Management Information System Using MMUST and IT Balanced Scorecard (Case Study of Bhakti Husada General Hospital Banyuwangi)

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ABSTRACT

The management information system acts as an information manager for organizational management, users as data processors, and organizational leaders as those who carry out the control mechanism. Currently HMIS at Bhakti Husada General Hosiptal is in the development stage in order to realize the ideal HMIS. MMUST is a model for assessing system success in mandatory environments and IT Balanced Scorecard used to measure success organizational performance and consider internal processes. This type of research is quantitative with cross sectional. Data from 45 HMIS users who were selected using disproportionate stratified sampling were analyzed using the SEM-PLS technique. The results of the MMUST analysis show that the variable condition of the facility affects attitudes and attitudes affect the overall quality in supporting the success of HMIS. The results of the IT Balanced Scorecard analysis show that the performance of HMIS RSU Bhakti Husada is categorized as good. Bhakti Husada General Hospital need to consider budget allocation for the HMIS module integration development by collaborating with several developers so that they can accelerate HMIS development, provide user authorization to hospital employees according to their main tasks and functions, and developing HMIS capable of implementing electronic medical records.

Keywords: HMIS; MMUST; IT balanced scorecard; HMIS success

INTRODUCTION

The Hospital Management Information System (HMIS) is a series of activities that includes all health services provided by hospitals at all administrative levels that can provide information related to the health service management process in hospitals[(1)]. The success of an information system can be seen from several things such as how good the quality of the system is, the quality of the information provided, how the level of use, and user satisfaction is and other things that show how much effect is obtained by the existence of the information system[(2)]. With a quality information system, the presence of HMIS acts as the main resource that has strategic value to be able to manage information effectively and efficiently to achieve the hospital's vision and mission.

Bhakti Husada General Hospital is one of the hospitals that has implemented HMIS since 2010. However, until now HMIS is still in the system development stage which is limited to only 1 developer. Preliminary studies have been conducted by interviewing 20 respondents and found several obstacles in the use of HMIS which include 1) the HMIS module has not been optimally integrated, 2) the HMIS output which is a hospital reporting requirement has not been fulfilled optimally, 3) there are errors HMIS users in entering and updating data, 4) there is no user manual for HMIS, and 5) frequent employee turnover, but no HMIS training for new employees. These obstacle indicate a failure in system development at the Bhakti Husada General Hospital. This is in line with the statement by Janson[(3)] and Lucas[(4)] that the failure of system implementation usually occurs because the system is not compatible with the business processes and information needed by the organization. Implementation failure can be minimized by measuring the success of HMIS. These measurements can be used to assess the success of HMIS implementation as well as to support the hospital's needs in achieving the hospital's vision, mission, and strategy.

Measurement of the success of information systems is often done based on investment in the use of HMIS by calculating the return on investment. Based on the development of the benefits of information systems, especially in achieving the vision, mission, and strategy, the method of balanced scorecards[(5)] and IT benchmarking[(6)] was developed. Previous researchers made a model for measuring the success of information systems with a focus on users as the main key to successful implementation of information systems [(7-9)]. Some of these research methods have not distinguished the nature of the use of the system, whether it is mandatory or voluntary. Chang E. Koh, et. al[(10)] created a model for assessing the success of a mandatory information system known as the Model for Mandatory Use of Software Technologies (MMUST). This study uses the combined assessment of HMIS success through analysis of HMIS performance in achieving the hospital's vision, mission, and strategy with the IT Balanced Scorecard and measures the variables that affect the success of HMIS from the user aspect with MMUST. There are 2 perspectives in the IT Balanced Scorecard used in this study, namely corporate contribution and user orientation. The MMUST variables that affect the success of HMIS at

Bhakti Husada General Hospital Banyuwangi, which consists of four measurement variables, namely attitudes, facility conditions, overall satisfaction, and overall benefits[11].

The objectives of research are to analyze the success of SIMRS using the Model for Mandatory Use of Software Technologies and IT Balanced Scorecard at Bhakti Husada General Hospital Banyuwangi.

