



The Effect Of Bridging Lis With Simrs Moderated Infrastructure, Competencies And Procedures On Waiting Time For Laboratory Results

(Study on Laboratory Personnel at dr. H. Andi Abdurrahman Noor Hospital, Tanah Bumbu Regency)

Alamsyah¹, Rian Andriani², Bambang Sukajie³

^{1,2,3}Master of Management Postgraduate Program, Adhirajasa Reswara Sanjaya University, Bandung

Email: ¹ppdspatkin2016@gmail.com, ²rian_andriani@ars.ac.id, ³b_s_ajie@yahoo.com

Article Info

Article history:

Received Jul 19, 2026

Revised Aug 27, 2026

Accepted Sept 22, 2026

Keywords:

Bridging LIS with SIMRS, Infrastructure, Competence, Procedure, Waiting Time for Laboratory Results

ABSTRACT

This study aims to analyze the effect of bridging LIS with SIMRS, moderated by infrastructure, competence, and procedures, on laboratory result waiting times, considering the mediating role of laboratory result waiting times. This study was conducted at Dr. H. Andi Abdurrahman Noor Regional General Hospital, Tanah Bumbu Regency, using a quantitative approach and a causal design. A total of 30 respondents were selected as the sample using a purposive sampling technique. Data were collected through questionnaires and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results of the study indicate that bridging LIS with SIMRS affects infrastructure, bridging LIS with SIMRS affects competence, bridging LIS with SIMRS affects procedures, bridging LIS with SIMRS affects waiting time for laboratory results, infrastructure affects waiting time for laboratory results, competence affects waiting time for laboratory results, procedures affect waiting time for laboratory results, bridging LIS with SIMRS affects waiting time for laboratory results moderated by infrastructure, bridging LIS with SIMRS affects waiting time for laboratory results moderated by competence, bridging LIS with SIMRS affects waiting time for laboratory results moderated by procedures at RSUD dr H Andi Abdurrahman Noor. This study suggests improving infrastructure, competence and procedures so that the implementation of LIS bridging is good and has an impact on the speed of waiting time for laboratory results.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Alamsyah

Master of Management Postgraduate Program, Adhirajasa Reswara Sanjaya University, Bandung

Email: ppdspatkin2016@gmail.com,

1. INTRODUCTION

Laboratory services are an important part of the diagnosis and treatment process of patients because the results of the examination are the basis for medical personnel to determine the right action. However, the delay in submitting laboratory results is still a problem in various hospitals, including dr. H. Andi Abdurrahman Noor Hospital. These conditions can be influenced by an administrative system that has not been integrated, examination queues, limited manpower, and infrastructure and human resource constraints.

Junjungsari (2019) found that 56.7% of laboratory service waiting times have not reached hospital quality standards. Siagian (2019) also reported that 267 patients (7.03%) experienced a waiting time for laboratory results of more than 180 minutes, while the service standard was set at a maximum of 60 minutes. Delays mainly occur in the process of sample examination and submission of results.



One of the efforts to improve service efficiency is the integration of the *Laboratory Information System* (LIS) with the *Hospital Management Information System* (SIMRS). LIS functions to manage the laboratory examination process from registration to reporting results, while SIMRS manages various aspects of hospital services. Through *bridging*, the results of the examination can be directly accessed by medical personnel through SIMRS, thereby reducing manual processes, waiting times, and the risk of recording errors.

Nugroho's research (2021) shows that the implementation of LIS-SIMRS is able to reduce the waiting time for laboratory results from an average of 4 hours to 2 hours. Arfiansyah (2022) also showed that the integration can reduce data recording errors. In addition to improving efficiency, the integration of LIS and SIMRS can improve the accuracy of medical data by automatically recording examination results to electronic medical records (Budiman, 2023).

At dr. H. Andi Abdurrahman Noor Hospital, LIS and SIMRS have been implemented, but there are still network connection constraints, devices that have not yet been supported, and human resource competencies that are not yet optimal. Therefore, this study is important to analyze "The Effect of *Bridging* LIS with SIMRS Moderated Infrastructure, Competencies and Procedures on the Waiting Time for Laboratory Results at dr. H. Andi Abdurrahman Noor Hospital, Tanah Bumbu Regency." The results of the research are expected to be the basis for improving the effectiveness and efficiency of laboratory services.

