Design and Construction of a Web-Based Fixed Asset Management System with a Combination of Straight Line Method, MAUT, and Telegram Bot Integration: Case Study of North Lombok District Hospital

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Abstract

North Lombok District Hospital is a health service institution in North Lombok District, West Nusa Tenggara Province, that provides health facilities and services to the community. Health service facilities provided to the community come from fixed assets owned by the North Lombok District Hospital. Management of fixed assets used for health service facilities at the North Lombok District Hospital is still done manually in planning, receiving, repairing, maintaining, and releasing assets. So, hospital employees have difficulty managing the assets they own. This study was conducted to help design and build a fixed asset management information system at the North Lombok Hospital using the SDLC Method with the Waterfall Model approach and system development using PHP, HTML, CSS, and JS languages with the Laravel Framework and MYSQL Database. This study uses the Straight Line Method to calculate asset depreciation, the MAUT Method to assist in decision-making for the elimination of damaged assets, and the Telegram Bot to send notifications from the website to each unit group in the hospital. The final result of this study is a web-based fixed asset management information system with developed features, namely asset planning features, asset planning change features, asset handover minutes features, asset inventory features, asset maintenance features, asset repair features, asset write-off features, asset whitening features, asset reporting features, master data features, and user access rights management features. The testing method used in this study is the Blackbox testing method, which tests the functionality of the system using 150 test scenarios on eight employees of the North Lombok Regional Hospital, with the test results showing that the system is running well and in accordance with the SOP that has been given, PSSUQ testing was carried out to evaluate user satisfaction with the system. The test results showed a SysUse subscale value of 1.93, IntQual 1.6, InfoQual 1.92, and Overall 1.93. Based on the results of the PSSUQ test, it can be concluded that the fixed asset management system has run very well and meets user expectations.

Keywords: Asset, Management System, Information Systems, Website Application, Waterfall

I. INTRODUCTION

Assets are anything with economic value owned by individuals, companies, or the government that can be valued financially" [1]. Assets owned by individuals or corporate institutions have a beneficial value that can positively contribute to various aspects of life. Using assets wisely can increase efficiency and productivity for individuals or corporate institutions in modern times.

North Lombok Regency Regional General Hospital is a health service institution in North Lombok Regency, West Nusa Tenggara Province. RSUD Lombok Utara, as one of the

North Lombok Regency Regional General Hospital is a health service institution in North Lombok Regency, West Nusa Tenggara Province. RSUD Lombok Utara, as one of the public service agencies, has many fixed assets that must be maintained to support the hospital's operational activities. North Lombok Hospital's fixed assets include medical equipment, ambulance vehicles, buildings, land, networks, irrigation, and other supporting equipment. The quality of fixed assets owned by North Lombok Hospital is an important thing that every employee must consider in providing comfort in the services performed. Asset management at North Lombok Hospital must be done correctly and efficiently to provide optimal service to the community. Asset management at North Lombok Hospital is still carried out manually, namely in the process of submitting asset planning, receiving assets, repairing assets, making asset maintenance schedules,

submitting deletion proposals, and reporting asset bleaching for the asset inventory and asset procurement process at North Lombok Hospital already uses a web-based government system, namely in the asset inventory process using a web-based system provided by the local government which comes from SIMDA BMD, and the asset procurement process already uses a web-based system provided by the ministry of health, namely E-KATALOG. The asset management process that still relies on manual methods at North Lombok Regency Hospital has created severe challenges for the material logistics section, IPSRS unit, and medical support field because the ability to monitor and manage asset management activities is less effective and efficient. The solution to overcome these obstacles requires implementing a fixed asset management system that can accurately record every step taken so that every action is documented in detail and can provide a solid basis for better analysis and decision-making.

Previous research on the design of asset management systems has been carried out on developing an asset management system for RSUD. Dr. Iskak Tulungagung by Guna Iksan in 2019 used the SLDC (Software Development Life Cycle) Method. The research results are in the form of an asset management system application with an item data feature, an item proposal feature, an item deletion feature, and an electric power usage feature [2]. Other research on designing asset management systems was conducted by Maryanah Safitri in 2019 using the SLDC Method in creating a web-based asset management inventory system, with the results of the research in the form of an asset management inventory application that has a homepage feature, asset master feature, asset unit master feature, branch master feature, transaction feature, asset request transaction feature, asset exit transaction feature, asset request transaction feature, and notification feature [3].

Previous research on the design of fixed asset management systems only involved notification features within the system, without integration with other platforms. The features developed were not too complex to carry out asset management, so in research on the design of fixed asset management information systems at North Lombok Regency Hospital developed a notification feature integrated with Telegram bots to provide notifications to system users quickly and the asset management features developed were quite complex (planning, transactions, inventory, maintenance, repair, deletion, and asset bleaching) by the SOP that was available at North Lombok Regency Hospital in carrying out asset management. Asset management system development is carried out using the SLDC Methodology because, based on several previous studies, using the SLDC Methodology has the advantage that system development is carried out in stages (structured) and iterative (developers can return to the last stage to make improvements or adjustments). The expected results in designing fixed asset management information systems at the North Lombok Regency Hospital are a website-based fixed asset management system application.

