DESIGN AND CONSTRUCTION OF INFRASTRUCTURE ASSET MANAGEMENT INFORMATION SYSTEMS USING THE RAPID APPLICATION DEVELOPMENT (RAD) METHOD

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ABSTRACT

The school administration system manages several things, such as the management, storage, and use of facilities and infrastructure items, which have been done traditionally. In contrast, the management must be well structured so that integration with information technology is needed. In previous studies, there were many areas for improvement in the asset information system, one of which was the use of traditional methods such as waterfall which had weaknesses in user flexibility and took a long time to process. Therefore, that a more relevant and accurate method is needed in its completion. SD Khaijah Surabaya built a facilities and infrastructure asset information system using the Rapid Application Development (RAD) method, which offers a more adaptive and interactive solution because it allows the development of rapid prototypes and continuous evaluation of the system. The results of this study show that building an asset management information system can simplify the process of managing infrastructure assets, improve data accuracy, and assist in making decisions related to asset management. The implementation of this system is expected to significantly improve organizational performance in terms of asset management, while system testing using the Black Box method shows accurate results and using the System Usability Scale (SUS) method manages to get a precise score of 80. The average person gives a score of 5 on the assessment of the questionnaire distributed to stakeholders.

Keywords: *Information system, System usability scale, Rapid application development, Asset management, Infrastructure*

1. INTRODUCTION

An educational institution manages assets from facilities and infrastructure to be important as the core of the success of school management operations [1], Information Technology is a tool that not only facilitates and speeds up work, but also increases work efficiency. In addition, with information technology, data can be accessed directly (real-time) without being limited by location and time [2]. In carrying out asset management, a school can increase the accuracy of data on goods in a school, but several obstructions will arise when the data in an asset is large and complex, and with the integration of asset management with information technology will minimize recording errors and high operational costs. However, there are several weaknesses in the asset information system in previous studies, one of which is the use of traditional methods such as waterfall which has weaknesses in user flexibility and takes a long time [3]. The waterfall method also requires a longer phase completion time which can result in delaying responses to user feedback and changing requirements [4].

The development of the agile method as one of the methods that can solve problems in the waterfall method, because in the agile method delivery will be faster, reduce defects [5] but in the agile method there are still weaknesses, namely the need for high intensity of collaboration between the development team and users, as well as increased complexity in managing small tasks [6] which results in less responsiveness of the system to user needs and less flexibility in future completion, the previous research was also still limited to the input function of asset facilities and infrastructure only without any integration for care, maintenance, and complaints from asset users and monitoring in

real time [7]. If the system cannot keep up with the current needs, the challenges that will be faced are managing data that is less up to date, the low level of accuracy and will slow down decision making [8].

The information technology-based Facilities and Infrastructure Asset Management System (SIMAS) is here to facilitate users in managing facilities and infrastructure asset data. The SIMAS is designed according to existing needs, in this case the Khadijah Wonorejo Elementary School The designed SIMAS in addition to managing facilities and infrastructure asset data as well as a means of complaining about facilities and infrastructure assets that need to be repaired. so that in terms of repair and replacement of assets can be done efficiently. The Rapid Application Development (RAD) method offers a more adaptive and interactive solution, because it allows rapid prototype development and continuous evaluation of the system. The RAD method offers a more adaptive and interactive solution, because it allows the development of rapid prototypes and continuous evaluation of the system this is evidenced in the research of online crime reports [9]. Furthermore, this method also facilitates the process of cooperation between developers and users in evaluating the system [10].

The purpose of this research is to design a WEB-based information system for managing asset management of infrastructure facilities at SD Khadijah Surabaya by using the RAD method, which is handled with PHP and MySQL programming languages, and the CI (Code Igniter) framework, the accuracy parameter uses the System Usability Scale (SUS) method [11]. It is hoped that the development of SIMAS can produce a system that not only meets the needs of the organization in managing assets, but can also adapt quickly to changing needs in the future. and can make a significant contribution to improving asset management practices in various.

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2. RESEARCH METHODOLOGY

2.1 System Design

The SIMAS application is shown in Figure 1, there are 3 stakeholders who have their respective privalage, namely the admin of facilities and infrastructure in charge of entering all asset data along with the location of the asset, and also the admin of facilities and infrastructure has the task of always checking complaints about facilities and infrastructure received either from teachers, from these complaints will be followed up by facilities and infrastructure officers, whether to be repaired or updated because the asset is damaged, the principal user only monitors the state of facilities and infrastructure both from data collection or complaints.