The purpose of this study is to analyze the influence of bridging LIS with SIMRS on infrastructure, competence, procedures, and waiting time for laboratory results, analyze the influence of infrastructure, competence, and procedures on the waiting time for laboratory results, and analyze the effect of bridging LIS with SIMRS on the waiting time for laboratory results with infrastructure, competencies, and procedures as moderation variables at dr. H. Andi Abdurrahman Noor Hospital

LITERATURE REVIEW

Laboratory Information System (LIS)

Laboratory Information System (LIS) is a computer-based application used to manage laboratory data, ranging from collection, management, and storage of patient data, test results, laboratory information, communication between laboratory departments, to reporting results. The implementation of LIS plays an important role in improving laboratory operational efficiency because various processes that were previously carried out manually can be automated, such as sample receipt and tracking, test scheduling, and result reporting. Such automation can reduce work that takes a long time and has the potential to lead to human error.

LIS also supports integrated data management. Patient data, medical history, test results, and other information can be recorded and accessed electronically. This integration makes it easy to track patient history, compile reports, and identify trends and patterns of examination results. In addition, LIS assists with quality control through quality control testing monitoring, equipment verification, trend monitoring, and result validation. The system also supports inventory management by assisting in the monitoring of chemicals, reagents, equipment, and other inventory.

In terms of reporting, LIS makes it easier to submit examination results to doctors, patients, and related parties through structured reports that can be submitted electronically. Thus, LIS can improve service coordination and support collaboration between health professionals.

The LIS workflow consists of three main stages, namely pre-analysis, analysis, and post-analysis. The pre-analysis stage includes system login, sample tracking, and inventory of materials and reagents. The analysis stage includes test scheduling, storage chain management, instrument integration, result input, and specimen examination. The post-analysis stage includes reporting results and archiving data.

1.2 Laboratory Information System (LIS) dr. H. Andi Abdurrahman Noor Hospital

The LIS used at dr. H. Andi Abdurrahman Noor Hospital is provided by PT Yamhatevi through the operational cooperation system (KSO). This system connects several laboratory tools so that the test results can be automatically entered into the system. LIS is also able to transfer information in two directions and retrieve data directly from the patient database contained in the SIMRS.

The implementation of LIS reduces or eliminates manual processes, especially in patient and specimen data entry. The system helps patients, dispatching doctors, laboratory personnel, and hospitals in providing faster, more accurate, and quality services.

1.3 Hospital Management Information System (SIMRS)

Hospital Management Information System (SIMRS) is an information and communication technology system that processes and integrates all hospital service flows in the form of coordination networks, reporting, and administrative procedures to produce precise, accurate, and fast information. SIMRS covers a wide range of processes,



.....
ranging from patient diagnosis and action services, medical records, pharmacies, pharmaceutical warehouses, billing, human resources, payroll, accounting, to management control.

The implementation of SIMRS requires six main components, namely human resources, hardware, software, computer networks, Standard Operating Procedures (SOPs), and monitoring. Human resources are responsible for the operation and management of the system. Hardware includes computers, printers, scanners, and storage media. Software functions to process data, while networks provide means of communication between devices. SOPs are guidelines for the implementation of the system, while monitoring is carried out to ensure that the data entered remains accurate.

SIMRS provides general, operational, managerial, and organizational benefits. Operationally, SIMRS improves the speed of administrative work, data accuracy, inter-unit integration, service quality, efficiency, and ease of reporting. Data that previously had to be entered repeatedly on each unit can be input once and used by the related unit. This reduces administrative burden and maintains data consistency.

Managerially, SIMRS helps speed up decision-making because information can be made available more quickly and as needed. The system also helps identify problems early through performance reports and supports the formulation of strategies based on the data and trends of available information. In the organizational aspect, SIMRS can encourage changes in work culture through discipline in data input, increase transparency, strengthen coordination between units, increase understanding of the flow of the hospital system, and reduce administrative costs in the long term.

SIMRS consists of various subsystems, such as financial information systems, inventory, assets, admissions, medical records, human resources, marketing, and executive information systems. The subsystems must be interconnected and work in harmony. Every system requires integrated hardware, software, brainware, procedures, databases, and communication networks.

1.3.2 Factors Affecting SIMRS

Some of the factors that affect the implementation of SIMRS include infrastructure, software, input devices, process devices, storage devices, and human resources. Infrastructure is a basic need to support the hospital's information system and communication network. The software serves as a link between the user and the hardware and executes various data processing instructions.

Input devices are used to enter data, such as keyboards, mice, monitors, and printers. Process devices include processors, motherboards, RAM, VGA, and power supplies that support data processing. Meanwhile, storage devices store data so that it can be reused when needed.