II. LITERATURE REVIEW

A. Management Information System

Management information systems are crucial in carrying out a company's operations [4]. They are information systems that produce a lot of information or reports for managers' decision-making.

B. Fixed Assets

Fixed assets are tangible assets that can be physically seen in existence, are relatively permanent, and have a long, useful life. Thus, fixed assets can be interpreted as tangible assets used in the company's operational activities and have a useful life of more than one year [5].

C. North Lombok Regency Hospital

Hospitals, as public service agencies, have a vital role in supporting development in the health sector. Law number 44 of 2009 explains that hospitals are health service institutions that organize comprehensive individual health services that provide inpatient, outpatient, and emergency services. North Lombok Regency, as the youngest district, has one advanced health facility: the UPTD Regional General Hospital of North Lombok Regency. This hospital began operating in 2010 as a development of the Tanjung Health Center with a type D classification; only in 2015 was it upgraded to type C.

D. Hospital Asset Management

Hospitals are units that manage physical resources (people, money, machines/medical devices/assets, materials such as drugs, Reagan, office stationery, consumables, and the like). However, the business processes in each hospital are unique; there are still standard processes in asset management, including planning, purchasing/procurement, stock/inventory maintenance, asset management, human resource management, money management (accounts payable, accounts receivable, cash, ledgers and others) [6].

E. Asset Price Depreciation

Asset price depreciation is the process of reducing the value of assets over time (Equation 1). It is essential to know the asset depreciation process in accounting to ensure that the value of assets is accurately reflected in the company's financial statements. Things that need to be considered in calculating asset depreciation are the depreciation period, the method used, the valuable life group and depreciation rate, and the acquisition price of the asset [7]. The straight-line method of calculating the depreciation of asset prices is used. The Straight-Line Method is an asset depreciation method that reduces the value of assets evenly over their useful life.

$$Depreciation\ Expense = \frac{Acquisition\ Value - Residual\ Value}{Economic\ Life} \quad (1)$$

Description:
a) Acquisition value : purchase price of the asset.
b) Residual value : final value of the asset's useful life.
c) Economic life : useful life of the asset.

F. Increase in Land Asset Price

Land appreciation is an increase in the value of real estate property over time, caused by several factors, such as increased demand for economic development and changes in zoning and land use regulations [8]. The straight-line method is used to calculate land asset price increases as shown in Equation 2.

$$Price\ Increase = HP + (HP\ X\ P) \quad (2)$$

Description:
a) HP : purchase price of the asset.
b) P : percentage increase in asset prices each year.

G. MAUT

MAUT method is one of the methods used in multi-criteria decision-making. The MAUT method has several steps in calculating, namely determining the criteria and weight values of each criterion, determining the sub-criteria and their weight values, creating a normalized matrix, then finding the final evaluation value, and determining the MAUT score ranking, the MAUT score value is getting closer to 0 indicating a lousy condition if it is getting further away from 0 and approaching one then it means a condition that is still good (Equation 3 and 4). The MAUT method in designing a fixed asset management system is used to help make decisions on the feasibility of an asset to be deleted or repaired when the asset is damaged.

$$U(x) = \frac{x - xi^{-}}{xi^{+} - xi^{-}} \quad (3)$$

Normalized Matrix Formula Description:
x : Alternative Weight
x_i^- : Worst (minimum) weight of the x criterion
x_i^+ : Best (maximum) weight of the x criterion

$$v(x) = \sum_{i=1}^{n} W_i\ V_i\ (X) \quad (4)$$

Formula Description for Finding the Final Evaluation Value:
x : Number of elements
I : 1 Total weight is 1
vi(x) : Weight that determines the value of how important element i is

H. Telegram Bot

Telegram Bot is a virtual user that can perform various tasks and provide a response to users who access the bot. Telegram Bot can be used to broadcast messages to provide service information and many other benefits. Telegram Bot in the design of a fixed asset management system is used to send notifications from the web to the telegram group of each unit in the hospital.

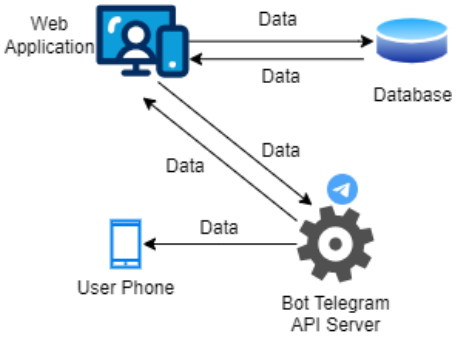

Figure 1. Integration Scheme with Telegram Bot

Figure 1 is a schematic image of the integration of a telegram bot with a web application, namely notifications from the web application will be received by the telegram bot and sent to each telegram group unit in the hospital.

