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The Effect of Information Technology and Human Resources Utilization on Hospital Performance Mediated by Lean Hospital Implementation (Case Study of Hospital X)

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Abstract: This study aims to analyze the Influence of Information Technology Utilization and Human Resources on Hospital Performance Mediated by the Implementation of Lean Hospital (Case Study of Hospital X). The population in this study were all employees at Harapan Sehat Bumiayu Hospital. The sampling method used in this study was probability sampling. The determination of the sample in this study used a saturated/census sample. So the sample size used in this study was all employees at Harapan Sehat Bumiayu Hospital. The results showed that Information Technology has an influence on Lean Hospital. Human Resources have an influence on Lean Hospital. Information Technology has an influence on Hospital Performance. Human Resources have an influence on Hospital Performance. Lean Hospital has an influence on Hospital Performance. Lean Hospital cannot mediate the influence of Information Technology on Hospital Performance. Lean Hospital cannot mediate the influence of Human Resources on Hospital Performance.

Keywords: Utilization of Information Technology, Human Resources, Hospital Performance, Implementation of Lean Hospital.

INTRODUCTION

One way to improve hospital service performance is the application of the lean concept in hospital management. Furthermore, the lean concept is a systematic approach to identifying and eliminating non-value-added tasks while reducing waste continuously. This approach allows the flow of products with a pull system from the customer's perspective to achieve perfect satisfaction (Graban, 2018). Lean management or lean hospital is a management system that can be applied to identify, measure, analyze and solve problems that often arise in a hospital. The implementation of lean management in hospitals is carried out to improve and enhance the quality of service to patients by reducing two main problems, namely minimizing errors and reducing waiting times.

As a patient of a hospital, of course, we expect the quality of service provided to be optimal and of high quality, because if a hospital does not have good quality, it can cause

patients to be disappointed. If this is not immediately addressed comprehensively, it will cause a decrease in patient loyalty. Therefore, a suitable plan is needed that is in accordance with the challenges in the field, and prioritizes services that are really needed by patients. For example, emergency services that really need improvement in order to provide much better, proper, fast, and optimal services (Ato'illah, 2018).

Emergency services in hospitals are based on the principle of " Time Saving it's Life Saving " which means that every action in an emergency situation must be optimal, effective and efficient. The ER is designed to handle patients with life-threatening conditions, by involving skilled medical personnel and equipped with special equipment, so that services can be provided immediately and accurately. The suitability of ER services also depends on the implementation of proper triage. (Suta Wijaya, 2009 in Mahyudin, M., and Deli, H., 2021). The emergence of patient complaints regarding the quality of service in most hospitals is often found in the Emergency Installation (IGD). The ER is the entry point for patients with emergencies that must be able to provide emergency, fast and accurate services to patients to minimize mortality and prevent disability. Complaints regarding patient dissatisfaction can be caused by various problems that arise. Waste that often occurs in the ER unit is usually related to waiting time. This waste must be eliminated or minimized in order to reduce hospital costs, increase patient satisfaction, and improve patient and employee safety.

Various efforts to improve quality have been developed by the Ministry of Health, including accreditation of health service providers. Therefore, the accreditation momentum is the main strategy to improve the quality of hospital services. Hospital accreditation in Indonesia is carried out to assess compliance with accreditation standards. However, awareness of the importance of accreditation for improving the quality of patient services, although there has been an increase in prevalence, has not been interpreted properly (David et al., 2020). The impact of accreditation on hospitals is that hospitals can find out to what extent the services in the hospital meet national standards. Accredited status can also increase public trust in hospital services and as a tool to prevent malpractice cases, because in carrying out their duties, hospital personnel have clear Standard Operating Procedures (SOPs). Hospital accreditation has a positive impact on the quality of care provided to patients and patient satisfaction (David et al., 2020).

In the context of healthcare services, information technology has great potential to improve the quality of services. The use of information technology in hospitals covers various aspects, such as patient data management, use of electronic medical records, to the implementation of telemedicine services. According to a study by McKinsey et al. (2020), hospitals that successfully implement information technology effectively can increase operational efficiency by up to 20% and reduce medical errors by up to 30%. Therefore, it is important to examine how information technology can be optimally applied in healthcare services in hospitals, in order to improve efficiency and patient safety (Nursalim et al., 2024).