Human resources are an important factor in the success of SIMRS. Adequate technology and funding will not provide optimal results without competent human resources in managing and using the system. Therefore, regular training is needed which includes data standardization, system integration and interoperability, laboratory information management system, electronic medical record, clinical decision support system, digitization of services, as well as hospital admission, discharge, and transfer systems.

1.4 Hospital Information System dr. H. Andi Abdurrahman Noor Hospital

Dr. H. Andi Abdurrahman Noor Hospital uses the SIMRS Generic Open Source (SIMRS-GOS) application from the Ministry of Health. SIMRS-GOS is a solution for hospitals that do not have SIMRS and can be developed according to the needs of hospitals. The system is open source so the source code can be opened and modified. Its use requires information technology infrastructure in the form of networks, computers, and servers as well as human resource support who has competence in the fields of system analysis, programming, hardware, and network maintenance.

SIMRS-GOS has interoperability properties, i.e. it is able to interact with other applications through an agreed protocol. At dr. H. Andi Abdurrahman Noor Hospital, SIMRS-GOS is connected to the Laboratory Information System (LIS), so that laboratory examination requests and examination results can be connected between the two systems.

1.5 Bridging LIS dan SIMRS

Bridging is the process of connecting LIS with web-based SIMRS so that it allows for automatic and real-time data exchange. This integration allows laboratory test results to be displayed directly on SIMRS. Thus, the service process can be more optimal and efficient.

Bridging LIS and SIMRS can reduce the need for manual data entry so that the risk of recording and transcription errors can be minimized. In addition, the results of the examination can be delivered faster to health workers in need so as to support the service process and medical decision-making.

1.6 Waiting Time for Laboratory Results

Turn Around Time (TAT) is the duration from the time the sample or specimen is received by the laboratory until the examination is completed, the results are determined, and issued. Each laboratory can set a completion time



.....

according to the type of examination. Timely reporting of results is one of the important indicators of the quality of laboratory services because results must be able to be provided reliably, precisely, and accurately. Based on the Decree of the Minister of Health in 2008, the TAT for routine blood and blood chemistry tests is ≤ 140 minutes.

Wait times for laboratory results have an impact on patient care, hospital efficiency, cost-effectiveness, and patient satisfaction. Faster results allow healthcare workers to make clinical decisions faster, especially in acute and emergency conditions. From a hospital perspective, shorter waiting times can reduce patient wait times and length of treatment and optimize the use of resources. Faster diagnosis also has the potential to reduce complications and treatment costs. For patients, timely results can reduce anxiety and uncertainty during the diagnosis process.

In achieving optimal TAT, there are several challenges, namely logistical problems, technical challenges, and human resource problems. Delays in transportation as well as sample handling can prolong the process. Inadequate equipment and complex inspection processes can also add time. In addition, the limitation of qualified human resources can affect the efficiency and accuracy of the examination.

Strategies that can be carried out include improving work processes, applying automation and technology, training and human resource development, and improving communication between laboratories, doctors, and other health care providers.

1.7 Frame of Mind

Based on theoretical reviews, LIS and SIMRS are technologies that can improve the efficiency of laboratory services. Bridging between LIS and SIMRS allows for automatic synchronization of examination results, reducing manual processes and patient waiting times.

The integration is expected to have several positive impacts, namely accelerating data processing because the results are recorded directly in the SIMRS, reducing manual input errors, increasing the efficiency of medical personnel because the results can be accessed without waiting for physical documents, and increasing patient satisfaction through reducing waiting time.

The study on the effect of bridging LIS with SIMRS on the waiting time for laboratory results using a quantitative approach with experimental methods and questionnaire surveys on laboratory health workers. The data analyzed included the time of the inspection process before and after the implementation of bridging. The variables used include bridging LIS with SIMRS as the main variable, while infrastructure, competence, and procedures are factors related to the waiting time for laboratory results.

1.8 Hipotesis

The research hypothesis consists of ten alleged relationships, namely: (1) there is an effect of bridging LIS with SIMRS on infrastructure; (2) there is an influence of bridging LIS with SIMRS on competence; (3) there is an influence of bridging LIS with SIMRS on the procedure; (4) there is an effect of bridging LIS with SIMRS on the waiting time for laboratory results; (5) there is an influence of infrastructure on the waiting time for laboratory results; (6) there is an influence of competence on the waiting time for laboratory results; (7) there is an influence of procedures on the waiting time for laboratory results; (8) there is an effect of bridging LIS with SIMRS on the waiting time for laboratory results moderated by infrastructure; (9) there is an effect of bridging LIS with SIMRS on the waiting time for competency-moderated laboratory results; and (10) there is an effect of bridging LIS with SIMRS on the waiting time for laboratory results that are moderated by the procedure.

