Analysis and Review of Student Information System Development at Piksi Ganesha Polytechnic

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Abstract: In this increasingly advanced era of digitalization, students at Piksi Ganesha Polytechnic still have to come directly to the academic department to manually update and manage their personal data using forms, which are considered inefficient because they have the potential to cause data damage or loss. This research uses *Waterfall* software development methods to ensure that the end result is in accordance with the user's needs and expected quality. The use of HTML and CSS as markup languages, as well as JavaScript, gives a web page dynamic and interactive functionality. Testing was carried out using *the black box method*. The main purpose of this study is to implement a more efficient and accurate Student Management Information System at Piksi Ganesha Polytechnic, especially in the management of student personal data, student achievements, and academic supervisor data. With the existence of SIM-SIS (Student Information System), it is hoped that it can make it easier for students and academic staff to manage data and information on campus.

Keywords: analysis, student information system, students.

Introduction

Currently, the importance of developing information systems is undeniable. Especially in universities, the implementation of information systems has become a must for every institution that wants to develop. The shift from manual systems to modern information systems is done to meet the need for fast and accurate information, so the transition from the old system to the new system must be a priority.

Piksi Ganesha Polytechnic, a private university in Bandung, faces challenges as the number of students and study programs (study programs) grows which now reaches 11 study programs. With the increasing number of students every year, the management of Piksi Ganesha Polytechnic is required to provide fast and efficient services.

One of the problems faced related to student services is the provision of grade information. Currently, to find out the course grades, students have to come directly to the institution and ask the academic department, which takes time to find out their grades. In addition, students have to wait for their turn to get this information, and often the score data is not neatly arranged based on a particular major or semester.

Student Information System (SIM-SIS) is a solution that can manage academic activity data in higher education. This system allows the management of data such as student grades, lecture schedules, distribution of guardian lecturers, attendance recap, and calculation of the Student Achievement Index (GPA). All of this is related to lecture activities.

The Student Information System (SIM-SIS) is not only beneficial for students and lecturers, but also parents, who can monitor their children's academic development through an online system. Many universities have implemented online-based academic information

systems, so parents can easily access them. In addition, this system also provides benefits for educational institutions in improving the quality of services and academic data management.

Literature Review

Information Systems are a structured combination of people, hardware, software, communication networks, and other resources that function to collect, process, and disseminate information in an organization (O'brien, 2008). An information system is a collection of components that work together to collect, process, store, and disseminate information to support decision-making, coordination, control, problem analysis, and visualization within an organization. Reynolds explained that information systems consist of interconnected elements to collect (input), process (process), store, and disseminate (output) data and information, as well as provide feedback to achieve goals (Reynolds, 2010), (Kenneth C. Laudon, 2016).

According to Ganda, students are individuals who pursue science seriously, where their learning process is influenced by their respective abilities, including students who work or are active in student organizations (Ganda, 2004). Hartaji defines a student as someone who is studying and enrolled in a university, whether academic, polytechnic, high school, institute, or university (Hartaji, 2009).

According to Amarusu, an academic information system is a system specifically designed to meet the needs of universities in providing technology-based educational services, with the aim of improving performance, service quality, competitiveness, and the quality of the human resources produced. In simple terms, an academic information system is an application that facilitates the management of data and information related to educational institution (Amarusu, 2013).

Research Methods

This SIM-SIS research uses the Waterfall Method, which is one of the models in *System Development Life Cycle* (SDLC), as an approach in system development (Pasaribu, 2023). The Waterfall method is a systematic approach to software development and follows a sequential flow of stages, similar to a waterfall. The stages in this method include planning, system design, implementation, verification, and maintenance (Pasaribu, 2023), (Pasaribu J. , 2022).

The reason for using the Waterfall Method is because it is easy to apply and takes place gradually. Each stage must be completed first before proceeding to the next stage, which is an advantage of this method as it allows the definition of the overall system requirements before proceeding to the next stage (Pasaribu J. , 2022).

