Chapter 4

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CHAPTER 4

REQUIREMENT ANALYSIS AND DESIGN

4.1 Introduction

This chapter delve into the requirements to develop the system and the design of the system. The requirements analysis will be divided into 2 part which are the functional requirements that consist of diagrams such as use case diagram, sequence diagrams and activity diagrams and the non-functional requirements. The design of the system is also included which are the project architecture design, database design and interface design. The complete diagrams and design can be found in the appendix section that separated into 3 parts, appendix A for SRS, appendix B for SDD and appendix C for STD.

4.2 Requirement Analysis

This section will discuss about functional and non-functional requirements of the system from the stakeholder.

4.2.1 Functional Requirements

In this part, the features and behaviors of the system will be discussed. It is crucial to have functional requirements since it define the main functions of the system.

4.2.1.1 Use Case Diagram

To represent the main functions and features of the system, use case diagram is used since it can describe the important component of the system along with its

relationship with the users of the system. The use case diagram of SAMS is depicted in figure 4.1.

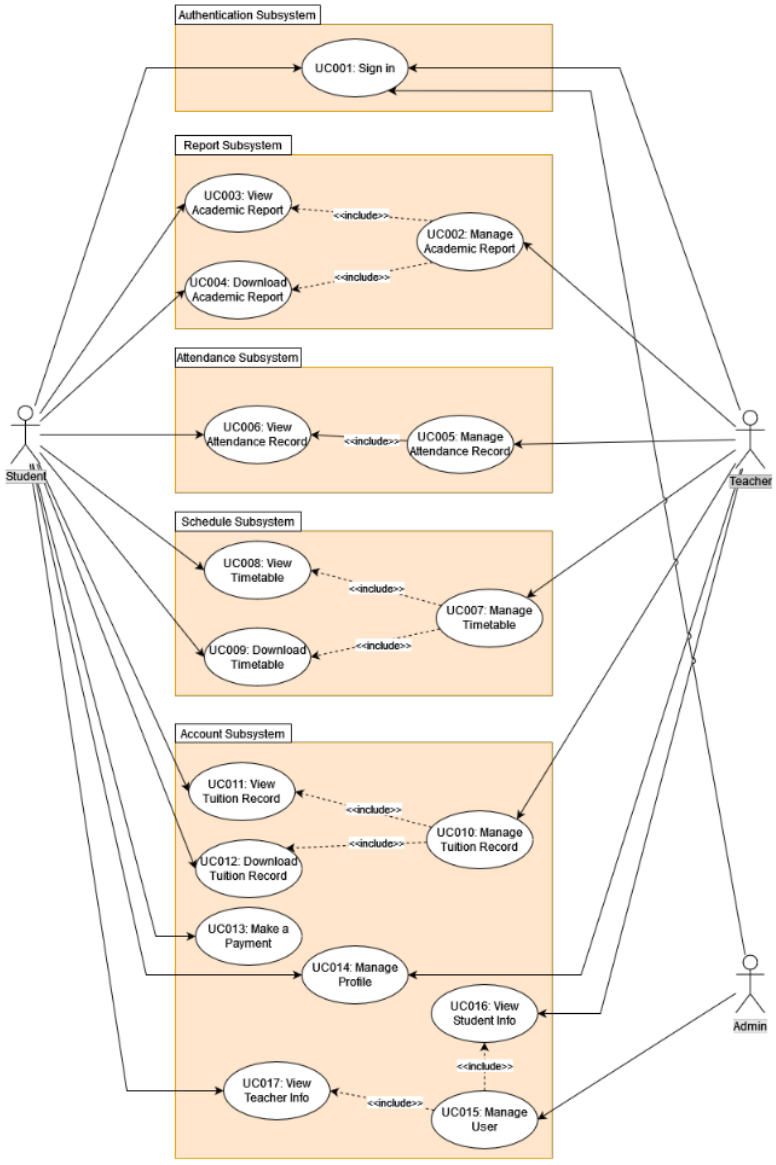

Figure 4.1 Use Case Diagram of Student Academic Management System

The figure above shows all of the functions that exist in the proposed system. Besides the use case and subsystems there are three users that directly involved in the system. The arrow shows users can only access certain functions. There are 17 use cases that divided into 5 subsystems. There are multiple use cases that included into

another use case, this is because certain user like student can only access some of the original functions. The description on what the actors and use case's role in the system will discussed in the next subchapter.