METHODS

This research was categorized into analytic quantitative research with a cross sectional design. The population in this study were 156 users of HIMS at Bhakti Husada General Hospital Banyuwangi. The sample size for this study was calculated using the Lameshow formula, as follows:

$$n = \frac{N.Z^2_{1-\alpha/2}.p.q}{d^2 (N-1) + Z^2_{1-\alpha/2}.p.q}$$

n: sample size; n: population size; $Z^2_{1-\alpha/2}$: Z value on degree of significance (95%=1.96); p: approximate proportion (0.2); q: 1-p; d: absolute precision (10%)

The sample size was 45 respondents who were selected through disproportionate stratified sampling; from strategic management, tactical management, and operational management (Table 1). This study used an instrument in the form of an online-based questionnaire, namely google form with a Likert scale for data collection.

Table 1. Research sample

Management level	Unit	Population	Sample
Strategic management	Head of hospital head of division	5	1
Tactical management	Unit head head of room	24	7
Operational management	Medical personnel, paramedic, other health workers, non-health workers	127	37
	Total	156	45

The data were analyzed by Structural Equation Modeling Partial Least Square (SEM-PLS) using SmartPLS.

RESULTS

Quantitative data analysis was carried out based on questionnaire data received by 45 respondents. Most of the respondents are women (60%), nursing profession (44.4%), education background D3 (55.56%). PLS analysis consists of two stages, namely the outer model and the inner model.

Table 2. Characteristics of research respondents

Characteristics	Criteria	System Management Level			Frequency	Percentage
		Strategic	Tactical	Operational		
Age	< 30 years old	-	3	14	17	37.8
	31-40 years old	1	2	13	16	35.6
	41-50 years old	-	2	9	11	24.4
	51-60 years old	-	-	1	1	2.2
	>60 years old	0	0	0	0	0
Gender	Man	1	3	14	18	40.0
	Woman	-	4	23	27	60.0
Last education	SMA/SMK	-	-	3	3	6.7
	D3	-	2	23	25	55.6
	D4	-	-	4	4	8.9
	S1	1	4	4	9	20.0
	Nurse	-	-	2	2	4.4
	Dentist	-	-	1	1	2.2
	S2	-	1	-	1	2.2
Position	Head of finance	1	-	-	1	2.2
	Head of Room	-	5	-	5	11.1
	Unit head	-	2	-	2	4.4
	Nurse	-	-	20	20	44.4
	Midwife	-	-	4	4	8.8
	Other implementing staff	-	-	13	13	28.8
Unit	Insurance services and JKN	-	-	7	7	15.5
	Medical support services	-	1	3	4	8.8
	Nursing service	-	2	17	19	42.2
	Medical services	-	3	5	8	17.7
	Administration and finance	1	-	4	5	11.1
	Communication and IT	-	1	1	2	4.4

Measurement Model

The tests carried out include validity testing (convergent validity and discriminant validity) and reliability testing.

Convergent Validity

For exploratory research, the loading factor value must have a value > 0.05. Loading factor is the amount of correlation between indicators and latent variables. In Table 3 it can be seen the results of the loading factor for each indicator owned by each variable.

In addition, convergent validity also looks at the AVE (average variance extracted) value with a value > 0.7. Table 4 shows the AVE value of the research variables.

Table 3. Convergent validity test results

Variable	Indicator	Loading factor
Attitude	S1	0.936
	S2	0.970
	S3	0.932
	S4	0.929
Overall Satisfaction	KSK1	0.882
	KSK2	0.943
	KSK3	0.941
	KSK4	0.910
	KSK5	0.903
Facility Condition	KF1	0.882
	KF2	0.843
	KF3	0.941
	KF4	0.910
	KF5	0.904
Overall Benefit	MF1	0.836
	MF2	0.858
	MF3	0.961
	MF5	0.873

Table 4. AVE value

Variable	AVE
Attitude	0.887
Facility condition	0.839
Overall satisfaction	0.839
Overall benefit	0.780

Discriminant Validity

Table 5 shows that the value of the square root of the variable AVE is greater than the other values (indicated by numbers in bold on the diagonal line). Each loading of each variable is the largest of its cross-loading, so it can be concluded that there is no discriminant validity problem (all variables have high discriminant validity).

Table 5. Cross loading

	S	KF	KSK	MF
S	**0.942**	0.755	0.756	0.154
KF	0.770	**0.916**	0.854	0.740
KSK	0.815	0.760	**0.916**	0.146
MF	0.089	0.049	0.096	**0.882**

Composite Reliability

Reliability is measured by looking at the Composite Reliability or Cronbachs Alpha value. The composite reliability value must be >0.7[(12)]. The value of the reliability test can be seen in table 6.