RESEARCH METHODS

Research Design

This study uses a type of observational research, which is research that collects data without intervening with the research subject. Based on its objectives, research includes causal research that aims to test hypotheses regarding the cause-effect relationship or influence of independent variables on bound variables. The approach used is cross sectional, which is the collection and measurement of research variables at one time without any follow-up.

Research Location and Time

The research was carried out at dr. H. Andi Abdurrahman Noor Hospital in April-June 2025.

Population and Sample

The research population is all health workers who work in the laboratory of dr. H. Andi Abdurrahman Noor Hospital, with a total of 30 people. Samples were taken using the total sampling technique, where all members of the population were sampled. The selection of this technique is in accordance with the consideration that the number of populations is less than 100, so the entire population can be used as a sample. Thus, the number of research samples is 30 respondents.

Data Collection Methods



The research data consists of primary data and secondary data. Primary data was obtained directly from respondents through a closed questionnaire, which is an instrument that provides a choice of answers so that respondents choose the appropriate answers. Data collection is also documented during interviews or filling out questionnaires as the basis for the validity of primary data. The measurement uses a Likert scale with five categories, namely a score of 1 for Strongly Disagree, a score of 2 Disagree, a score of 3 Neutral, a score of 4 Agree, and a score of 5 Strongly Agree.

Secondary data was obtained from monthly reports of laboratory examination results as well as data on waiting time for laboratory results before and after the implementation of LIS and SIMRS bridging.

3.5 Operational Variables and Definitions

The research variables included Bridging LIS with SIMRS (X) as the main variable, Infrastructure, Competence, and Procedures as the moderation variable, and Laboratory Result Waiting Time (Y) as the bound variable. LIS-SIMRS bridging is measured based on the integration of laboratory results data, the speed of delivery of results, and the automation of data input. Infrastructure includes device and network availability, connection stability, and support system readiness. Competencies include mastery of LIS and SIMRS, bridging experience, and response to technical obstacles. Procedures include the availability of SOPs, compliance with SOPs, and monitoring and evaluation. Meanwhile, the waiting time for laboratory results includes the duration of the examination, the speed of access to the results by doctors or officers, and user satisfaction with the speed of the service.

Validity, Reliability, and Data Analysis

The research instrument comes from the instrument that has been used in the previous study, but because there is an adjustment in language and context, the validity and reliability are still tested using the research sample data through the PLS-SEM method. The analysis was carried out with the help of the SmartPLS program.

PLS-SEM analysis includes outer model and inner model. The outer model is used to test convergent validity, discriminant validity, and construct reliability. Convergent validity was assessed based on the outer loading values >0.7 and AVE >0.5 . Discriminant validity was assessed using the Fornell-Larcker criteria, while construct reliability was assessed through Cronbach's Alpha >0.6 or Composite Reliability >0.7 .

Hypothesis testing was carried out through an inner model with path coefficient estimation and bootstrapping. The relationship between variables is expressed as significant if the value $|T| > 1.96$ or p-value < 0.05 . Model fit was assessed using Goodness of Fit (GoF), with a larger value indicating better model fit to the observational data.

Research Ethics

The research was carried out after obtaining permission from dr. H. Andi Abdurrahman Noor Hospital and ensuring the confidentiality of patient data used in the research.

RESULTS AND DISCUSSION

Description of Respondent Characteristics

The study involved 30 respondents of health workers working in laboratories, according to the minimum sample target. Respondents' characteristics included age, gender, education, and length of employment. Based on age, the most respondents were 31–35 years old as many as 10 people (33%), followed by 26–30 years old as many as 8 people (17%) and 20–25 years old as many as 7 people (23%). Based on gender, the majority of respondents were women as many as 21 people (70%), while men as many as 9 people (30%). The education of the respondents was dominated by 24 DIII graduates (80%), DIV 4 people (13%), and S1 as many as 2 people (7%). Based on the length of work, most respondents had a working period of 6–10 years as many as 13 people (43%), followed by 1–5 years as many as 12 people (40%) and 11–15 years as many as 5 people (17%).

Description of Respondent Assessment

1. Bridging LIS with SIMRS

The bridging variable LIS with SIMRS obtained an average score of 3.46 in the good category. The highest value is found in the indicator that the system automatically inputs the results to SIMRS with a score of 4.20, while the lowest value is found in the indicator of no delay in sending data to SIMRS with a score of 2.57. These results show that input automation is working well, but there are still obstacles in the speed of data transmission.