4.2.1.2 Actors Description

Actors involved in the system are Student, Teacher and Admin. For student they will get access to most of their data by viewing or downloading it. As for teacher they mostly have access to managing use case means that they gain access to a lot of CRUD operations. Lastly, the admin has a role to manage all of the user account since creating users account is done by the admin. So, they have quite an important role in the system.

4.2.1.3 Use Case Description

Use Case Description describes how each of the use case works if an actors or user using them. All of 17 uses cases will be briefly explaining here.

1) UC001 – Sign In: This use case is used for every user in the system to enter the system
2) UC002 – Manage Academic Report: This use case is used for teacher to manage the academic report and marking of students
3) UC003 - View Academic Report: This use case is used for student to view their academic report
4) UC004 – Download Academic Report: This use case is used for student to download their academic report
5) UC005 – Manage Attendance Record: This use case is used for teacher to manage the attendance record including to take attendance during class
6) UC006 – View Attendance Record: This use case is used for student to views the attendance record
7) UC007 – Manage Timetable: This use case is used for student to manage the attendance record including to take attendance during class

8) UC008 – View Timetable: This use case is used for student to views the timetable
9) UC009 – Download Timetable: This use case is used for student to download the timetable
10) UC010 – Manage Tuition Record: This use case is used for teacher to manage the tuition record including approving or rejecting tuition payment
11) UC011 – View Tuition Record: This use case is used for student to view the tuition record
12) UC012 – Download Tuition Record: This use case is used for student to download the tuition record
13) UC013 – Make a Payment: This use case is used for student to download the tuition record
14) UC014 – Manage Profile: This use case is used for student and teacher to view and edit their profile
15) UC015 – Manage User: This use case is used for admin to manage user account both student and teacher
16) UC016 – View Student Info: This use case is used for teacher to view list of students and their detailed information
17) UC017 – View Teacher Info: This use case is used for student to view list of students and their detailed information

4.2.1.4 Use Case Specification

Use case specification will describes the use cases in a more detailed manner. In this case, one of the use cases will be used as an example on how use case specification works. The rest of the use case specification can be found in the SRS in the appendix A.

Use Case ID:	UC-002
Use Case Name:	Manage Academic Report
Actors:	Teacher
Description:	This use case is used for teacher to manage the academic report and marking of students
Pre-conditions:	1. Logged in to the system
Normal Flow:	1. Go to the “Rapor” page 2. If the teacher clicks “Penilaian” performs AF1 3. If the teacher clicks “Edit Penilaian” performs AF2 4. Select academic year 5. Select semester 6. Select class 7. Select student 8. The system displays the academic report 9. If the teacher wants to download the academic report performs AF3 10. If the teacher is a homeroom teacher and clicks “Buat Rapor” page performs AF4 11. If the teacher wants to delete the academic report performs AF5
Alternative Flow:	1. Marking 1.1 System redirects teacher to “Peniliain” page 1.2 System display the marking form 1.3 Fill in the marking form 1.4 System saves student mark 2. Edit Marking 2.1 System redirects teacher to “Edit Penilaian” page 2.2 System displays the student that the teacher already marked 2.3 Select student 2.4 System displays the marking form 2.5 Edit the mark 3. Download Academic Report 3.1 Click the “Unduh” button to download 4. Create Academic Report 4.1 System redirects teacher to “Buat Rapor” page 4.2 Select Student 4.3 Teacher fills in additional information 4.4 Teacher clicks “Buat Rapor” button 5. Delete Academic Report 5.1 Click “Trash” icon to delete the academic report
Exception:	**E.1 Required field(s) is/are empty in marking form** 1. an error message will be displayed by the system 2. Performs NF2/AF1 **E.2 Required field(s) is/are empty when creating Academic Report**

Table 4.1: Use case specification for UC002 - Manage Academic Report

	1. an error message will be displayed by the system 2. Performs NF9/AF4
Post-conditions:	1. Teacher successfully views the academic report 2. Teacher successfully downloads the academic report 3. Teacher successfully marks the student 4. Teacher successfully edits the marks of the student 5. Teacher successfully creates the academic report
Related Requirement:	-

4.2.1.5 Sequence Diagram

Sequence diagram is designed to show the action between actors/users and the system's objects. In this case, UC002 will be used again to represent the sequence diagram. The rest of the diagram can be found in the appendix B.