The implementation of the Harapan Sehat Bumiayu Hospital Management Information System using (SIMRS) KHANSA includes various features that support the needs of the hospital's business processes. The following are the main features that are usually found in SIMRS KHANSA to assist hospital operations and management, consisting of 1. Registration and Registration Module, 2. Electronic Medical Record (RME) Module, 3. Outpatient Management Module, 4. Inpatient Management Module, 5. Pharmacy Management Module, 6. Billing and Payment Module, 7. Doctor and Medical Personnel Scheduling Module, 8. Laboratory and Radiology Management Module, 9. HR and Payroll Management Module, 10. Report and Statistics Module, 11. Patient Queue System Module, 12. Nutrition and Catering Management Module, 13. Facility and Inventory Management Module, 14. Data Security and Privacy, 15. Notification and Reminder System.

System quality is not always directly related to user satisfaction. User satisfaction and good system quality do not always indicate that there are no problems related to human resource variables. In particular, human resources with high levels of education and work experience tend to have higher motivation and productivity. In this case, the hospital information management system plays a very important role in supporting the overall development of the hospital, especially in terms of increasing the efficiency and quality of health services (Febrita et al, 2021). However, although information technology, human resources, and hospital information systems have great potential in improving hospital performance, their implementation is not without challenges. In Indonesia, the challenge that is often faced is the limited technology infrastructure in several hospitals, including those experienced by Harapan Sehat Bumiayu Hospital. In addition, the cost of implementing information technology, including the development of an adequate hospital information system, can be an obstacle for hospitals with limited budgets. According to a report by the Indonesian Ministry of Health, only around 30% of hospitals in Indonesia have implemented a full hospital information system. Hospitals that have not implemented a hospital information system often face problems in managing patient data, administration, and resource management (Gunawan, 2023). In addition to technological challenges, other challenges come from the human resources aspect. Although information technology and hospital information systems can improve efficiency, this will not be effective if not supported by competent and adaptive human resources to new technologies. In many hospitals, human resources training for the use of information technology and hospital information systems is still limited.

METHOD

This research is included in the type of explanatory causality research , which is research that refers to research studies that aim to explain why certain events occur in certain situations. In quantitative research, explanatory studies are represented by experimental designs, which seek causal relationships between variables (Riazi, 2016:112). The independent variables in this study are information technology and human resources. While the dependent variables are hospital performance and lean hospital as mediating variables. In this study, the data used consists of primary data and secondary data. Primary data were obtained through the distribution of questionnaires to management, medical personnel, and non-medical staff at Harapan Sehat Bumiayu Hospital. This questionnaire was designed to measure research variables such as information technology, human resources, hospital performance, and lean hospital implementation. In addition, secondary data was also used, which included related documents, annual reports, and hospital accreditation records obtained from management. This secondary data is important to provide additional context and support the analysis in the study.

The population in this study was all employees at Harapan Sehat Bumiayu Hospital . The sampling method used in this study is probability sampling . Probability sampling is a sampling technique that provides an equal opportunity for each element (member) of the population to be selected as a sample member. According to Maruyama and Ryan (2014), a census is a calculation of all elements in a population and/or determination of the distribution of its characteristics, based on information obtained for each element. So the sample size used in this study was all employees at Harapan Sehat Bumiayu Hospital . Data analysis uses a structural equation model (SEM) to assess hypotheses because it has the ability to estimate various relationships and interrelationships when explaining measurement errors in the estimation process (Hair et.al., 2020:710). This study uses the Structural Equation Model-Partial Least Square (SEM-PLS), because SEM-PLS provides a conceptually interesting way

of testing a theory. This study uses the Structural Equation Model-Partial Least Square approach with a measurement model using the Smart PLS version 3 program.

RESULTS AND DISCUSSION

Descriptive Statistical Test

Descriptive statistics in research aims to determine the maximum, minimum, average (mean) and standard deviation values of each research variable. The results of the descriptive statistical test are shown in table 1:

Table 1. Descriptive Statistical Test Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
AVR_TI	112	1.65	4.94	3.6987	.70458
AVR_SDM	112	1.86	5.00	3.6988	.76414
AVR_LH	112	2.20	5.00	3.8464	.61100
AVT_KI	112	1.73	5.00	3.7618	.73226
Valid N (listwise)	112				

Source: Data Processing Results with SmartPLS

The descriptive statistical results in table 1 show that the Information Technology variable has a minimum value of 1.65 and a maximum value of 4.94 with an average value (mean) of 3.6987 and a standard deviation of 0.70458 . Furthermore, the Human Resources variable has a minimum value of 1.86 and a maximum value of 5.00 with an average value (mean) of 3.6988 and a standard deviation of 0.76414 . Then, the Lean Hospital variable has a minimum value of 2.20 and a maximum value of 5.00 with an average value (mean) of 3.8464 and a standard deviation of 0.61100 . Then, the Performance variable has a minimum value of 1.73 and a maximum value of 5.00 with an average value (mean) of 3.7618 and a standard deviation of 0.73226 .