2.2 System Development Model

The Rapid Application Development (RAD) model is one of the System Development Life Cycle (SDLC) where as sequential liner-based software development, the RAD method emphasizes cost and time efficiency [12]. The stages of the RAD method start from requirement planning whose job is system planning and the needs needed in the application, after knowing the needs of the next stage is user design, starting from the user who plays a role according to their respective needs and in accordance with their plans and expectations can overcome the problems that occur, at this stage use cases and system flowcharts are needed to be easily understood, do construction in accordance with the needs that have been designed using the PHP programming language and MySQL database in its implementation which will then be tested using the black box method and also the SUS method the purpose of the test is to determine the level of accuracy and efficiency of the system created, and the last stage is system implementation and can be seen in Figure 2.

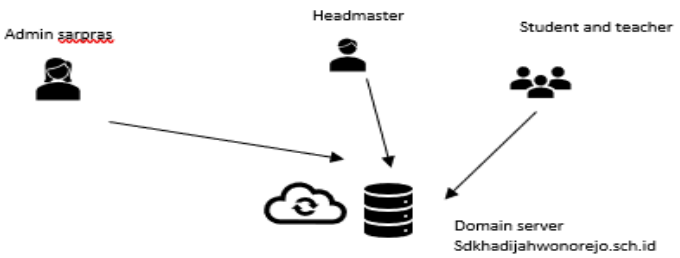

Figure 1. Design System

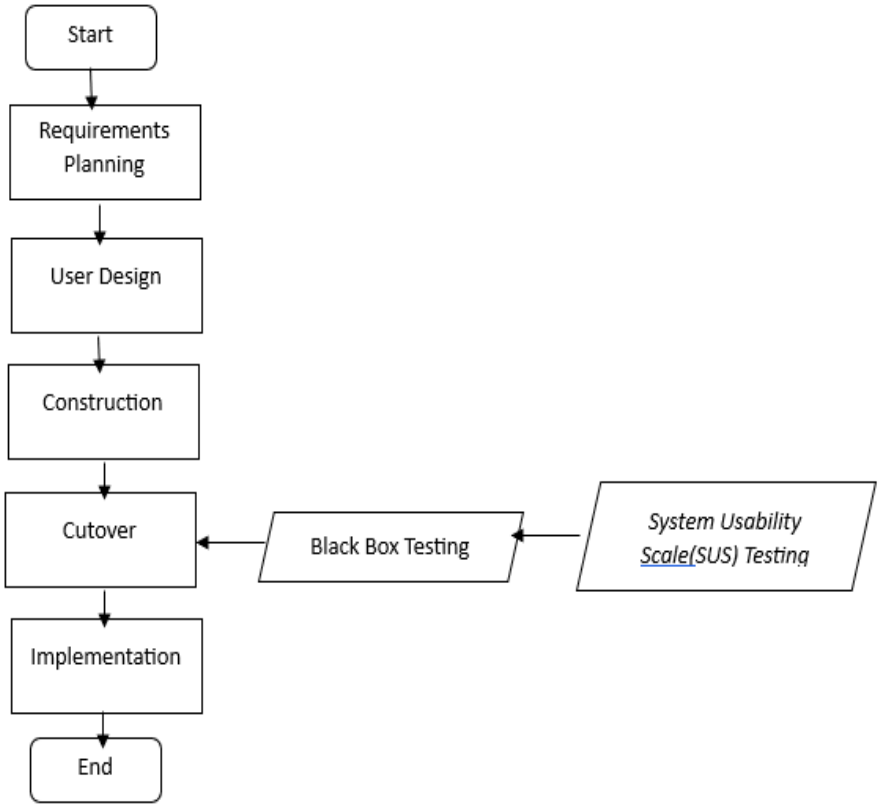

Figure 2. Flowchart RAD Method

2.3 Use Case Diagram

Use case is a description of the interaction between users and existing systems to achieve certain goals [13]. Use cases serve to explain the functional requirements of the system and provide an in-depth understanding of how the system works from the user's perspective [14]. In the use case designed, there is 1 admin managing facilities and infrastructure assets in charge of entering data on facilities and infrastructure assets and has privalage to input data, delete data, and update data, and the principal user can only see reports from facilities and infrastructure, while teacher users can make complaints about facilities and infrastructure assets that are experiencing problems.