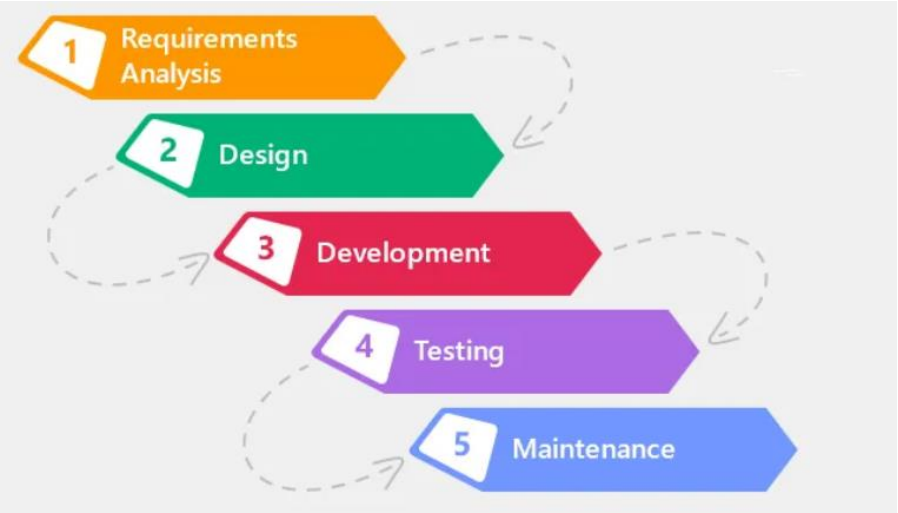


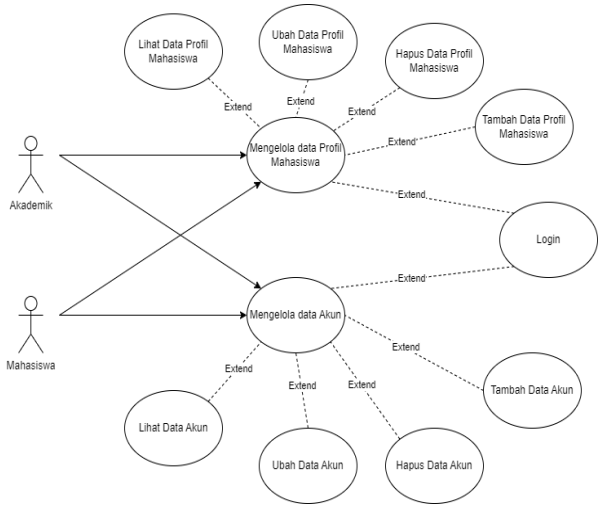
Figure 1. Classic Life Cyle or Waterfall Method

Stages in the development of the Classic Life Cyle or Waterfall Method:

1. **Requirement Analysis.** System developers must communicate with users to understand the software's needs and limitations through interviews, observations, surveys, or discussions.
2. **System Design.** This design process aims to translate system requirements into software designs that will be used as a reference in the coding process. This design stage focuses on the data structure, software architecture, interface representation, as well as procedural algorithms to be used. Some examples of system designs that are typically created include: **Data Flow Diagram (DFD), Flowchart, Mind Map, Entity Relationship Diagram (ERD), Context Diagram**, and so on. Unified Modeling Language (UML) is a versatile visual modeling language designed to provide a standard way of visualizing the design of a system. UML is a visual modeling method that is used as a tool to design object-oriented systems. UML is a standard language used to visualize, design, and document systems, often referred to as a blueprint for software development (Pasaribu J. e., 2024). The main goal of UML is to facilitate software development so that it can meet the needs of users thoroughly, accurately, and effectively. One of the important tools in behavior modeling in UML is *use case*. *Use case* used to describe the needs and usage of a system, and is usually used to capture the requirements of the system, i.e. to determine what the system should do
3. **Implementation.** The implementation stage is the process of translating the system design into a programming language that is understood by the machine through program codes.