Table 6. Cronbach's alpha value and somposite reliability

Characteristics	Cronbach's Alpha	Composite reliability
Attitude	0.958	0.887
Facility condition	0.952	0.839
Overall satisfaction	0.952	0.839
Overall benefit	0.914	0.780

Structural Model

Inner models (structural model) is a pattern of relationships between research variables. Evaluation of the structural model by looking at the coefficients between variables and the value of the coefficient of determination R square (R^2). The R^2 value is divided into 3 classifications, namely strong (0.67), moderate (0.33), and weak (0.19)[(12)]. The value of R^2 can be seen in Table 7.

Table 7. R-square (R^2) value of research variables

Variable	Adjusted R square
Facility condition	-
Attitude	0.721
Overall satisfaction	0.637
Overall benefit	0.018

Based on Table 7 it can be interpreted that the variables that do not have R^2 are independent variables or variables that are not influenced by other variables. The attitude variable has an R2 value of 0.721 so that this model is included in the category of a strong model. it can be interpreted that the attitude variable can be explained by the variable condition of facilities and performance expectations of 72.1% while the remaining 27.9% is explained by other variables not included in this model. The overall satisfaction variable has an R2 value of 0.637 so this model is included in the moderate model category. it can be interpreted that the overall satisfaction variable can be explained by the attitude variable of 63.7% while the remaining 36.3% is explained by other variables not included in this model. The overall benefit variable has an R2 value of 0.018 so that this model is included in the weak model category. it can be interpreted that the overall benefit variable can be explained by the overall satisfaction variable of 1.8% while the remaining 98.2% is explained by other variables not included in this model.

Identify the MMUST Variables that Affect the Success of HIMS

Hypothesis testing was done by the bootstrapping method. The value of T table with a significance level of 0.05 and degrees of freedom (df) = (n-1) = (45-1) = 45 for the one-tailed hypothesis is 1.66. If the value of T statistic the value of T table, then the effect of one variable with another variable is significant and the opposite applies. In addition to looking at the T value, you can also look at the P value. If P value value = 0.05 then the influence between one variable and another is significant and otherwise.

Table 8. Hypothesis test result

Hypothesis	Line		Path coefficient	T-statistics	p-value	Conclusion
	From	To				
H1	Facility condition	Attitude	1,852	4.997	0.000	Significant
H2	Attitude	Overall satisfaction	0.803	10.505	0.000	Significant
H3	Overall satisfaction	Overall benefit	-0.069	0.338	0.735	Not significant

The results of hypothesis testing in table 8 show that there are 2 variables that have a significant effect and 1 variable that has no significant effect on the success of HMIS at Bhakti Husada General Hospital. So it can be concluded that the hypothesis testing of HMIS success at Bhakti Husada General Hospital Banyuwangi is as follows:

1. There is an influence of facility conditions on attitudes on the success of HMIS at Bhakti Husada General Hospital Banyuwangi (hypothesis accepted)
2. There is an influence of attitude on overall satisfaction on the success of HMIS at RSU Bhakti Husada Banyuwangi (hypothesis accepted)
3. There is no effect of overall satisfaction on overall benefits on the success of HMIS at Bhakti Husada General Hospital Banyuwangi (hypothesis rejected)

Identification of Strategic Objectives, Strategic Measures and Achievements of Strategic Measures from the IT Perspective Balanced Scorecard HMIS

Alignment of hospital vision, mission and strategy with the vision, mission and strategy of the IT Unit is the first step in building the IT Balanced Scorecard. The alignment is shown in Table 9.

Aligning Hospital Vision and IT Unit Vision

For the sake of realizing a competent and competitive HMIS as well as the reliability of data management and reliable information systems, the IT Unit tries to develop and manage HMIS in supporting hospital services so that the vision of Bhakti Husada General Hospital becomes a leading health service business unit in Banyuwangi Regency.

Aligning Hospital Mission and IT Unit Mission

By providing reliable HMIS services to support corporate operations and providing software and hardware planning for companies according to hospital procedures and needs, the IT unit can support hospitals in providing quality and reliable health services and providing complete and integrated infrastructure.