The Figure 3 explains that there are 3 users who play a role in the system, namely, admin, teachers, and principals, the task of the admin is to manage assets, asset locations and complaints from other users, which will later be repaired after the complaint, and if the repair or update of the asset has been carried out the complaint user will get feedback from the admin, while the teacher user, can only make complaints about facilities and infrastructure that are damaged so that they can be repaired quickly by the school, while the principal user as a party who monitors the state of infrastructure assets whether there is damage that requires renewal or just repair. The flow chart of the information system for managing asset facilities and infrastructure can be seen in Figure 4 below based on the duties of each user, the activities in this flow chart describe the data input activities and reports of each user starting from the dashboard page of each user to several menus in each user account for the principal user can only report on the maintenance and repair of assets, admin users as managers of all asset management needs starting from inputting asset data, inputting asset locations, getting reports of complaints from teacher and student users, and making monthly reports while for teacher users and student guardians can only complain about asset facilities and infrastructure. Figure 4 shows the flowchart of the system. The explanation is as follows, in this case the user who has the highest privallage is the admin, the user can do CRUD (Crete, Read, Update, Delete) while the principal, teacher and employee users can only do one of the CRUD depending on their respective duties.

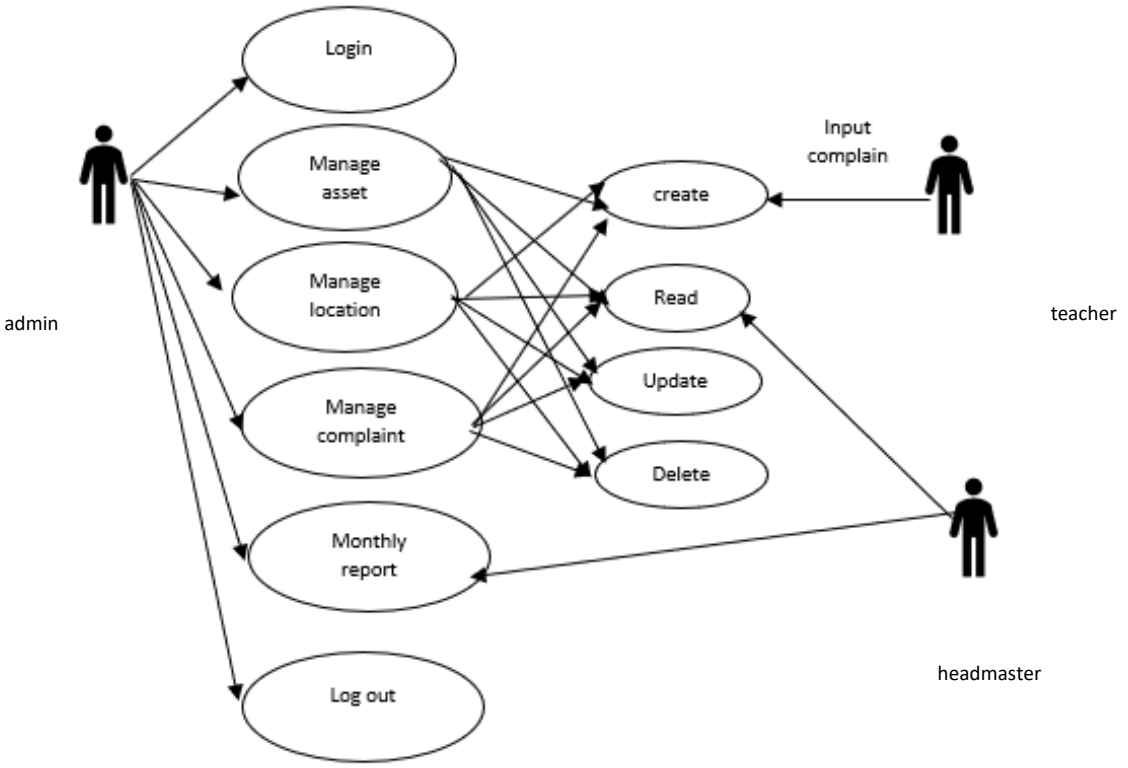

Figure 3. Use case system

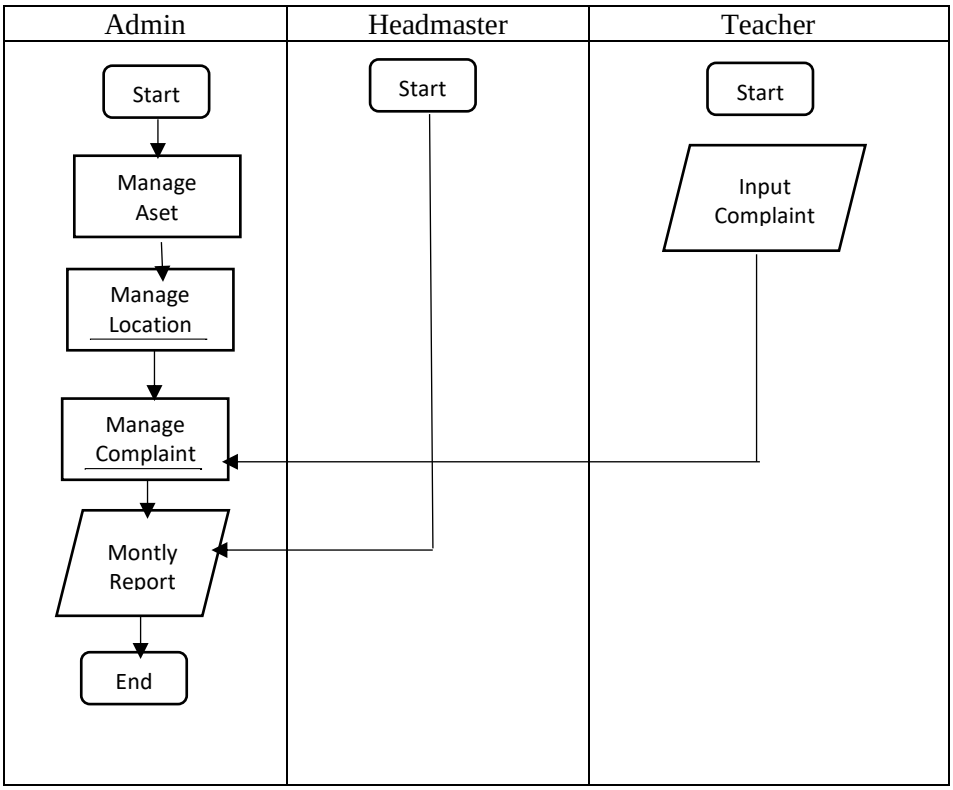

Figure 4. Flowchart System

2.4 Interface of Facilities and Infrastructure Asset Management Information System (SIMAS)

The interface of the SIMAS application that has been built is WEB-based, here are some interfaces of the SIMAS application:

a. Login View

When accessing the domain www.sdkhadijahwonorejo.sch.id, the login page will appear. Where on this page the facilities and infrastructure admin user, principal user, teacher user will log in, with each privilege of the user.

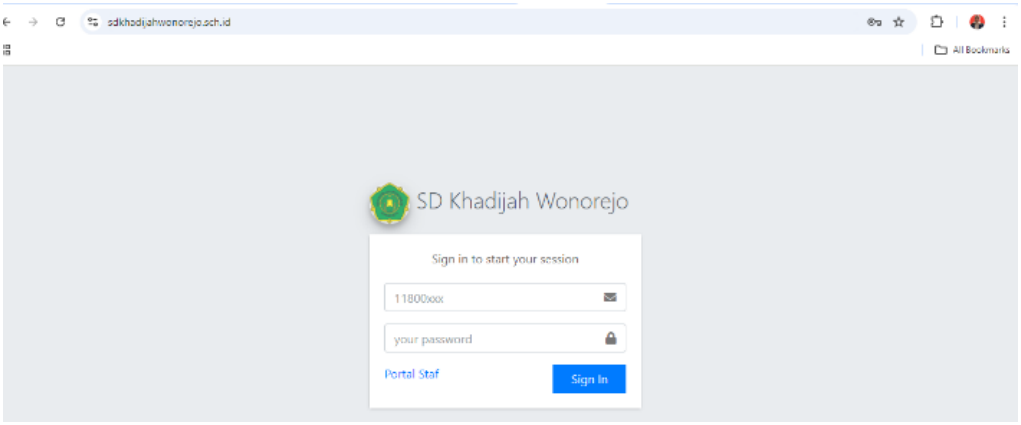

Figure 5. login page

b. User Interface Admin of Facilities and Infrastructure

The Dashboard page is presented in Figure 6. This page is the initial home page when the user logs into the system. This page also shows the menus that can be used by the user.