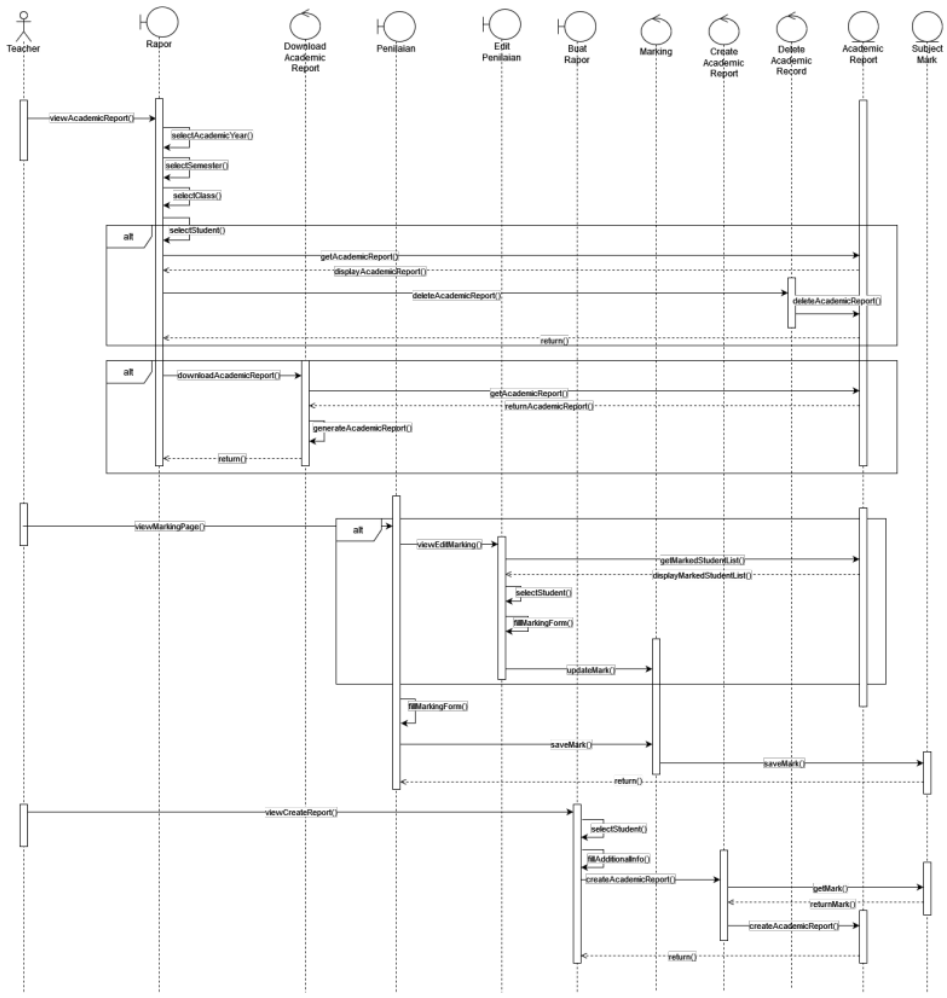

Figure 4.2: Sequence diagram of UC002 – Manage Academic Report

The figure above depicts how the users interact with object in the system through UC002. There are two alternatives that can be done by the teacher when viewing academic report which are deleting them or downloading the academic report. The Teacher can also go to the marking interface to mark student or they can edit the mark in the edit mark page. The last action that the teacher can do in this use case is to create the academic report. After all the action done indicated by the arrow going into the entity and return back to the boundary.