2 Infrastructure

The infrastructure variable obtained an average of 3.59 in the good category. The highest indicator is the readiness of the IT team in providing support with a score of 4.07. Meanwhile, stable network connections and network speeds to support the input process obtained the lowest score, which was 3.10, and were in the sufficient category. This shows that IT support is good, but network stability and speed still need to be considered.

3 Competencies



The respondents' competence obtained an average of 3.90 in the good category. The highest score was found in the experience of bridging for more than one year and an understanding of the bridging flow as a whole, each of 4.30. The lowest score was found in the ability to troubleshoot independently with a score of 2.20, which was in the bad category. Thus, in general, the competence of officers is good, but the ability to solve technical problems independently still needs to be improved.

4 Procedure

The procedure variable obtained an average of 4.15 in the good category. The highest indicator is the availability and ease of understanding the SOP bridging LIS with SIMRS with a score of 4.60. The lowest score is found in the indicators of periodic SOP updates and evaluations with a score of 3.70. This shows that SOPs are available and well understood, but the process of evaluation and updating of SOPs still needs to be improved.

5 Waiting Time for Laboratory Results

The variable waiting time for laboratory results obtained an average of 4.30 in the very good category. The highest value of 4.70 is found in the indicator of rapid access to laboratory results, results directly into the medical record, patient satisfaction with the speed of results, and no need to wait long to obtain results. The lowest value of 3.60 is found in the indicator of the absence of technical problems when accessing the results. Overall, respondents assessed that the waiting time for laboratory results was very good.

Validity and Reliability Tests

The results of the convergent validity test showed that all indicators in the LIS bridging variable with SIMRS, infrastructure, competence, procedures, and waiting time for laboratory results had an outer loading of >0.70 . The AVE value of all variables is also greater than 0.50 so that the entire construct meets the criteria of convergent validity. The discriminant validity based on the Fornell-Larcker criterion shows that the square root of each variable's AVE is greater than the correlation between variables. In addition, all HTMT values are below 0.85, so the discriminant validity is declared met.

Reliability testing showed that all variables had Cronbach's Alpha >0.60 and Composite Reliability >0.70 . Thus, all five variables are declared reliable with a high level of reliability.

Model Fit Test

The average AVE value is 0.657, while the average R^2 is 0.657. The results of the calculation resulted in a Goodness of Fit (GoF) value of 0.717, which indicates that the research model as a whole has a good level of suitability.

Uji Hypothesis

The test results showed that all the direct relationships tested obtained a p value of <0.05 . Bridging LIS with SIMRS had an effect on infrastructure with a coefficient of 0.611 ($p=0.008$), on competence of 0.603 ($p=0.031$), and on procedures of 0.504 ($p=0.001$). LIS bridging also affects the waiting time for laboratory results with a coefficient of 0.636 ($p<0.001$).

Furthermore, infrastructure affects the waiting time for laboratory results with a coefficient of 0.460 ($p=0.023$), effective competence of 0.711 ($p=0.011$), and effective procedures of 0.603 ($p=0.027$). The indirect influence of LIS bridging through infrastructure has a coefficient of 0.488 ($p=0.012$), while through competence is 0.711 ($p=0.033$) and through procedures is 0.603 ($p=0.006$).

Discussion

The results of the study show that bridging LIS with SIMRS has a positive effect on infrastructure. System integration requires adequate hardware, software, networking, and information technology system support for data exchange to run automatically and in real-time. Good infrastructure supports service efficiency and reduces the need for repetitive data input.

Bridging LIS also has a positive effect on the competence of officers. The implementation of an integrated system requires technical skills and an understanding of workflows so that officers are able to map data, manage systems, maintain data security, and handle technical obstacles. Good competence allows the bridging process to run more effectively and reduces errors and duplication of data.

LIS bridging has a positive effect on the procedure. SOPs function as guidelines in the integration process, starting from data mapping, specimen flow, delivery of results, to evaluation. Clear and consistent procedures can reduce human error, maintain data quality, facilitate training, and become the basis for performance evaluation.

Bridging LIS with SIMRS has been proven to affect the waiting time for laboratory results. The integration allows for automatic input of inspection requests, direct transfer of results, real-time access to results, and reduces transcription errors and data duplication. This condition can speed up the laboratory service process.

Infrastructure also affects waiting times. Adequate digital devices, networks, servers, and systems allow the process of checking and exchanging data faster. Conversely, a slow network, problematic servers, or inadequate devices can be a barrier to service.