Figure 6. Dashboard user admin

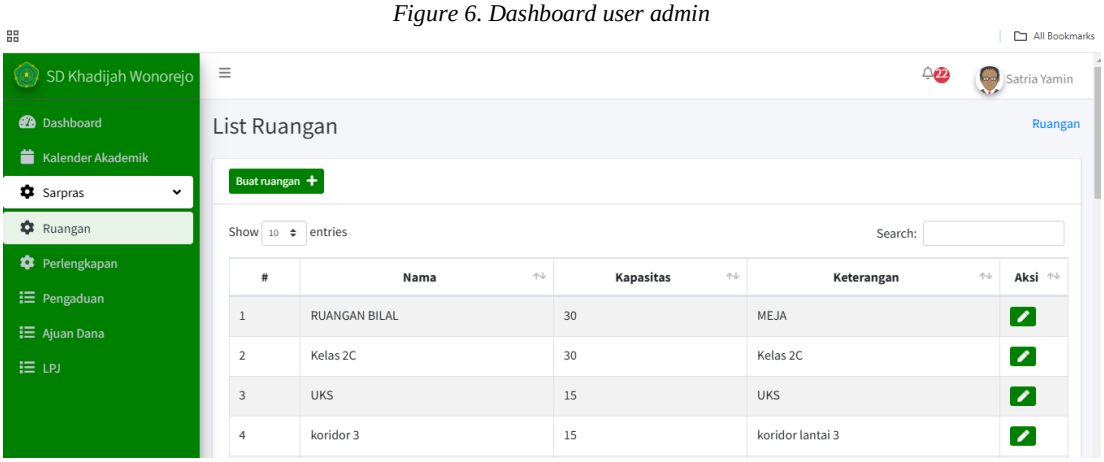

Figure 7. page manage asset

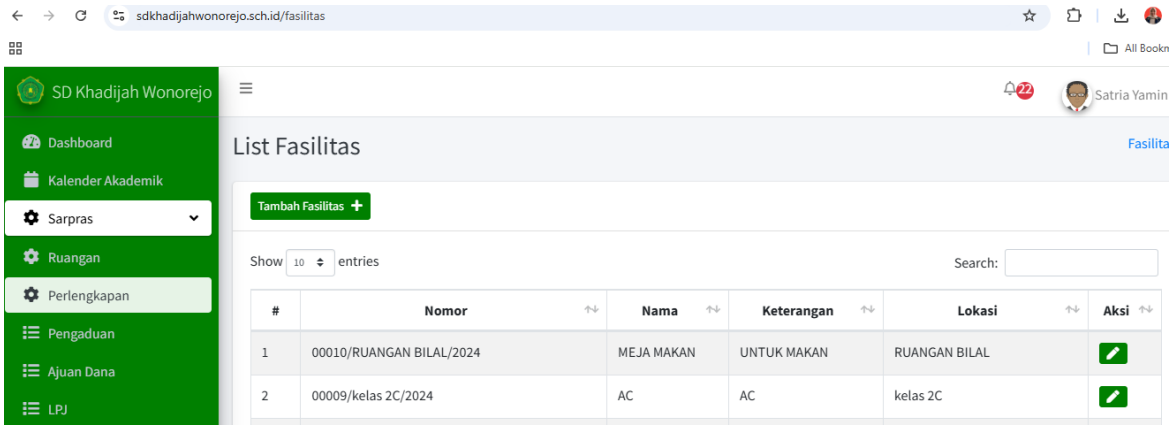

Figure 8. Page manage location

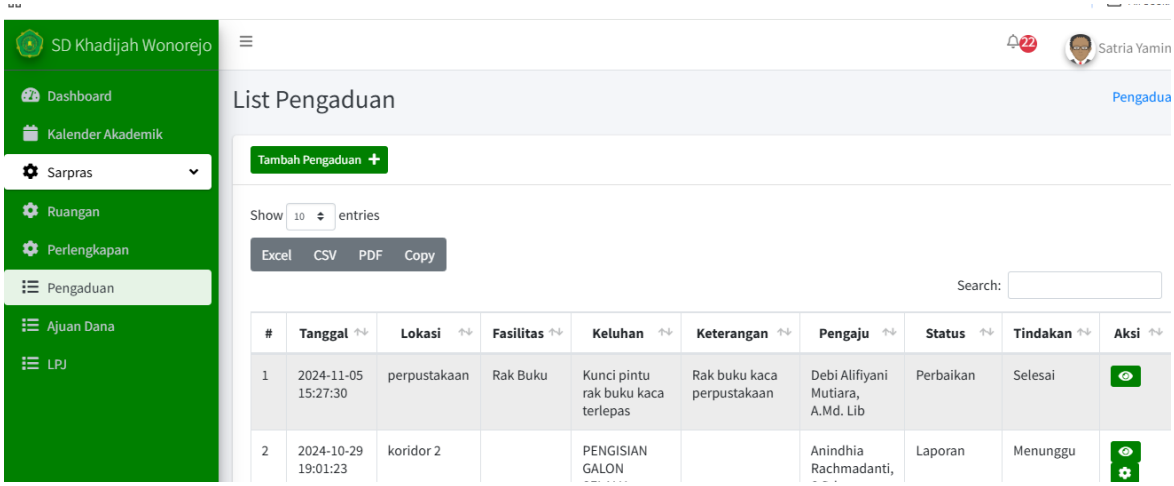

Figure 9. Page manage complaint

In Figures 7,8 and 9, the admin user of facilities and infrastructure has the highest access rights when compared to other users, because this user has the right to CRUD (Create, Read, Update, Delete) while for other users it is not. Therefore, the admin user of facilities and infrastructure can manage everything related to assets, or asset complaints.