Aligning Hospital Strategic Goals and IT Unit Strategic Goals

Bhakti Husada General Hosiptal participates in the development of public health in order to improve the quality of Indonesia's human resources spiritually and physically. To improve the quality of human resources as an effort to develop public health in the field of information technology, the IT unit is carried out through:

a. Implementation of a comprehensive and integrated HMIS
b. Develop HMIS application module to realize an effective and efficient management system
c. Develop HMIS infrastructure to support HMIS quality improvement
d. Improving the competency of IT Unit HR and user competencies related to HMIS

Aligning IT Unit Strategy with IT Balanced Scorecard Perspective

Table 9. Aligning IT unit strategy with IT balanced scorecard perspective

IT balanced scorecard	Strategic goals	Strategic size
Corporate Contribution Perspective	a. Implementation of a comprehensive and integrated HMIS b. Develop HMIS application module to realize an effective and efficient management system	a. Optimization of HMIS integration to support RS operations b. Availability of HMIS module as needed
User Orientation Perspective	a. Develop HMIS application module to realize an effective and efficient management system b. Develop HMIS infrastructure to support HMIS quality improvement c. Improving the competency of IT Unit HR and user competencies related to HMIS	a. Improved user satisfaction b. User competency improvement c. Improved user cooperation relationship with IT Unit

After aligning the vision, mission and strategy of the Hospital with the vision, mission and strategy of the IT Unit, the next step is to align the strategy of the IT Unit with the 2 perspectives of the IT Balanced Scorecard. The alignment aims to obtain strategic objectives that are in accordance with each IT Unit's strategy.

Planning Cause and Effect

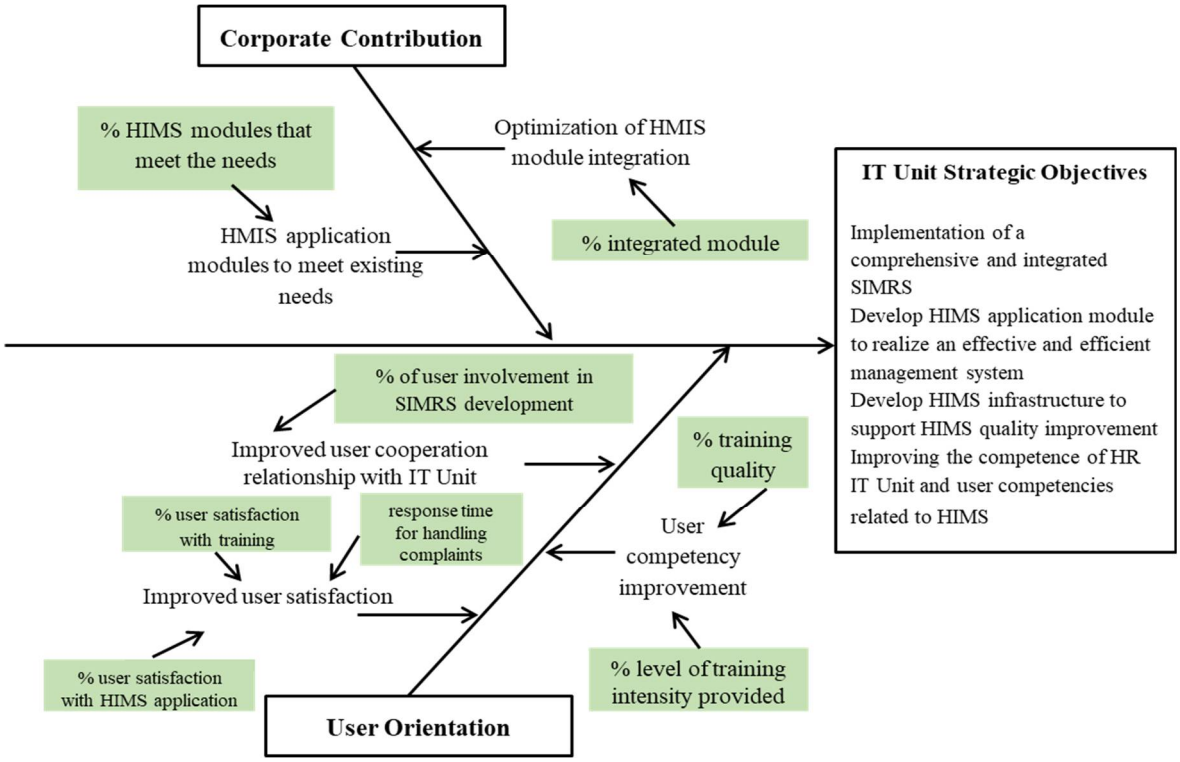

Figure 1. Fishbone Diagram based on Perspective IT Balanced Scorecard

IT Balanced Scorecard Measurement Results

The measurement of IT Balanced Scorecard is done by collecting the actual data of the hospital. After data collection is done, the next step is to calculate the achievement of the targets of each strategic measure.