.....
Officers' competence affects waiting time because competent officers are able to run processes more efficiently, reduce errors, validate results, and handle obstacles quickly. Competencies include technical skills, workflow understanding, data management, and troubleshooting skills.

Procedures also affect waiting time. Standardized procedures at the pre-analytical, analytical, and post-analytical stages help ensure the process runs consistently and efficiently. Clear SOPs can speed up services while maintaining the accuracy of inspection results.

The effect of LIS bridging on waiting time is also supported by infrastructure and competence. A strong infrastructure allows the system to work optimally, while the competence of the officers ensures that technology is used appropriately, able to adapt to new systems, solve technical problems, and maintain data quality.

Meanwhile, the results showed that the procedure did not moderate the effect of LIS bridging on the waiting time for laboratory results. Although SOPs remain important to ensure consistency and compliance in system implementation, the results show that the existence of procedures does not provide a significant moderation effect on the relationship between LIS bridging and lead times.

Research Limitations

Research has some limitations. First, cross-sectional design only describes conditions at one time so it cannot depict changes over time. Second, the use of total sampling by laboratory officers has the potential to cause bias and does not necessarily represent all patients using laboratory services. Third, the research variables were limited to bridging LIS with SIMRS, infrastructure, competencies, procedures, and waiting times, so other factors such as hospital policies and management have not been analyzed. Fourth, the research is only conducted on one hospital so that generalization of results to other hospitals needs to be done carefully.

CONCLUSION

Based on the results of the analysis of research data conducted on customers (patients) at Restu Ibu Balikpapan Hospital using the *Partial Least Square Structural Equation Modeling* (PLS-SEM) approach, as well as hypothesis testing through the *bootstrapping* method, several important findings were obtained that can be substantively concluded as follows:

1. *Bridging* LIS with SIMRS affects the infrastructure at dr H Andi Abdurrahman Noor Hospital, so the better bridging with SIMRS, the better the infrastructure.
2. *Bridging* LIS with SIMRS affects competence at dr H Andi Abdurrahman Noor Hospital, the better bridging with SIMRS, the better the competence.
3. *Bridging* LIS with SIMRS affects the procedure at dr H Andi Abdurrahman Noor Hospital, the better bridging with SIMRS, the better the procedure.
4. *Bridging* LIS with SIMRS affects the waiting time for laboratory results at dr H Andi Abdurrahman Noor Hospital, the better bridging with SIMRS, the better the waiting time for laboratory results.
5. Infrastructure affects the waiting time for laboratory results at dr H Andi Abdurrahman Noor Hospital, the better the infrastructure, the faster the waiting time for laboratory test results.
6. Competency affects the waiting time for laboratory results at dr H Andi Abdurrahman Noor Hospital, the better the competence, the faster the waiting time for laboratory test results.
7. Procedures affect the waiting time for laboratory results at dr H Andi Abdurrahman Noor Hospital, the better the procedure, the faster the waiting time for laboratory test results.
8. *Bridging* LIS with SIMRS affects the waiting time for laboratory results moderated by infrastructure at dr H Andi Abdurrahman Noor Hospital, the better bridging with SIMRS, the faster the waiting time for laboratory results supported by infrastructure.
9. *Bridging* LIS with SIMRS affects the waiting time for competency-moderated laboratory results at dr H Andi Abdurrahman Noor Hospital, the better bridging with SIMRS, the faster the waiting time for laboratory results supported by competence.
10. *Bridging* LIS with SIMRS affects the waiting time for laboratory results moderated by procedures at dr H Andi Abdurrahman Noor Hospital, the better bridging lis with SIMRS, the faster the waiting time for laboratory results supported by the procedure.

Managerial Implications

The results of this study provide a number of important implications that can be used as a basis for strategic decision-making by the management of dr H Andi Abdurrahman Noor Hospital, especially in an effort to build and maintain the quality of laboratory services in hospitals.

1. Implementation of Quality Management System (QMS)



The implementation of a Laboratory Quality Management System (LQMS) is essential to ensure accurate and reliable results. It is necessary to create a Standardization of Standard Operating Procedures (SOPs) by developing and adhering to clear SOPs for all stages of testing: pre-analytical (patient and sample preparation), analytical (testing process), and post-analytical (reporting of results). It is necessary to control internal and external quality by conducting internal quality control programs on a regular basis and participating in external quality assessment programs to validate the accuracy of results.

2. Resource Optimization

Efficient resource management can increase productivity and reduce costs. Implement efficient Inventory management by implementing a "just-in-time" inventory system to manage reagents and consumables, reduce waste, and prevent stockouts. Perform equipment planning and maintenance by investing in quality equipment and perform preventive maintenance and calibration on a scheduled basis to ensure the reliability and longevity of the tool.