4.2.1.6 Activity Diagram

Activity diagram is used to demonstrate the flow of a certain functions. All of the involved actor will start at the same time and destination and also end at the same destination. UC015-Manage User will be used as the activity diagram in this part. Other activity diagram can be found in appendix A.

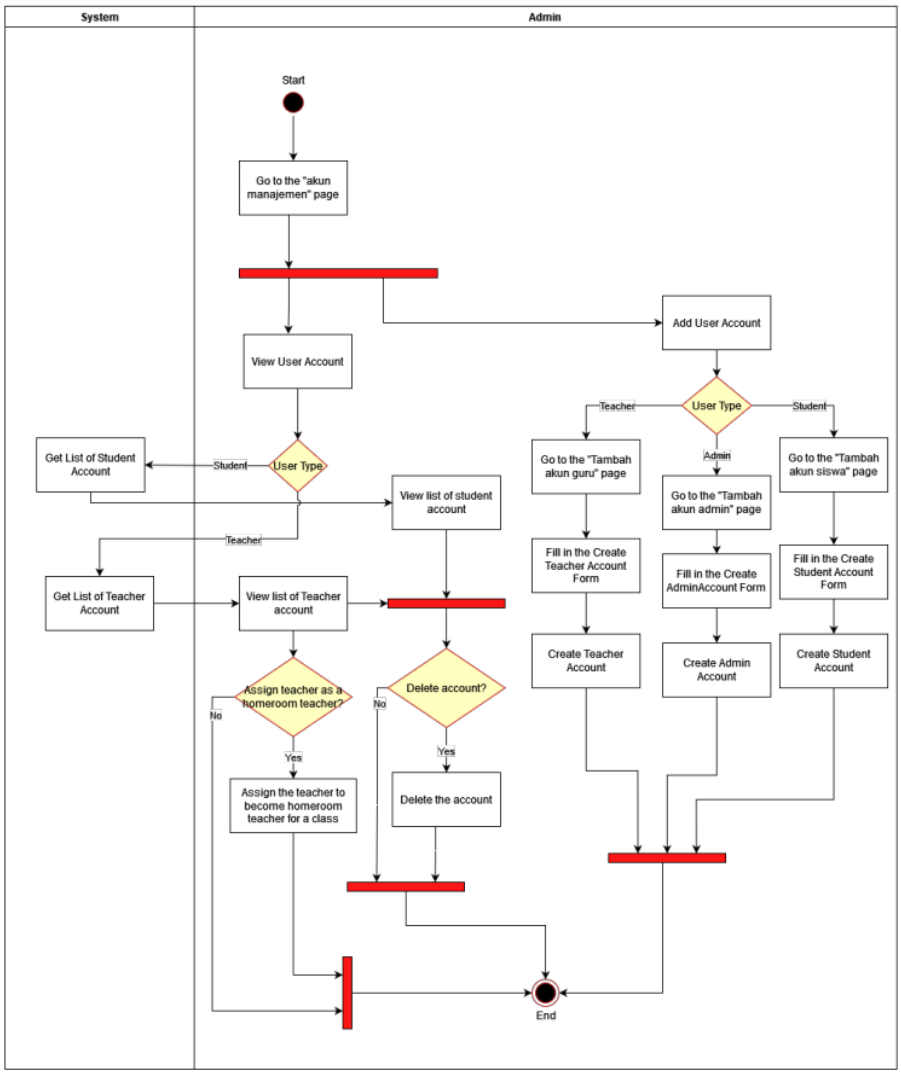

Figure 4.3: Activity diagram of UC0015-Manage User

In this UC, the admin can go to account management page to manage all user account. The admin has a few conditions from the start when viewing user account, they can choose to view students account or teacher account. They can also delete the user account when the system displays the user list. Additionally, when viewing the teacher account list, they can assign them to classes to act as a homeroom teacher. The admin can also add new account since this is the only way for user to be added to the system. Once again, the admin can choose what type of user account they want to create. When creating student account, they can assign the semester and academic year of that student.