III. RESEARCH METHOD

The system development used in the research is the SLDC (Software Development Life Cycle) Method with the Waterfall Model. The Waterfall method is the earliest SDLC approach used for software development [9]. SLDC consists of various techniques, one of which is the Waterfall Method, a systematic and sequential SLDC system development model [10]. The waterfall method consists of several stages, as shown in Figure 2.

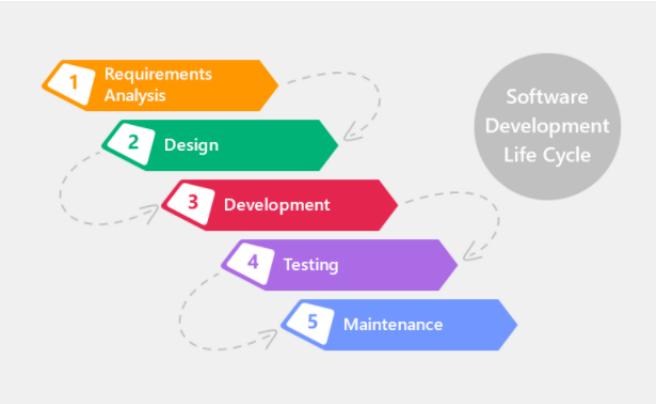

Figure 2. SLDC Methodology

A Requirement

The requirement is a stage for collecting information related to the research on user needs for the system and software to be designed. Collecting information on the design of fixed asset management information systems at the North Lombok Regency Hospital is done by conducting interviews with the North Lombok Regency Hospital regarding the flow of the asset management process and collecting literature studies on similar research that has been done before.

B Design

Design is the stage to process the information obtained at the requirement stage into a system design or description of

the system to be created. The design of the fixed asset management information system at North Lombok Regency Hospital is made in the form of a DFD (Data Flow Diagram) diagram, Use Case Diagram and PDM.

C Development

Development is the implementation stage based on the system design description in the form of program code or applications that users can use. The development of fixed asset management applications at the North Lombok Regency Hospital uses the Laravel Framework with PHP, HTML, CSS, and Javascript programming languages.

D Testing

The testing stage tests each application feature to ensure that each feature functions correctly and as expected. The Black Box Testing method is used in designing the fixed asset management system of the North Lombok Regency Hospital. The BlackBox Testing method is one approach applied in software testing that focuses on testing from the end user's perspective without paying attention to the internal details of the software [11].

E Maintenance

Maintenance is the final stage in software development using the Waterfall Method. Maintenance is a stage carried out when an application has been used and responds to the user. Software maintenance is carried out to fix errors that still occur in the system and adjust the system to users' wishes.

IV. RESULTS AND DISCUSSION

Figure 2 to Figure 12 below is a display of the Use Case Diagram which displays a visualization of the system user on the activities carried out on the system. In the asset management system of the North Lombok Regency Hospital, there are 12 system user actors, namely with 9 activity processes carried out on the system, namely.

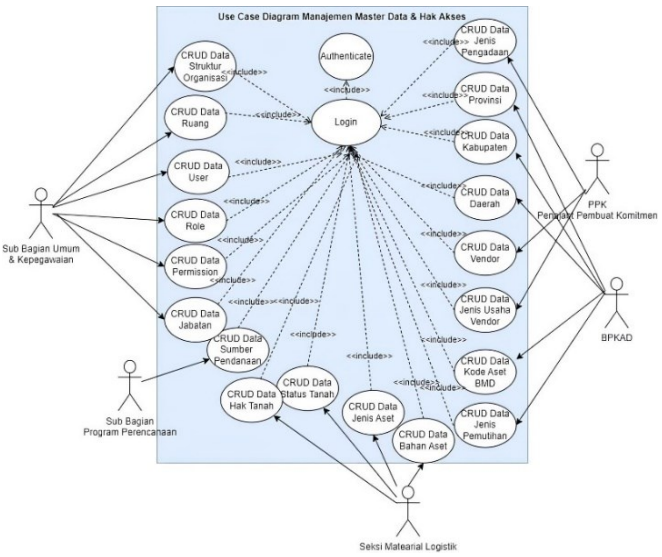

Figure 3. Use Case Diagram of Master Data Management

Figure 3 shows the Use Case Diagram for the master data management process. In the master data management process, users with positions as general and staffing sub-sections can manage organization data, room data, user data, role data, permission data, and position data.