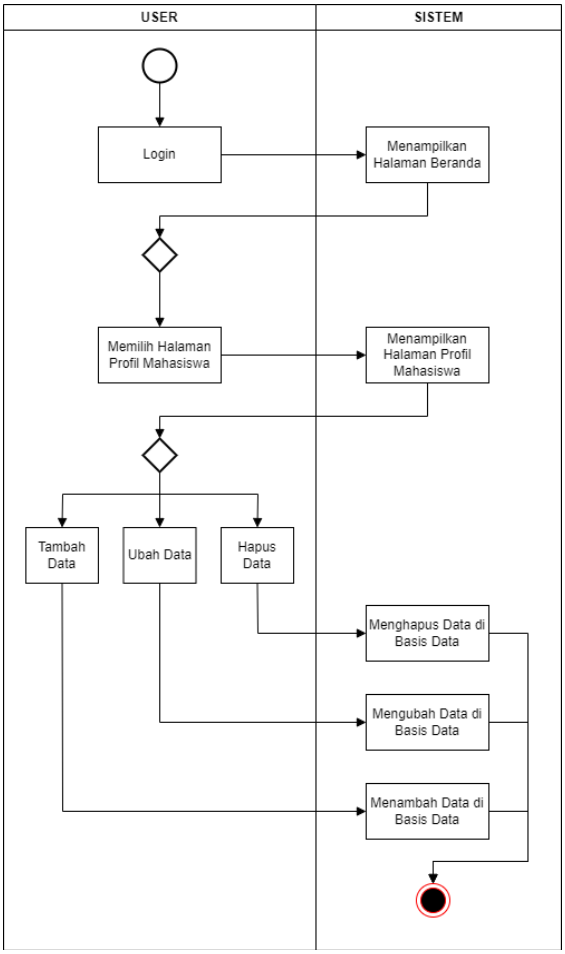
4. **Integration & Testing.** Here, the modules that have been developed are combined and tested. Testing is carried out to ensure that the software has been designed and whether there are any errors or bugs that need to be fixed.
5. **Operation & Maintenance.** In the operation and maintenance stage, the completed software will be operated and maintained regularly. Maintenance includes fixing previously undetected errors, improving systems, and improving services according to new needs that arise.

Based on the results of the analysis of student information system needs, the author has described a *Use Case Diagram* (Pasaribu J. e., 2024), which describes the interaction between students and the academic section with the information system. At *Use Case Diagram* This is like Figure 2, there are only two actors, namely students as users and academics as administrators (admin). Both can access various functions such as logging in using their respective usernames and passwords, as well as managing student profile data by viewing, changing, or deleting it.



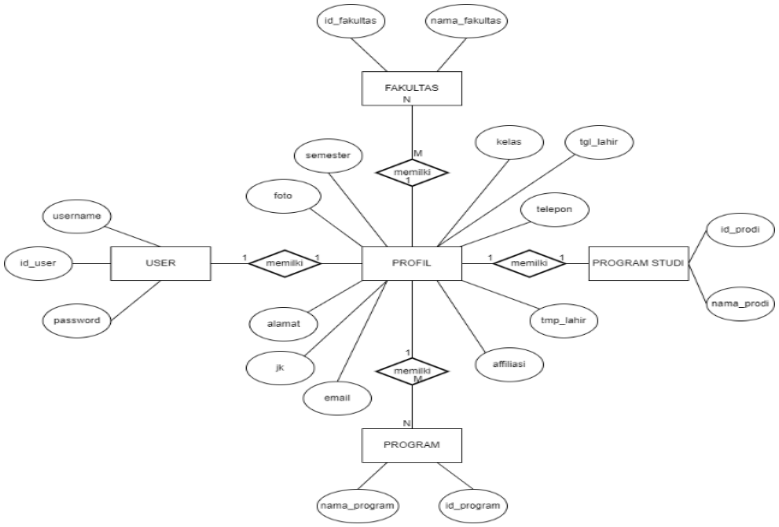
Gambar 2. Use Case Diagram

After designing *Use Case Diagram*, the following are *Activity Diagram* (Pasaribu J. e., 2024), which describes the flow of managing the student profile database in the Student Information System at Piksi Ganesha Polytechnic. *Activity Diagram* It shows the activities or data flows that can be performed by the user, such as adding, viewing, changing, and deleting data on the system in a structured manner.