Structure Testing (Inner Model)

Inner model testing is the development of a concept-based and theory-based model in order to analyze the relationship between exogenous and endogenous variables. This test consists of several stages analyzed using SmartPLS.

Coefficient of Determination Test

Evaluation of the inner model is done by looking at the coefficient of determination. The coefficient of determination aims to measure how far the model's ability to explain the variance of endogenous latent variables. Changes in the R-Square value can be used to explain the influence of certain exogenous latent variables on endogenous latent variables whether they have a substantive influence .

Table 2. R-Square Value (R^2)

Variables	R Square
Lean Hospital	0.644
Performance	0.820

Source: Data Processing Results with SmartPLS

The R Square value can be explained that the R Square value on the Lean Hospital variable is 0.644 . This shows that 0.644 or 64.4% of the Lean Hospital variable can be influenced by the Information Technology and Human Resources variables while the remaining 35.6% is influenced by other variables outside those studied . Then for the

Performance variable shows an R Square value of 0.820. This proves that 0.820 or 82% of the Employee Performance variable can be influenced by the Information Technology and Human Resources variables while the remaining 18% is explained by other variables outside those studied.

Hypothesis Testing

Hypothesis testing between constructs was carried out using the bootstrap resampling method . Hypothesis Test Calculation using SmartPLS version 3.2.9 can be seen from the Path Coefficient value , which is the t-statistic value of the relationship between variables in the study, with a significance level (α) of 0.05. The results of the hypothesis can be seen more clearly in the following table.

Table 3. Path Coefficient Values , t-Statistics and P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Information Technology -> Lean Hospital	0.351	0.362	0.095	3,714	0.000
Human Resources -> Lean Hospital	0.526	0.518	0.106	4.971	0.000
Information Technology -> Performance	0.261	0.261	0.100	2,608	0.009
Human Resources -> Performance	0.462	0.454	0.113	4.091	0.000
Lean Hospital -> Performance	0.280	0.285	0.130	2.155	0.032
Information Technology -> Lean Hospital -> Performance	0.098	0.101	0.051	1,946	0.052
Human Resources -> Lean Hospital -> Performance	0.147	0.153	0.084	1,760	0.079

Source: Data Processing Results with SmartPLS

The results of the first hypothesis test on the Information Technology variable on Lean Hospital produced a P-Value of 0.0 00 < 0.05. Thus, H1 is accepted, so it can be concluded that Information Technology has an effect towards Lean Hospital . The second hypothesis on the Human Resources variable towards Lean Hospital produces a P-Value of 0.000 < 0.05. Thus H2 is accepted, so it can be concluded that Human Resources have an effect towards Lean Hospital . The third hypothesis test on the Information Technology variable towards Performance produces a P-Value of 0.0 00 < 0.05. Thus, H3 is accepted, so it can be concluded that Information Technology has an effect on Performance. The fourth hypothesis on the Human Resources variable on Performance produces a P-Value of 0.0 09 < 0.05. Thus, H4 is accepted, so it can be concluded that Human Resources have an effect on Performance. The fifth hypothesis on the Lean Hospital variable on Performance produces a P-Value of 0.0 32 < 0.05. Thus H5 is accepted, so it can be concluded that Lean Hospital has an effect on Performance. The sixth hypothesis on the variable Information Technology on Performance mediated by Lean Hospital produces a P-Value of 0.0 52 > 0.05. Thus H6 is rejected, so it can be concluded that Lean Hospital cannot mediate the influence of Information Technology on Performance. The seventh hypothesis on the Human Resources variable on Performance mediated by Lean Hospital produces a P-Value of 0.0 79 > 0.05. Thus H7 is rejected, so it can be concluded that Lean Hospital cannot mediate the influence of Human Resources on Performance.