4.2.2 Non-functional Requirements

Different from functional requirements, non-functional requirements act as the constraints of the system. Non-functional requirements more focused toward the system itself on what it can do to improve the functionality of the system. The system must achieve the requirements that are listed below.

1) Availabilty – The user should be able to access the system at any moment thus, the system must be available all day every day.

2) Security – The system should only allow authorized user from SMAS Muhammadiyah 1 to access the system. The system must provide protection to all of the data exist in the system.

3) Usability – The user should be able to explore the system with ease after inspecting the system a little bit. The system must be simple to use and comprehend.

4) Portability – The system should work with any web browser. The user shall be able to access the system from their preferred web browser

4.3 Project Design

The architecture used for this proposed system is MVC or Model-View-Controller. In this model the code structure separated into different part which are mode, view and controller. The model in MVC is used as a bridge to transfer data between view and controller. As the name suggest the view in the MVC is for the user interface. And the controller is used for calling the functions.

One of the most important benefits of using MVC in a web-based app is how flexible it is which led to faster process when developing. Since its flexible, it means that changes made will not entirely affect other part of the system. Additionally, it has the benefit of helping the developers repeating the same code because model which represents data is separated from the logic in the controller. All of these benefits will greatly help developing SAMS. Following is the MVC diagram of SAMS.

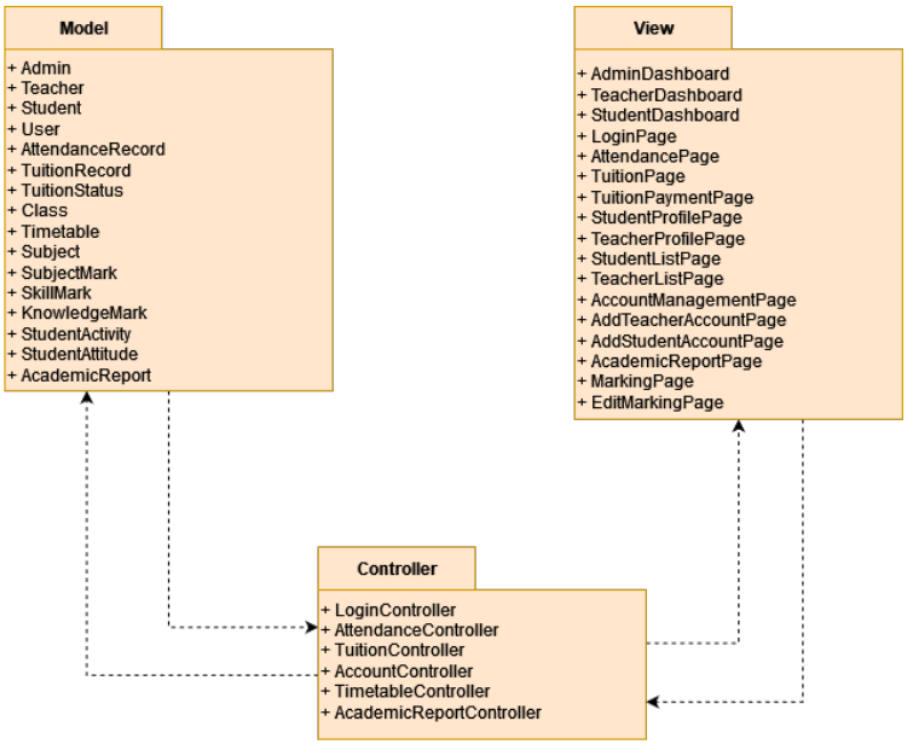

Figure 4.4: Architecture model diagram for SAMS

4.4 Database Design

In this part of the chapter, the design of the database for SAMS will be explored. Since database is a crucial part when developing the proposed system, an excellent database design is required. Following is the Entity Relationship Diagram (ERD) of Student Academic Management System.