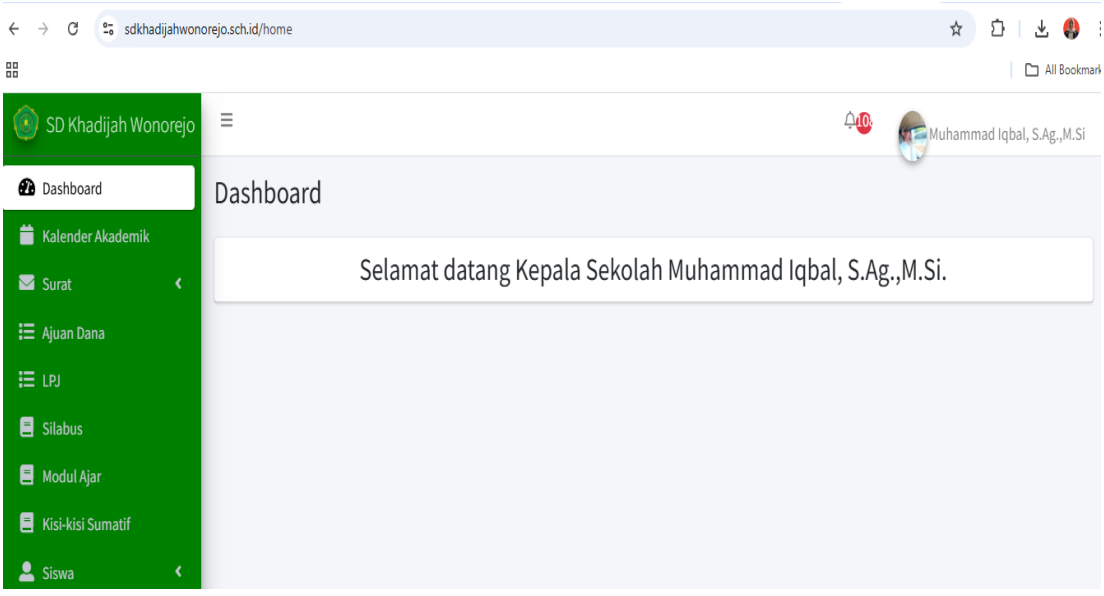

Figure 10. Dashboard

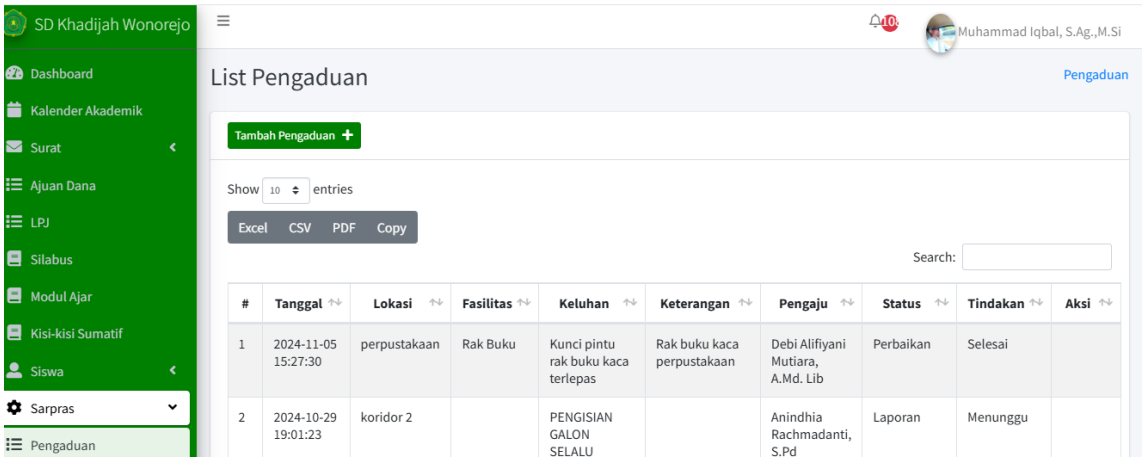

Figure 11. Monthly Report

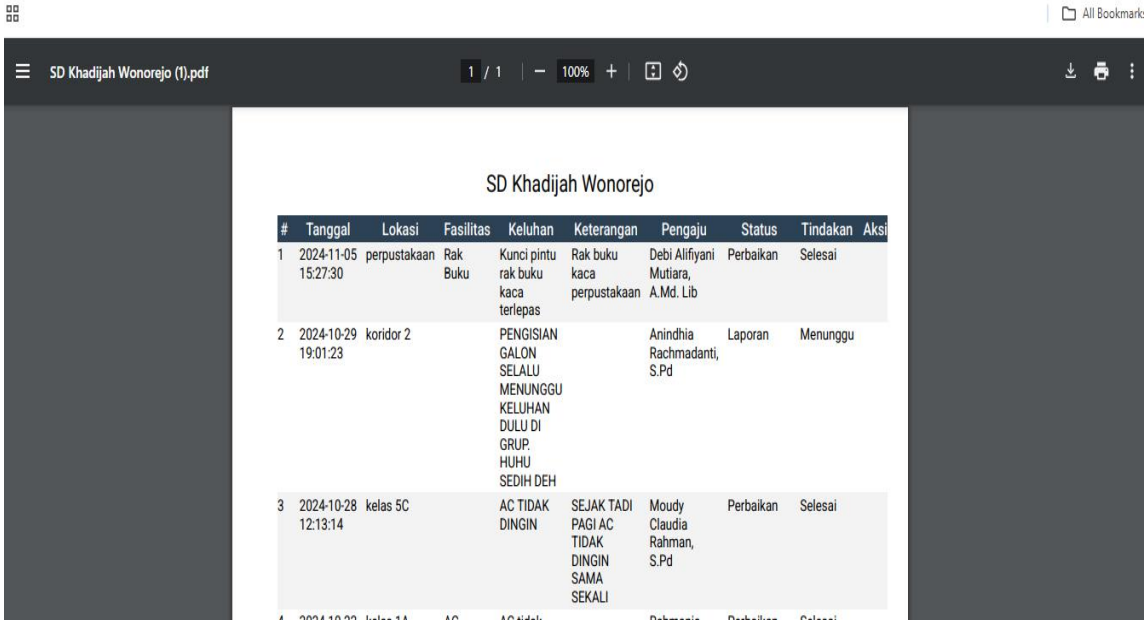

Figure 12. Print Report

c. Interface User Headmaster

The principal user acts as a monitoring party and only as a user receiving information related to location, facilities, complaints or complaints, actions that have been taken by the facilities and infrastructure admin user, and the principal user can download monthly reports, this can be seen in Figures 10, 11 and 12.

d. Interface User Teacher

In the teacher user interface only has access rights to input complaints related to assets or other infrastructure facilities, after inputting a complaint report, it will be followed up by the admin user whether to replace or repair the asset, from the teacher user complaint report, it will improve performance in terms of efficient repair or replacement of assets. This can be seen in Figures 13 and 14.