Gambar 3. Activity Diagram

An Entity Relationship Diagram is a diagram that depicts the relationships between entities in a schema. In figure 4, the ERD of the database design for the Student Information System of Piksi Ganesha Polytechnic can be seen. This diagram depicts four main entities, namely *Users*, *Profiles*, *Programs*, *Faculties*, and *Study Programs*, which are connected to several relationships.



Gambar 4. Entity Relational Diagram

Results & Discussion

Implementation is the application of the results of the design that has been made, where all elements of the system and database are combined and displayed on the website page. The following is the implementation in the Student Information System of Piksi Ganesha Polytechnic, which is shown through several images and a brief explanation. The results obtained from the SIM-SIS website include various data, including student personal information, account details, achievement records, MBKM program data, academic supervisor information, and final project or scientific paper data.

- **Login page view**. On the login page, users enter data in the form of a username and password. If the username and password do not match, the system will display an error message. If the user doesn't have an account yet, they can access the registration page.

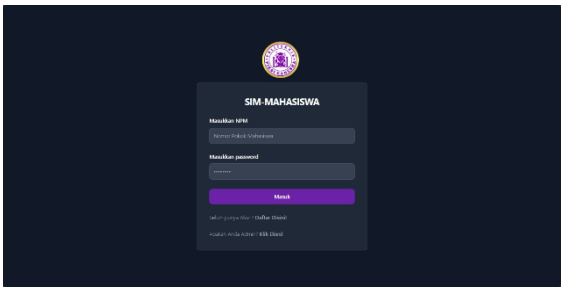


Figure 5. Login Page

- **Home Page Display**. After successfully logging in, users are redirected to the home page that displays important information related to the campus. On this page, users can also manage their profiles by accessing the manage profile page.

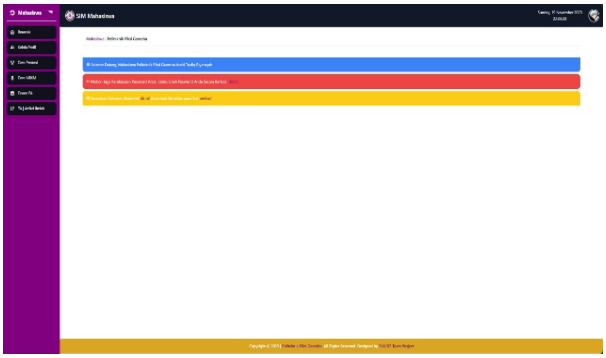


Figure 6. Home Page

- **View of the student profile page**. The profile page displays the student's personal data as well as information related to their participation in lectures.

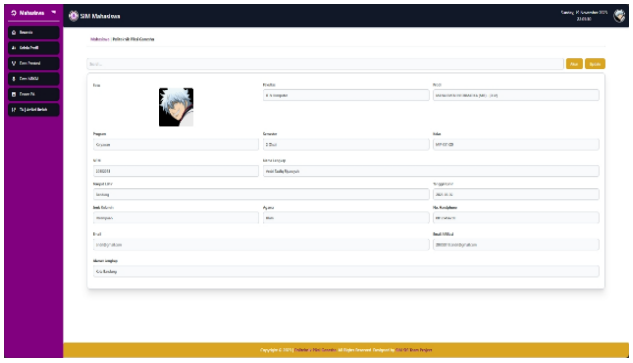


Figure 7. Student Profile Page

- **Change Student Profile Page View**. This page allows students to change their personal data, select an option from the checkbox, and upload a profile picture. Once the data changes are saved, the system will provide a confirmation.