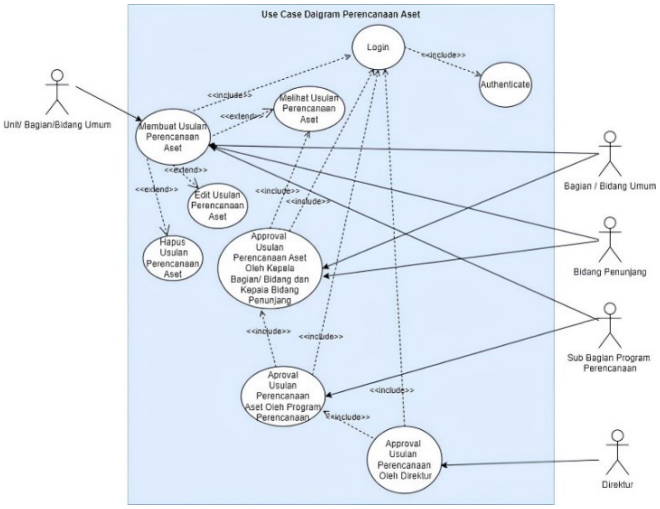

Figure 4. Use Case Diagram of Asset Planning

Figure 4 is a view of the Use Case Diagram of asset planning. In the Use Case Diagram of asset planning, users with positions in general units/sections/fields can submit asset proposals, then the proposed assets will be approved by the head of the general section/field, then approved by the supporting field, then approved by the planning program sub-section, and the director.

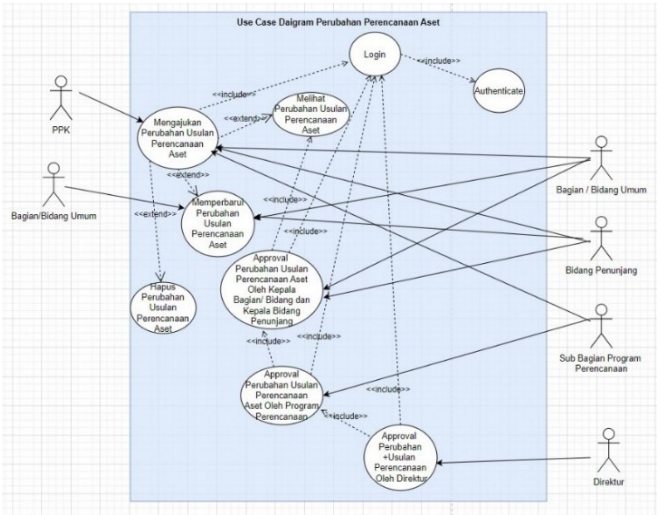

Figure 5. Use Case Diagram of Asset Planning Changes

Figure 5 shows the Use Case Diagram of asset planning changes. In the Use Case Diagram of changes in asset planning, users with positions in general units/sections/fields can submit asset proposals. The proposed assets will be approved by the head of the general section/field, then approved by the supporting field, then approved by the planning program sub-section, and the director.

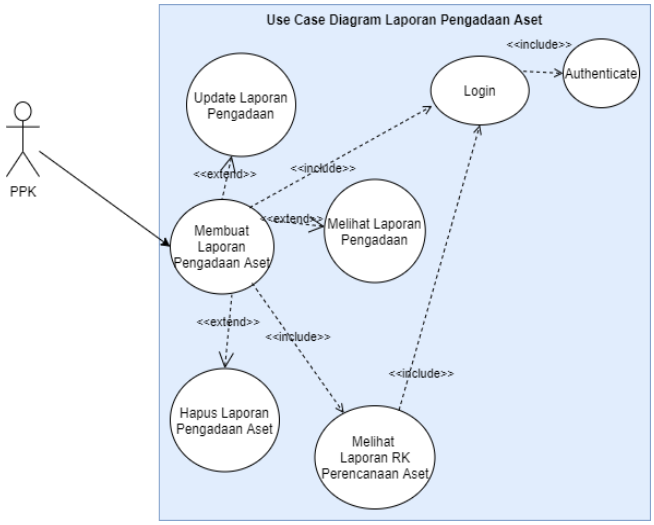

Figure 6. Use Case Diagram of Asset Procurement Report

Figure 6 is a display of the Use Case Diagram of making asset procurement reports that have been carried out by PPK. In the Use Case Diagram of asset procurement, users with positions as PPK can input asset procurement data that has been carried out on the system.

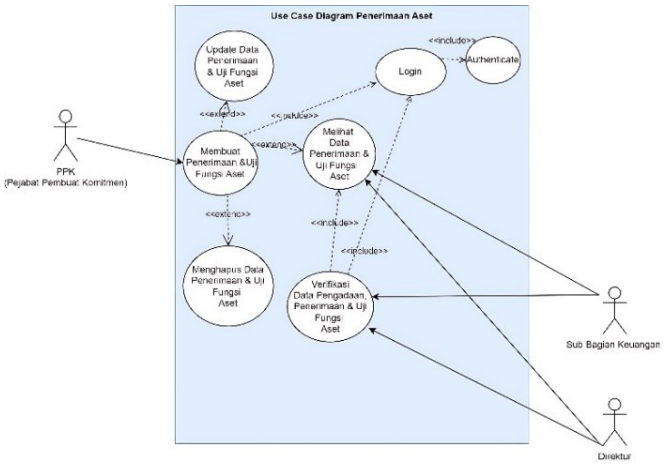

Figure 7. Use Case Diagram Use Case Diagram of Asset Receipt Report

Figure 7 is a display of the Use Case Diagram of asset receipt. In the Use Case Diagram of asset receipt, users with positions as PPK can input asset receipt data, and then the asset receipt data will be verified by the finance sub-section and the director.