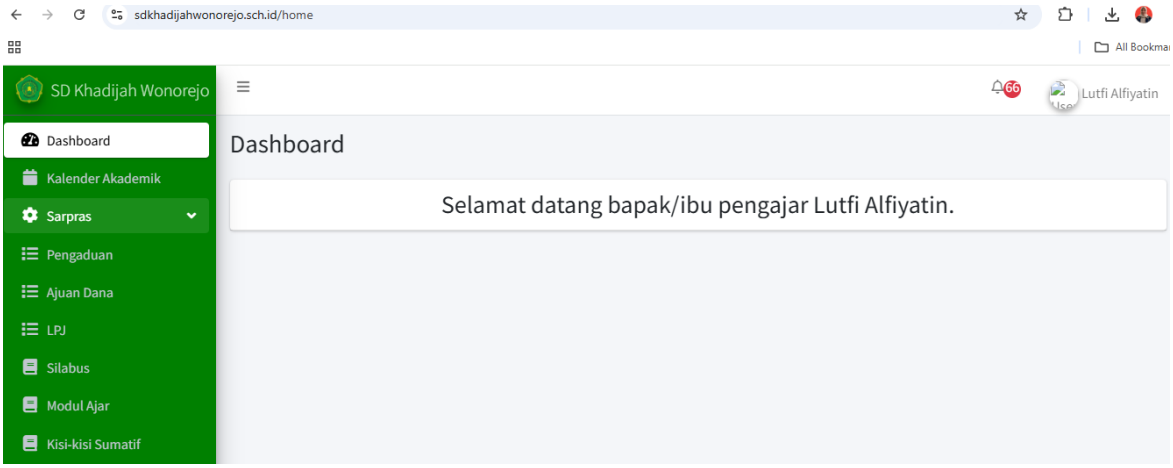

Figure 13. Dashboard Teacher or Employee

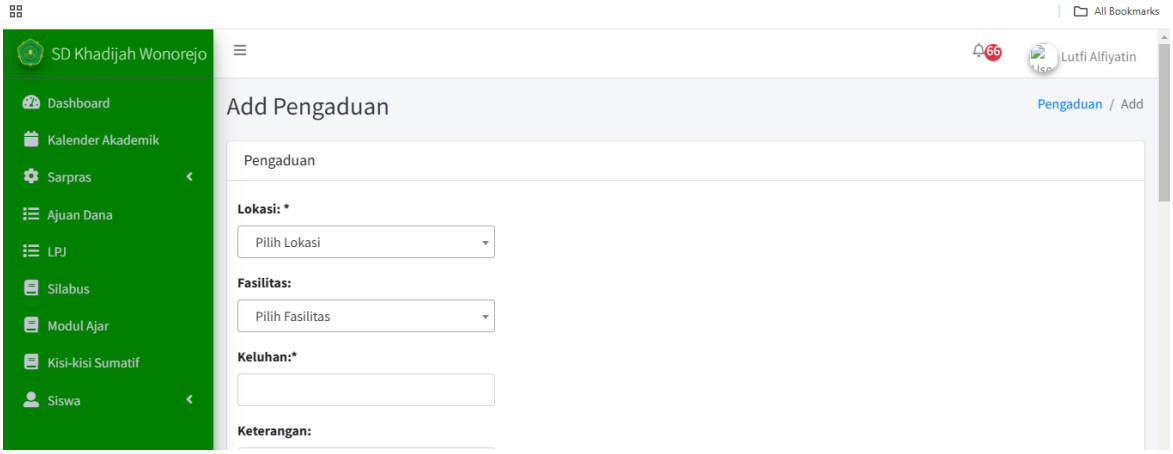

Figure 14. Input Complaint

3. RESULTS AND DISCUSSIONS

The method used in this research is black box testing and SUS testing, where black box testing is used for testing application system functions [15] while SUS testing is carried out for system feasibility testing using questioners.

3.1 Results of Black Box Testing

Black box testing aims to test the function of the application whether the menu, sub menu, and buttons in the application run properly or errors occur. The testing is presented in Table 1.

Table 1. Black Box Testing

No.	User	Component	Success	Not Success
1.	User admin	Login & Logout	Yes	
		Manage asset	Yes	
		Manage Location	Yes	
		Manage Complaint	Yes	
		Monthly Report	Yes	
2.	User headmaster	Login & Logout	Yes	
		Download Monthly Report	Yes	
3.	User Teacher or employee	Login & Logout	Yes	
		Input Complaint	Yes	

3.2 Discussions

In the calculation of respondents using the SUS testing method with user admin facilities and infrastructure totaling 3 people, user principal totaling 1 person, user teacher totaling 40 people and several employee users totaling 50 people. The total number of respondents is 94 people with the highest score limit is 5 and the lowest score is 1. The result is presented in Table 2.

Table 2. SUS Testing

No.	Username	Total	Questions								Total	Score
			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8		Totalx2.5
1	Admin	3	3	3	5	4	4	5	5	5	102	255
2	Headmaster	1	4	5	4	4	5	5	5	5	32	80
3	Employee	12	5	3	5	5	4	3	3	4	384	960
4	Teacher	40	3	4	3	2	5	5	5	5	1.280	3200
	Total	**56**	**15**	**14**	**13**	**14**	**16**	**15**	**15**	**19**	**1.780**	**4.495**

From the table above it can be concluded that in SUS testing the SIMAS application can be used properly and accurately with average results 80, because the results of the average score obtained are more than 68, because the lower limit score with SUS calculation is 68.

4. CONCLUSION

In this study it can be concluded that designing and designing a school asset management information system using the RAD method proved to be effective and flexible by adjusting user needs. The test results show that this system can reduce the time needed for the asset recording process and facilitate real-time data access, thus supporting faster and data-based decision making. Overall, this research succeeded in overcoming the existing gaps in the management of facilities and infrastructure assets through the development of an integrated and appropriate system. The implementation of this information system is expected to be applied more widely in various agencies to improve efficiency, transparency, and more optimal asset management. While the system testing carried out using the black box method shows accurate results and using the System Usability Scale (SUS) method succeeded in getting an accurate value with 89 people giving a score of 5 on the assessment of the questionnaire distributed to stakeholders.

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