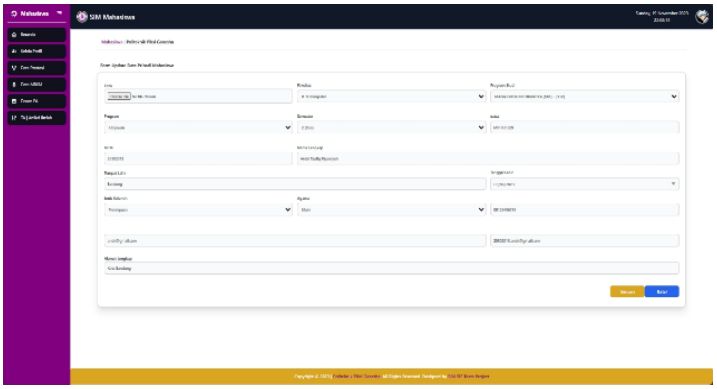


Figure 8. Change Student Profile Page

- **Account Page View**. This page contains username and password data created during registration. Users can only change their passwords, as usernames are unique and cannot be changed. After saving the changes, the system will display a confirmation message.

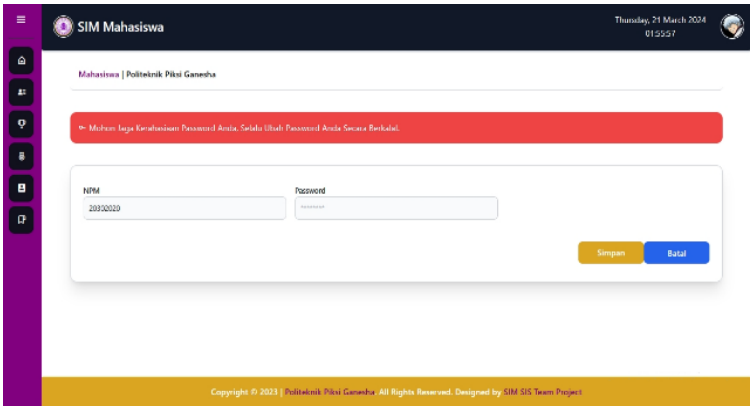


Figure 9. Account Page

- **View of the Student Achievement Data Page.** On this page, students can view, add, edit, and delete academic and non-academic achievement data that has been achieved. By pressing the plus [+] button, the user is redirected to the form to add the achievement data.

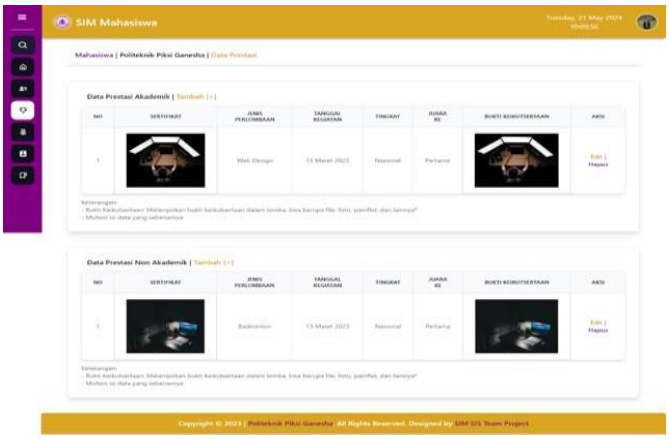


Figure 10. Student Achievement Data Page

- **MBKM Program Page Display.** This page displays information related to the MBKM Program, where students can view, add, and edit data if they have participated in MBKM activities.