Discussion

The Influence of Information Technology on Lean Hospital

The results of the first hypothesis test on the Information Technology variable on Lean Hospital produced a P-Value of 0.0 00 < 0.05. Thus, H1 is accepted, so it can be concluded that Information Technology has an effect towards Lean Hospital . Information technology can help reduce administrative and clinical processes such as data input, patient information searches, and interdepartmental communication. According to Alvarez & Patterson (2021), the implementation of IT in a patient management system can reduce patient waiting times and improve data accuracy, which are important elements in a lean hospital to eliminate unnecessary waste of time. Information technology allows hospitals to make data-driven decision making , which is a decision based on accurate and real-time data. In a lean hospital , these data-driven decisions are important to identify areas of waste, such as excess inventory or process inefficiencies. In a study by Young & McClean (2021), it was found that IT allows medical teams to share patient information more quickly and accurately, which is in line with the principles of a lean hospital to ensure a fast flow of information without unnecessary obstacles.

The Influence of Human Resources with Lean Hospital

The results of the second hypothesis test on the Human Resources variable on Lean Hospital produced a P-Value of 0.0 00 < 0.05. Thus, H2 is accepted, so it can be concluded that Human Resources have an influence towards Lean Hospital . Changes in work culture in hospitals are needed to support Lean implementation. Human resources who are open to change and improvement will more easily adopt Lean principles (Drotz & Poksinska, 2021). A culture that supports this change must be implemented by all levels of management so that improvement efforts can run effectively. Research by Poksinska et al. (2022) shows that employee involvement greatly influences the implementation of Lean in hospitals. Lean will only be successful if human resources in the hospital are fully committed and involved in every stage of implementation. Employees who feel involved will be more motivated to contribute to continuous improvement efforts. The competence and ability of the workforce in implementing Lean methods are major factors in the success of Lean Hospital . A skilled workforce trained in Lean principles has a better understanding of how to identify and eliminate waste in the work process, thereby increasing efficiency and quality of service (Womack & Jones, 1996) in (Kusumastuti et al., 2024).

The Influence of Information Technology on Hospital Performance

The results of the third hypothesis test on the Information Technology variable on Performance produced a P-Value of 0.0 00 < 0.05. Thus, H3 is accepted, so it can be concluded that Information Technology has an effect on Performance. According to Amin (2021) information technology supports the digitization of medical records and hospital information management systems that streamline internal operations and increase staff productivity. Through the application of information technology in hospitals, it helps speed up administrative processes, reduces patient waiting times, and allows staff to manage data more quickly and accurately. Bates & Gawande (2003) in Amin et al. (2024) highlighted that information technology in hospitals such as automatic alert systems and electronic drug recording systems help reduce medical errors, which ultimately improves patient safety. Rezaei et al. (2021) revealed that with the existence of a management information system in hospitals, hospital administrators can obtain analytical data that helps in better decision making. This data includes patient statistics, facility usage, and treatment effectiveness, so that management can design more effective strategies. Mohammed et al. (2021) found that

information technology plays a role in increasing patient satisfaction by providing faster and more precise services.

The Influence of Human Resources on Hospital Performance

The results of the fourth hypothesis test on the Human Resources variable on Performance produced a P-Value of 0.0 09 < 0.05. Thus, H4 is accepted, so it can be concluded that Human Resources have an influence on Performance. The quality of human resources including the competence and skills of medical and non-medical personnel plays a role in determining the overall performance of the organization (Robbins & Judge, 2021). In the context of hospitals, well-trained human resources are able to provide high-quality services, reduce medical errors, and increase the efficiency of patient care time. In hospitals, motivational factors, such as incentives, recognition, and career development opportunities, are very important. If the workforce feels motivated, they tend to be more enthusiastic and dedicated to serving patients, which ultimately improves hospital performance. Through proper training, hospital human resources will be better prepared to face modern medical challenges, such as new technologies and innovative treatment methods. This improves the quality of health services and patient satisfaction. Research conducted by Effendy et al. (2024) states that human resource management (HR) has a very important role in improving hospital performance.

The Influence of Lean Hospital on Hospital Performance

The results of the fifth hypothesis test on the Lean Hospital variable on Performance produced a P-Value of 0.0 32 < 0.05. Thus, H5 is accepted, so it can be concluded that Lean Hospital has an effect on Performance. Lean Hospital focuses on improving operational efficiency by reducing processes that do not add value to patients. Womack & Jones (1996) in Kusmiati (2024) stated that Lean principles can increase productivity by reducing non-value-added activities. In the context of hospitals, the implementation of Lean has been shown to reduce patient waiting times, increase resource utilization, and improve workflow. This was stated by Anita and Yuliati (2024) that Lean can significantly increase efficiency and reduce waiting times in hospitals. By prioritizing patient needs and eliminating inefficient processes, hospitals can provide better and more timely services. Radhiana et al. (2025) showed that Lean can reduce production costs and increase profitability. By eliminating waste and increasing operational efficiency, companies can optimize production processes, improve product quality, and expand cost-benefit margins by optimizing processes and reducing the need for additional resources. In the long run, this results in significant savings for hospitals without reducing service quality.