3. Human Resource Development (HR)

Competent and motivated personnel are the backbone of a successful laboratory. There is a need for ongoing training by providing regular training on new procedures, technologies, and safety practices for all staff. Cross-skill development by training staff to perform various roles and tasks (*cross-train*) to ensure flexibility in scheduling and operational continuity in the event of staff shortages.

RECOMMENDATIONS

Following up on the findings and the resulting implications, the researchers recommend the following strategic steps:

1. Hospitals need to maintain network reliability, perform regular server maintenance, and minimize technical glitches (*downtime*) so that the integrity of laboratory data remains *real-time*.
2. Hospitals must constantly upgrade hardware (such as computers/terminals in the lab, internet network speeds/LANs) so that the operation of information systems does not experience bottlenecks.
3. Hospitals need to regularly hold training (*workshops* or *in-house training*) related to digital literacy, the operation of LIS-SIMRS, and service time management so that officers are more proficient and efficient.
4. Hospitals continue to evaluate and simplify convoluted manual bureaucratic workflows, so that the use of technology can cut waiting times to the maximum.
5. Further research that explores other moderation variables beyond infrastructure, competencies and procedures is more complex with multi-site studies.

BIBLIOGRAPHY

- Ambawani S (2014). Grammatical Errors On Indonesian–English Translation by Google Translate. *National Seminar on Science and Technology Applications*. Yogyakarta.
- Arfiansyah, R. (2022). Evaluation of Laboratory Information Systems in Hospitals. *Journal of Information Technology*, 9(3), 45-56.
- Arikunto, S. (2017). Research Procedure Approach to Practice Revised Edition VI. In *Rineka Cipta*.
- Azizah, A., Syahfutra, R. V., Mabrurroh, S. D., & Wijaya, D. (2025). *The Effectiveness of E-Modules in Vocational Students' Understanding of IOT*. 9643–9649.
- Budiman, S. (2023). Integration of LIS and SIMRS for medical service efficiency. *Medical Informatics*, 12(1), 77-89.
- Prides. (2022). Stages of Specimen Examination of the Ministry of Health of Yogyakarta. <https://eprints.poltekkesjogja.ac.id/11955/4/Chapter%202.pdf>
- Ferdinand, A. (2014). *Management Research Methods* (5th ed.). Publishing Agency of Diponegoro University.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2022). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–152. <https://doi.org/10.2753/MTP1069-6679190202>
- Hakam, F., Nugroho, E., & Meliala, A. (2017). Information Systems and Technology Analysis as a Reference in the Planning of the Information Systems and Information Technology Strategy Plan (Renstra SI/TI) at the Yogyakarta Islamic Hospital PDHI. *Journal of Information Systems (JSI)*, 9(1). ISSNPrint : 2085-1588 ISSNOnline : 2355-4614
- Hariana, E., G. Y. S. A. R. R. B. M., & E. N. (2013). Use of Hospital Management Information System (SIMRS) in DIY. *SESINDO Journal*.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New Challenges to International Marketing (Advances in International Marketing, Vol. 20)* (pp. 277–319). Emerald Group Publishing Limited.