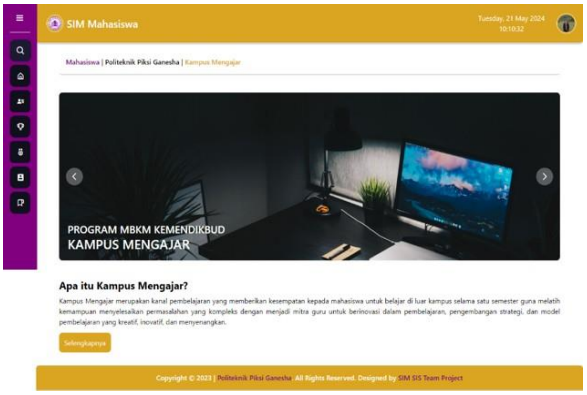


Figure 11. MBKM Program Page

- **View of the Academic Supervisor Data Page.** On this page, information about the academic advisor is displayed, including the lecturer's name, NIDN, and phone number.

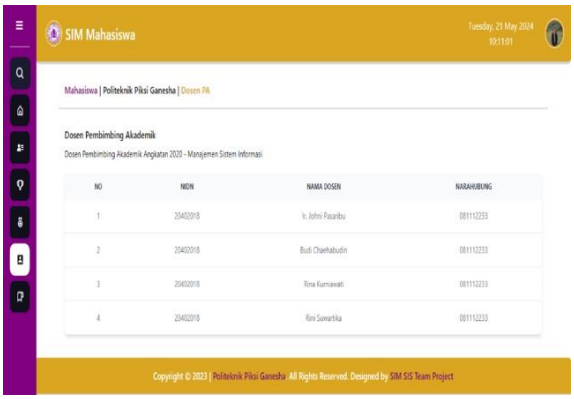


Figure 12. Academic Advisor Data Page

- Final **Project/Scientific Assignment Page Display.** This page displays information about the student's final project, such as the title of the final project, the name of the supervisor, and the final project file. By pressing the add [+] button, users can add final project data through the form provided.

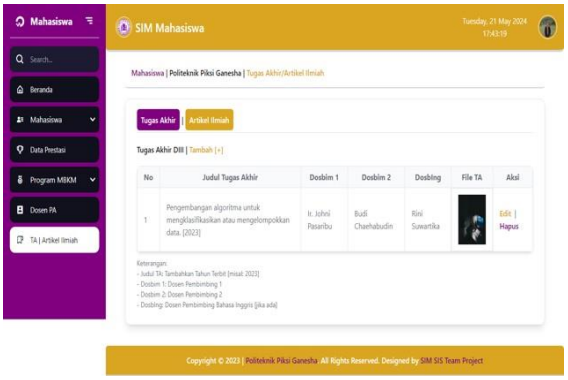


Figure 13. Final Project/Scientific Assignment Page

Testing of the system was carried out using **the Black Box** method. This method focuses on testing system functions based on inputs and outputs without looking at the internal structure. Testing is carried out by entering data into existing forms. These tests are used to ensure that the system is functioning as expected.

The following table shows the results of the Black Box test:

Table 1. Pengujian Black Box

It	Testing	Result
1	Log in and view the home page	Successful
2	View and update data on the manage profile page	Successful
3	View and change passwords on the account management page	Successful
4	View, add, edit, and delete academic achievement data	Successful
5	Displaying the MBKM Program page and integration to the MBKM KEMDIKBUD website	Successful
6	Displaying, adding, editing, and deleting data on MBKM activities	Successful
7	Displaying academic supervisor data	Successful
8	View, add, edit, and delete final project data	Successful

Conclusion

This study concludes that the implementation of the web-based Student Management Information System (SIM-SIS) at Piksi Ganesha Polytechnic has helped improve the efficiency of student data management. With SIM-SIS, students can access through the website and do not have to go to campus to fill in or collect the necessary data, so they are more productive.

The system also reduces the time it takes to manage data and improves the accuracy of information. However, the main drawback of this system is the lack of security features to protect data from leaks. Therefore, regular system maintenance and security improvements are essential to minimize the risk of data leaks.

For further development, it is recommended that this system be equipped with additional features, such as information about student organizations, student activity units, and ongoing activities on campus.

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