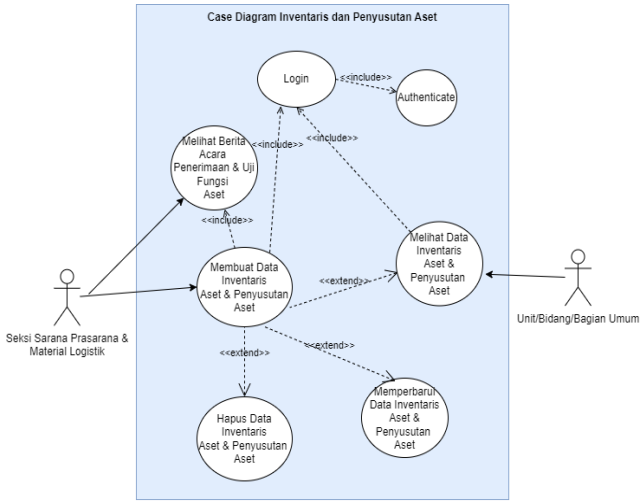

Figure 8. Use Case Diagram of Asset Inventory and Depreciation

Figure 8 is a view of the Use Case Diagram of asset inventory. In the Use Case Diagram of asset inventory, users with positions in infrastructure & material logistics sections can input asset data that has been received into the system, and the system will automatically calculate asset depreciation and asset price increases every year using the StraightLine Method.

Figure 9. Use Case Diagram of Asset Repair

Figure 9 is a display of the Use Case Diagram of asset repair. In the Use Case Diagram of asset repair, users with positions as units/sections/general fields can input data on proposed asset repairs. The proposed repair data will be verified by the head of the section/general field and then verified by the IPSRS unit (Hospital Infrastructure and Facilities Installation).

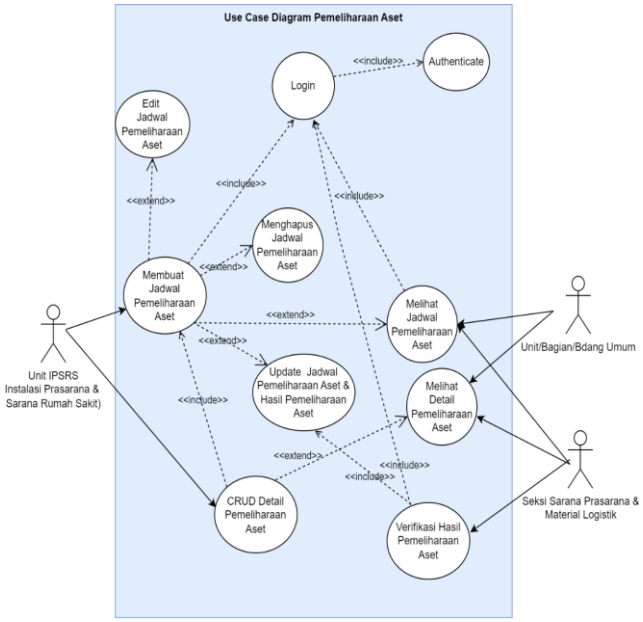

Figure 10. Use Case Diagram of Asset Maintenance

Figure 10 is a display of the Use Case Diagram of asset maintenance. In the Use Case Diagram of Asset Maintenance, users with positions as IPSRS units can create asset maintenance schedules, and data on asset maintenance results will be verified by the infrastructure and material logistics section.

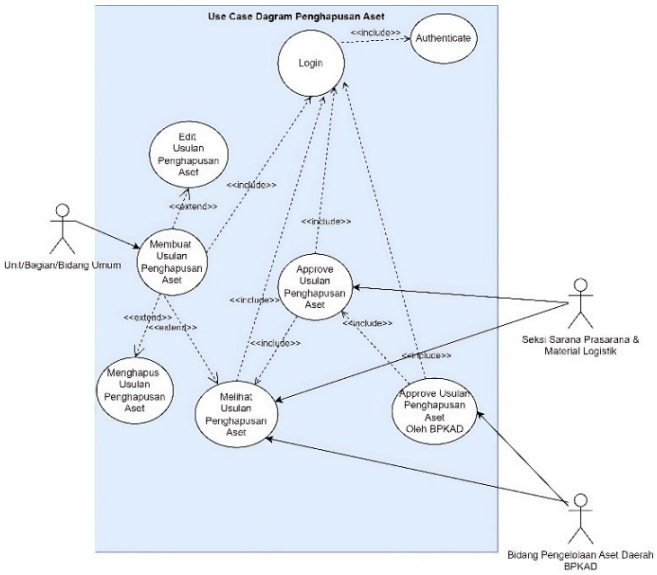

Figure 11. Use Case Diagram of Asset Removal

Figure 11 is a display of the Use Case Diagram of asset deletion. In the Use Case Diagram of asset write-off, users with positions as units/sections/general fields can submit proposals for asset write-off, then the proposed asset write-off will be approved by the infrastructure and logistics material section and the BPKAD regional asset management field.