- https://doi.org/10.1108/S1474-7979(2009)0000020014
- Henseler, J., & Sarstedt, M. (2023). Goodness-of-fit indices for partial least square path modeling. *Computational Statistics*, 28(2), 565–580.
- https://doi.org/10.1007/s00180-012-0317-1
- Indonesia, Ministry of Health of the Republic of Indonesia. (2008). *Decree of the Minister of Health of the Republic of Indonesia on Minimum Service Standards for Hospitals*. Jakarta.
- Indonesia, Ministry of Health of the Republic of Indonesia. (2013). *Regulation of the Minister of Health of the Republic of Indonesia Number 82 of 2013 concerning Hospital Management Information System*. Jakarta.
- <https://www.kemhan.go.id/itjen/wp-content/uploads/2017/03/bn87-2014.pdf>
- Junjungsari, F. S., Arso, S. P., & Fatmasari, E. Y. (2018) "Analysis of Waiting Time in the Laboratory Unit of Private Mother and Child Hospital X Jakarta City," *Journal of Public Health*, 7(1): 57-63.
- Kock, N. (2018). Should Bootstrapping Be Used in Pls-Sem? Toward Stable P-Value Calculation Methods. *Journal of Applied Structural Equation Modeling*, 2(1), 1–12. [https://doi.org/10.47263/jasem.2\(1\)02](https://doi.org/10.47263/jasem.2(1)02)
- Komara, E., Syaodih, E., & Andriani, R. (2022). *Qualitative and Quantitative Research Methods*. Aditama Review.
- Marianne, L., Pratama, V. (2023). The Role of Laboratory Information Systems in Improving the Quality of Laboratory Services, *Journal of Health and Nutrition Sciences*. 1(3), 185-194
- Maulyan, F. F. (2019). The Role of Training to Improve the Quality of Human Resources and Career Development: A Theoretical Review. *Journal of Management Science*, 1(1), pp. 40-50
- Murnita, E., Sediyo, E., Purnami, C.T., (2016) Evaluation of the Performance of Pharmaceutical Management Information System at Roemani Muhammadiyah Hospital with the Hot Fit Model Method. *Journal of Indonesian Health Management*. Sec. 4(1)
- Nadiya, N., S. R. (2021). The implementation of the hospital management information system (SIMRS) is seen from the aspect of human resources in the inpatient unit of H. Badaruddin Kasim Hospital, Tabalong Regency. *Journal of Business Public Administration*, 4(1), pp. 583-595.
- Nugroho, A. (2021). The Effectiveness of SIMRS in Hospital Data Management. *Journal of Hospital Management*, 7(2), 99-110.
- Nurmila, A., Purwadhi., Andriani, R. (2023). The Influence of Hospital Management Information System and Organizational Culture on the Performance of Pulmonary Special Hospitals in Karawang Regency. *Journal Of Social Science Research*
- Permana, B (2017). Computer hardware. *IlmuKomputer.Com eLearning Community*
- <https://ilmukomputer.org/wpcontent/uploads/2012/12/Budi-Perangkat-Keras Komputer.pdf>
- PT Yamhatevy. *Manual Book Laboratory Information System*
- Restyandito. (2016). The Challenges of Implementing Hospital Management Information Systems (A Human Resources Perspective). *National Conference on Information and Communication Technology (KNASTIK)*.
- Romi, Y., Juliandi, H., & Begum, R (2021). Analysis of factors that affect the waiting time for clinical laboratory examination results at Dr RM Djoelham Hospital, Binjai City.
- Schindler, P. S. (2019). *Business Research Methods*. McGraw-Hill Education.
- Sekaran, U., & Bougie, R. (2021). *Research Methods for Business: A Skill-building Approach* (7th ed.). Wiley.
- Setiawan, H. (2023). The impact of digitalization on health services. *Journal of Health Information Management*, 10(2), 45-58.
- Siagian, M, T., Sinaga, J., & Mokoagow, W, N. (2019) Analysis of Factors Affecting the Waiting Time for Clinical Laboratory Examination Results at Haji Adam Malik Hospital Medan. *Journal of Public Health and Environment*. 27-43
- Sidiq, M. (2018). Implementation of Management Information System at Putri Hijau Hospital Medan. *Health Scientific Journal*, 17, 30-35
- Suci, R. Y. (2015) *The Relationship between Human, Organization and Technology with User Satisfaction of the Management Information System of Siti Rahmah Islamic Hospital Padang in 2015*. (Thesis, Andalas University).
- Sugiyono. (2018). *Quantitative Research Methods*. Alfabet.
- Taufiq, R (2019). Implementation of Standard Operating Procedures (SOP) and Hospital Performance Accountability. P-ISSN:2086-7662
- Wahyuni, V., & Maita, I. (2015). Evaluation of Hospital Management Information System (SIMRS) using the *Unified Theory of Acceptance and Use of Technology* (UTAUT) method. *Journal of Engineering Science and Management Inf.* 2015; 1(1):55–61.



-
- Widyatmojo, H., Rohendi, A., & Wahyudi, B. (2023). The Effect of Competence and Motivation on the Performance of Health Workers at the Fever Clinic of Primaya Karawang Hospital. *Journal of Hospital Management*. 1(1):15-22
- Yanti, K. J., Hidayat, D., & Widjaja, Y. R. (2024). The Level of Efficiency of the Use of Electronic Medical Record Systems in the Hospital. Dr. Kariadi Semarang. *Journal of Social and Economic Research*. 6(2):682-703
- Yusneli, Harnani, Y., Ismainar, H., Marlina, H., & Jepisah, D. (2024) Analysis of the Implementation of the System Information Laboratory (LIS) Connection with the Awal Bros. Pekanbaru Hospital Information System (SIRS). *Encyclopedia of Journal*, 6(3). 299- 30.