The Influence of Lean Hospital in Mediating Information Technology on Hospital Performance

The results of testing the sixth hypothesis on the Information Technology variable on Performance mediated by Lean Hospital produced a P-Value of 0.0 52. > 0.05. Thus H6 is rejected, so it can be concluded that Lean Hospital cannot mediate the effect of Information Technology on Performance. Lean Hospital is a management approach that focuses on reducing waste and increasing efficiency in the health care process in hospitals. Lean Hospital plays an important role as a mediator between the implementation of information technology and improving hospital performance. Information technology provides an infrastructure that enables more effective data management and communication, but without the support of Lean Hospital , the use of this technology can be suboptimal. However, in the results of this study, lean hospitals cannot play an important role as a mediator in the implementation of information technology in improving hospital performance. These results

are different from the research of Ratnaningrum et al. (2023) which found that the effective implementation of lean hospital management will affect the level of patient satisfaction, namely a level of patient feelings that arise as a result of the performance of the health services they receive after patients compare it with what they expect, which ultimately contributes to overall hospital performance.

The Influence of Lean Hospital in Mediating Human Resources on Hospital Performance

The results of testing the seventh hypothesis on the Human Resources variable on Performance mediated by Lean Hospital produced a P-Value of 0.0.79 > 0.05. Thus, H7 is rejected, so it can be concluded that Lean Hospital cannot mediate the influence of Human Resources on Performance. Lean Hospital is a management approach adapted from the Lean Manufacturing concept to increase efficiency and reduce waste in hospitals, so that patient services can be faster, more efficient, and of better quality. The implementation of Lean Hospital can strengthen the role of HR in improving operational performance and hospital services. Womack & Jones' (2003) research in (Kusumastuti et al., 2024) revealed that Lean practices not only increase productivity but also increase employee and patient satisfaction by simplifying work processes. On the other hand, Graban (2021) in his research emphasized that with the support of proper management, HR training, and the implementation of Lean Hospital, hospitals can achieve higher efficiency and reduce excessive workloads that often reduce service quality. This study shows that Lean Hospital functions as a " mediator " that optimizes HR potential to achieve better hospital performance. However, the results of this study indicate that lean hospitals cannot act as a mediator in human resources in improving hospital performance.

CONCLUSION

Based on the results of statistical tests, it can be concluded that Information Technology has an influence on Lean Hospital . Human Resources has an influence on Lean Hospital. Information Technology has an influence on Hospital Performance. Human Resources has an influence on Hospital Performance. Lean Hospital has an influence on Hospital Performance. Lean Hospital cannot mediate the influence of Information Technology on Hospital Performance. Lean Hospital cannot mediate the influence of Human Resources on Hospital Performance.

Hospitals must continue to develop and update existing IT infrastructure, both in terms of hospital management information systems (SIMRS), diagnostic tools, and applications that support communication and coordination between departments. Good data integration can provide more accurate information for better decision making. Hospitals need to focus on better HR planning. This includes recruiting quality medical personnel, providing ongoing training, and welfare programs to increase employee motivation and productivity. A competent and motivated team will be more effective in providing quality services. Hospitals must conduct regular evaluations and monitoring of the implementation of Lean Hospital , information technology, and HR management to ensure that all these elements are running according to plan and have a positive impact on hospital performance. By conducting regular evaluations, hospitals can adjust strategies and approaches to achieve better goals in terms of service quality and operational efficiency.

Future researchers can explore more deeply the mechanism of influence between information technology and human resources on hospital performance. For example, although Lean Hospital did not mediate the influence in this study, there may be other factors that influence the course of the influence, such as aspects of organizational culture or the level of technology adoption in the hospital. Using a broader mediation or moderation approach, such

as analyzing the interaction between various factors internal and external to the hospital, could provide deeper insights. Future studies can deepen the specific aspects or dimensions of Lean Hospital that may play a greater role in improving hospital performance. The implementation of Lean Hospital is not only related to efficiency, but also to quality management and patient satisfaction. Researchers can further examine whether there are certain elements of Lean (such as waste reduction, continuous improvement, or employee empowerment) that are more directly related to hospital performance, and whether these dimensions are more effective in certain contexts.

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