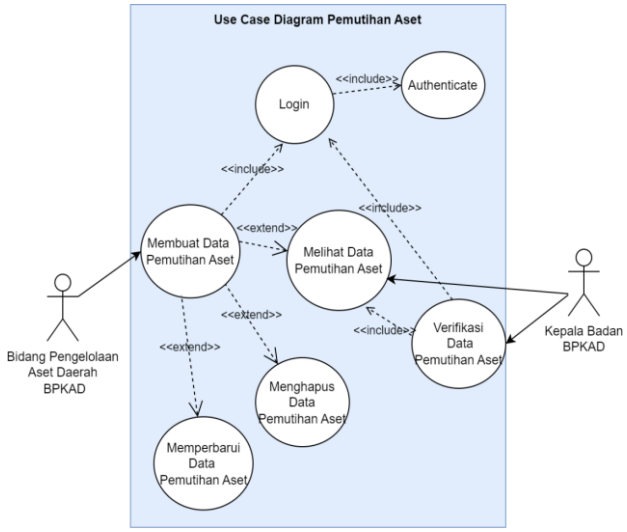

Figure 12. Use Case Diagram of Asset Bleaching

Figure 12 is a display of the Use Case Diagram of asset bleaching. In the Use Case Diagram, the asset bleaching user with a position in the BPKAD regional asset management field can create an asset bleaching report, then the asset bleaching report will be verified by the head of the BPKAD agency.

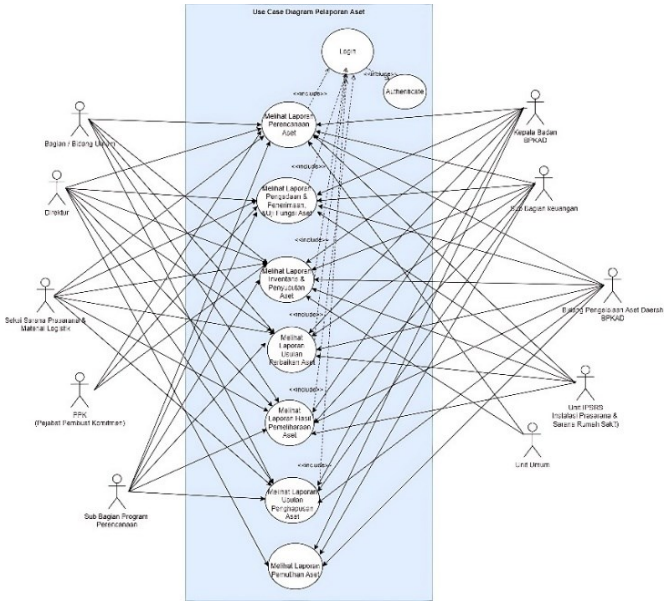

Figure 13. Use Case Diagram of Asset Reporting

Figure 13 is a display of the Use Case Diagram of asset reporting. In the Use Case Diagram of asset reporting, users with positions as units/sections / general fields can receive asset planning report data and asset inventory, and users with positions as PPK can receive asset planning report data, asset transactions, and asset inventory, users with general section positions can receive asset planning report data, asset inventory, asset repair, asset maintenance, and asset write-off. Users with positions in infrastructure and material logistics sections, planning program subsections, and IPSRS units can

receive data on asset planning reports, asset transactions, asset inventories, asset repairs, asset maintenance, and asset write-offs. Users with positions as head of BPKAD agency, BPKAD regional asset management division, and director of RSUD can receive data on asset planning reports, asset transactions, asset inventory, asset repair, asset maintenance, asset write-offs, and asset bleaching.

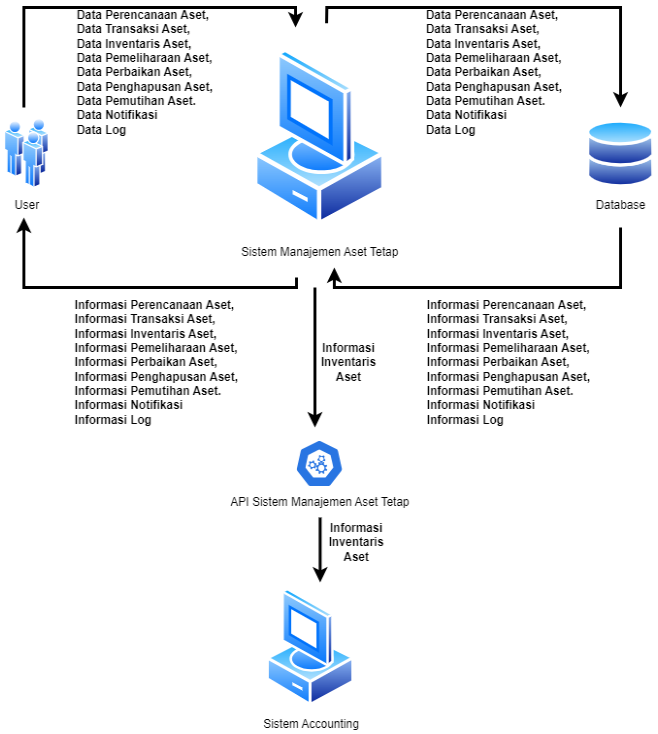

Figure 14. System Overview

Figure 14 is an overview of the fixed asset management system that shows the interaction of the user with the system along with the data sent to the system by the user and the information received back by the user. In the system overview, there is asset inventory information sent to the hospital accounting system through the API provided by the asset management system.