Perspective of the Corporate Contribution

Table 10. Corporate contribution perspective

	Strategic Goals	Strategic Size	Target	Actual condition	Achievements
A.	Optimization of HMIS module integration	A.1% integrated modules	100% (19 modules)	89% (17 modules)	89%
B.	Availability of HMIS modules that suit your needs	B.1% HMIS modules that meet the needs	100%	82%	82%
		Total			171%
		Average			85%

Perspective of User Orientation

Table 11. User orientation perspective

	Strategic goals	Strategic size	Target	Actual condition	Percentage
A.	Improved user satisfaction	A.1% user satisfaction with HMIS application	100%	80%	80%
		A.2% user satisfaction with HMIS training	90%	71%	71%
		A.3% average response time for handling complaints	100%	52%	52%
		Total			203%
		Average			68%
B.	User competency improvement	B.1% training quality	90%	86%	86%
		B.2% intensity of training provided	75%	70%	70%
		Total			156%
		Average			78%
C.	Improved user cooperation relationship with IT Unit	C.1% user involvement in HMIS development	80%	62%	62%
		Total			62%
		Average			62%
		Total average			208%
		Overall average			69.3%

DISCUSSION

Analysis of MMUST variables that affect the success of HMIS

The facility condition has a significant influence on attitudes of the success HIMS. All units at Bhakti Husada General Hosiptal have computer and network facilities that are interconnected with HMIS. So, officers who will use HMIS can access it easily. This creates a positive attitude of officers to take advantage of the facilities provided to complete the work. These results are in accordance with the research of Mitropoulus[13] which states that attitude is a determining factor in mandatory implementation. Behavior in using HMIS is influenced by the fact that supporting facilities both physically and technically are available to support the system. Supporting facilities are a key factor in the successful implementation of HMIS[14]. Supporting facilities in the form of facilities and infrastructure such as hardware, software and network in each installation/unit are already available at Bahti Husada RSU. In addition, it is also required ffacilities non-technical support such as IT Staff assistance can be easily accessed. However, HMIS users at Bhakti Husada General Hospital feel that the training facilities are still lacking. *Training* new employees are carried out by employees old, not by IT staff. It can lead to misperceptions when employees long time can not explain in detail. Training can be done for old employees to improve knowledge related to the development of HMIS that has been carried out. Trainingwill improve understanding due to lack of knowledge, experience, and awareness of use HMIS[15].

The attitude has a significant influence on overall satisfaction of the success HIMS. The emergence of a positive attitude of officers to use HMIS in completing daily work, it will foster a feeling of satisfaction because their work tasks can be easily completed through HMIS. These results are in accordance with the study of Mitropoulus[13] attitude is an influential factor in implementing a technology that is mandatory. A positive attitude towards system users leads to high satisfaction with the system as a whole[10]. Satisfaction is a response that appears after users use HMIS. The positive attitude of users towards HMIS makes respondents satisfied and feels comfortable using HMIS to complete their work. To see the success of information systems in a mandatory environment, the right measurement is user satisfaction[16]. In a mandatory environment, users are required to use the system so that the intensity of use does not affect the success of HMIS implementation.

The overall satisfaction doesn't have a significant influence on attitudes of the success HIMS. HMIS user satisfaction at Bhakti Husada General Hospital has no significant effect on net benefits because of the 45 respondents there are 19% of respondents experiencing problems, namely several modules that have not been integrated so that it slows down the work process that must still be done manually even though there is an information system. This has an impact on the information generated by HMIS does not provide direct benefits to respondents as users of information systems. The results of this study are consistent with research by Panjaitan et al[17], user satisfaction does not have a significant effect on net benefits because of the 42 respondents who answered the questionnaire questions, 14% of respondents experienced problems in using the system so that the information obtained did not provide direct satisfaction and net benefits. to respondents. Another similar study is that user satisfaction does not have a significant effect on net benefits because of the obstacles faced by users of accountting information systems, especially in the cash search section. The number of users of an accounting information system may be one of the factors that slows down the index process.