Figure 15. PDM Master Data and General Settings

Figure 15 is a view of the PDM master data and general settings of the asset management system consisting of 22 tables, namely the hospital asset type table, asset material table, BMD asset code table, land rights table, land status table, procurement type table, fund source table, bleaching type table, organizational structure table, position table, space table, user table, region table, city table, province table, notification table, role table, permission table, activity table, vendor table, vendor business type table, and vendor pivot table.

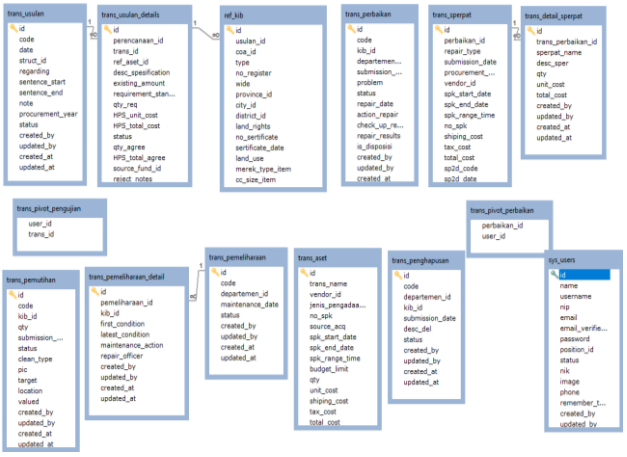

Figure 16. PDM Transactional Data

Figure 16 is a PDM view of the transactional table, which has 12 tables: asset proposal tables, asset proposal detail tables, asset transaction tables, asset testing pivot tables, asset repair tables, asset repair testing pivot tables, asset spare part transaction tables, asset spare part proposal detail tables, asset maintenance tables, asset maintenance detail tables, asset deletion tables, and asset bleaching tables.

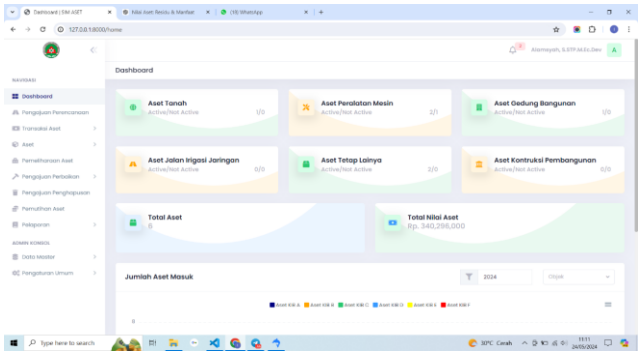

Figure 17. Asset Management Dashboard Display Interface

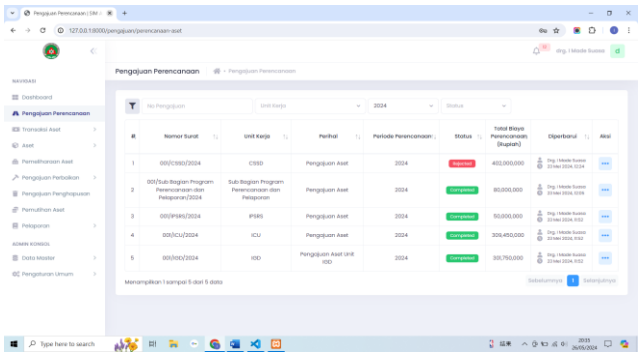

Figure 18. Display Interface of Asset Planning Menu

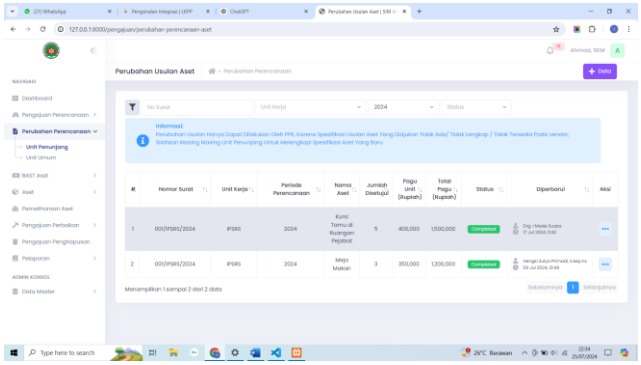

Figure 19. Asset Planning Change Menu Display Interface

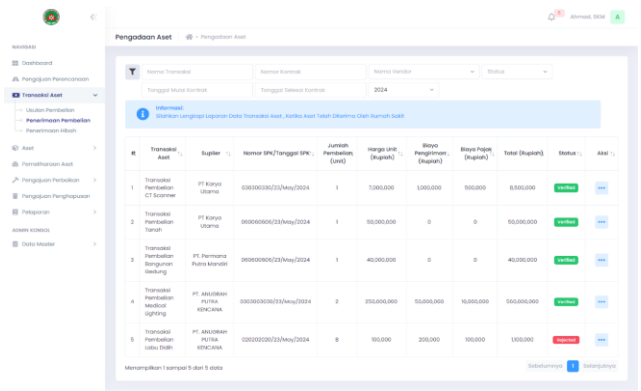

Figure 20. BAST Menu Display Interface (Minutes of Asset Handover)

Figure 21. Telegram Group Notifications

Figure 17 to Figure 20 is a page view of the fixed asset management system on each menu that has been created, namely the dashboard menu, planning menu, transaction menu (BAST), and several other menus on the system that are not shown in the image, namely inventory menu, repair menu, maintenance menu, deletion menu, bleaching menu, reporting menu, bleaching menu, master data menu, and general settings menu. In the asset inventory menu, six types of assets are managed, namely land assets (KIB A), equipment and machinery assets (KIB B), building and building assets (KIB C), network and irrigation road assets (KIB D), other fixed assets (KIB E), and construction in progress assets (KIB F).

Figure 21 is a notification that has been sent to the Telegram group, based on the actions/activities carried out by the user on the North Lombok District Hospital fixed asset management system.

The Black Box Testing method carried out on the fixed asset management information system of the North Lombok Regency Hospital was carried out using 150 test scenarios on nine available menus (asset planning menu, asset planning change menu, asset handover minutes menu, asset inventory menu, asset repair menu, asset maintenance menu, asset write-off menu, asset bleaching menu, asset master data menu, profile menu, and system login) which was carried out on eight users (3 General Units, 1 Section Unit for Infrastructure Facilities and Logistics Materials, 1 Supporting Division, 1 Planning Section, 1 Finance Section, 1 IPSRS Unit) who came from the North Lombok Regency Hospital. Testing on the system is carried out to ensure the validity, functionality, and reliability of the fixed asset management information system of the North Lombok Regency Hospital, which has been running well and by the SOP provided by the North Lombok Regency Hospital in carrying out asset management. The results of testing the Black Box Testing Method that has been carried out on the fixed asset management information system of the North Lombok Regency Hospital, namely, overall, all menus on the system have run well per the SOPs that the North Lombok Regency Hospital has given.

Post-Study Usability Questionnaire (PSSUQ) evaluates user satisfaction with the system, focusing on the quality of information presented. Testing using the PSSUQ method was carried out using Google Forms with eight respondents who were employees of the North Lombok District Hospital. Respondents were asked to try the information system and then fill out the user satisfaction questionnaire on Google Forms.

Table 1. Comparison of PSSUQ Norms with Respondent Results

Sub Scale	Lower Limit	Means	Upper Limit	Results
SysUse Question 2,79	1-6	3.02	3.24	1.93
SysUse Question 2,28	7-12	2.49	2.71	1.92
SysUse Question 2,62	13-15	2.82	3.02	1.6
SysUse Question 2,57	1-16	2.80	3.02	1.93

Table 1 shows the average scores obtained from the use of the Post Study System Usability Questionnaire (PSSUQ) version 3. The average score for System Usefulness (SysUse) is 1.93, which means that user satisfaction in using the fixed asset management information system is stated as very good, the average score for Information Quality (InfoQual) is 1.92, which means that the quality of information provided is very good to system users, the average score for Interface Quality (IntQual) is 1.6, which indicates that the quality of the display on the fixed asset management system is very good, and the average Overall score is 1.93, which indicates that overall the fixed asset management system is very good to use.

V. CONCLUSION

The fixed asset management information system of North Lombok Regency Hospital was developed using the SDLC Method with the Laravel Framework and PHP, HTML, CSS, and JavaScript programming languages. The system design process begins with data collection from the hospital, then proceeds with making system design diagrams such as Use Case diagrams, DFD, PDM, and coding using the Laravel Framework with PHP, HTML, CSS, and JavaScript programming languages. Testing on the system was carried out using the Black Box Testing Method, which used 150 test scenarios on nine available menus. Testing involved eight users from the North Lombok Regency Hospital and showed that all menus in the system had run well by the SOP given. The implementation of a fixed asset management system at the North Lombok District Hospital has provided excellent benefits to the employees of the North Lombok District Hospital, where several asset management processes that were previously carried out manually can run more effectively and efficiently after using the asset management system, this has been proven based on the results of the PSSUQ test with the overall test results giving a very good value.

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