Analysis of Performance Achievements IT Balanced Scorecard

The perspective of the company's contribution is measured by optimizing the integration of the HMIS module and the availability of the HMIS module that suits the needs. In general, the results of the company's contribution to the implementation of HMIS at Bhakti Husada General Hospital are categorized as good. However, to provide complete services, hospitals need the contribution of companies that are able to achieve maximum performance. The need for integration of the HMIS module that has not been optimally integrated requires the hospital's contribution in terms of budget allocation for HMIS development. Hospital management and IT units need to consider budget proposals for HMIS development.

Several respondents stated that there are several things/items that cannot be accessed through HMIS at this time, such as the accounting and staffing module. There are 2 modules that have not been integrated with HMIS, namely the accounting module (journal and mocker (VINA)) and the IHC module (FOPI (PBM IHC drug formulary) and DAKSPI (List of PBM IHC medical devices)). The perspective of the corporate's contribution has a mission to obtain a decent business contribution from IT investment. Based on this mission, IT investment, in this case HMIS investment, must be able to provide a proper business contribution for the hospital. The lack of maximum performance from this perspective can hinder the achievement of the HMIS unit strategy to be able to contribute to hospitals through HMIS implementation which will ultimately have an impact on not achieving hospital goals[18].

From the user orientation perspective, it can be said that this perspective has not achieved the expected performance. Health services by utilizing HMIS are able to provide convenience for users in completing work. However, the utilization of HMIS at Bhakti Husada General Hospital has not been optimal, both for services to patients and the hospital's internal management. This has an impact on the length of waiting time for patient services at the end of service units such as pharmacy units. In this case, RSU Bhakti Husada requires consideration to provide user authorization to service providers and develop an HMIS capable of implementing electronic medical records. Thus, the service is more effective and has integrated data and the service time can be carried out quickly and precisely.

There are only 2 IT officers and with a non-shift work system, if an error occurs, the response of the old officer is because the officer does not stand by in the IT room. Other than that, the limitations of IT staff also hamper the transaction/service process if the error occurs simultaneously or more than 1 unit. In addition, it is the responsibility of IT officers to comprehensively manage HMIS both software and hardware and IT networks at Bhakti Husada General Hospital Banyuwangi. User involvement in HMIS development is rarely carried out, because most users are HMIS operational implementing staff. If there is an idea/input, the user submits it to their respective superiors to be further

proposed during the supervisor's meeting regarding the development of HMIS. because most of the users are HMIS operational staff. If there is an idea/input, the user submits it to their respective superiors to be further proposed during the supervisor's meeting regarding the development of HMIS. because most of the users are HMIS operational staff. If there is an idea/input, the user submits it to their respective superiors to be further proposed during the supervisor's meeting regarding the development of HMIS.

Meanwhile, the achievement of the strategic goal of increasing user competence reached 78%, better than the other two strategic goals. HMIS design that is simple and easy to understand makes it easy for officers to understand the procedures for using HMIS in completing work. The training provided is peer-to-peer training. The limited staff of IT officers causes the IT unit to never conduct routine training for HMIS users. Training is given only to units that need it if there are problems or additional modules.

According to Grembergen[18] in his journal published by the ISACA Journal, he stated that the user orientation perspective has the mission of providing information systems as the main choice. Based on this mission, the IT Unit is expected to be able to provide a reliable information system to be able to assist users in carrying out their work so that HMIS is able to contribute to improving user performance and supporting services provided to patients. on the perspective of user orientation, namely increasing user satisfaction and increasing user cooperation with the HMIS unit.

CONCLUSION

The conclusion that can be drawn from this research is that the successful implementation of HMIS RSU Bhakti Husada is categorized both in the operational process, both from the front office and back office. however, to realize a complete service, it is necessary to develop a system that is in accordance with the needs of the hospital and is developed quickly, accurately, and comprehensively. The results of the MMUST analysis show that the variable condition of the facility affects attitudes and attitudes affect the overall quality in supporting the success of HMIS. The results of the IT Balanced Scorecard analysis show that the performance of HMIS RSU Bhakti Husada is categorized as good. The achievements of the company's contribution perspective and user orientation perspective need to be improved so that the hospital can realize the vision of becoming a leading hospital in the Banyuwangi area.

Based on the results of the MMUST and IT Balanced Scorecard measurements, the researcher recommends that Bhakti Husada Hospital allocates the HMIS module integration development budget by collaborating with several developers so that they can accelerate HMIS development, provide user authorization to hospital employees according to their main tasks and functions, and developing HMIS capable of implementing electronic medical records.

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