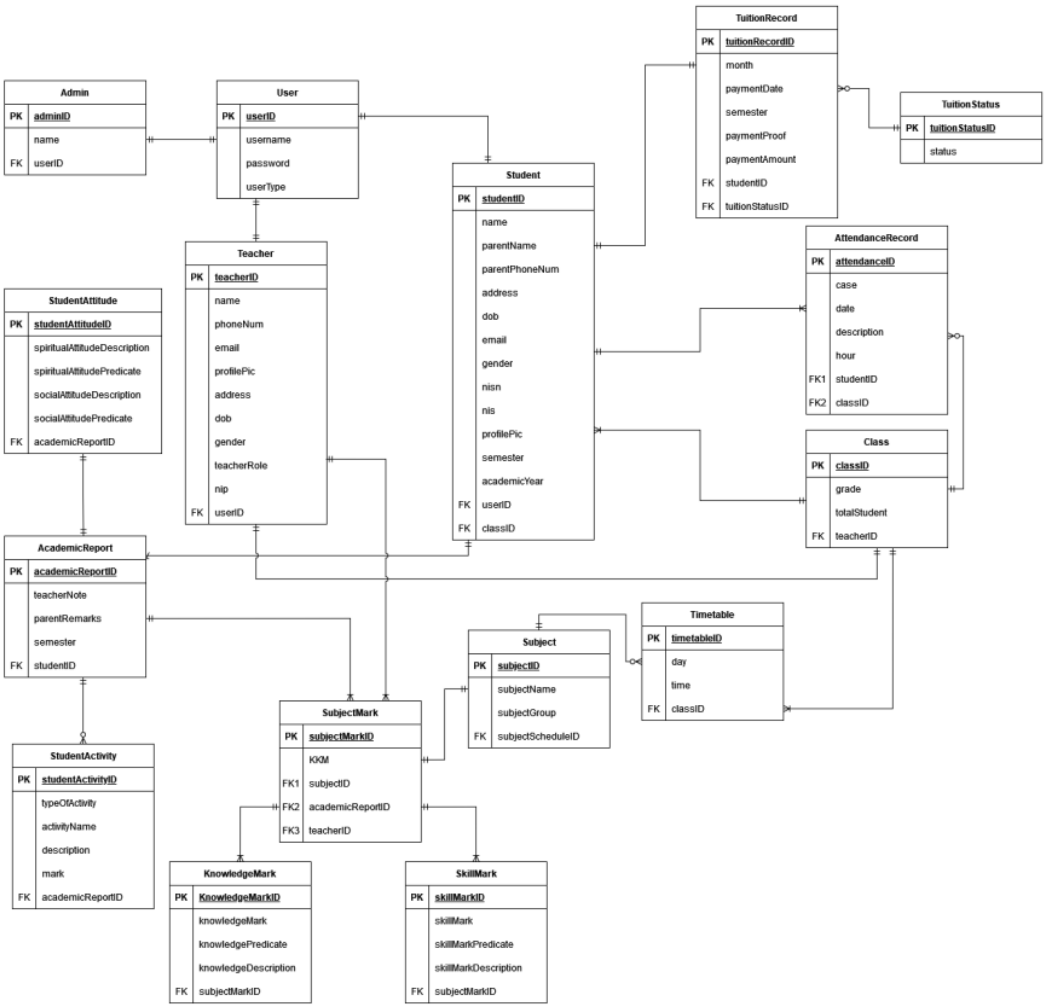

Figure 4.5: ERD of Student Academic Management System

From the ERD figure above, there are total of 16 entities. The purpose of the user entity is to store username and password from all of the different type of users. The academic report table will hold all of the marks of a student when all of the teacher finished marking and the creation of academic report can begin. The mark itself separated into two tables which are knowledge mark and skill mark. The subject mark table then will collect both type of mark and store it until the teacher create the academic report. The attendance table is used for the attendance checking function while the tuition record table is used for managing student's tuition payment. The timetable table will store the timetable created by teacher.

4.4.1 Data Dictionary

Data dictionary provide description about the attributes from the figure above. Here are the data dictionary for two entities which are academic report and knowledge mark.

Table 4.2: Data dictionary of AcademicReport Table

AcademicReport Table			
Field Name	Datatype	Constraint	Description
academicReportID	BIGINT	Primary Key	Unique ID of the AcademicReport table
teacherNote	TEXT	not null	Note from the teacher about the student
semester	VARCHAR	not null	The semester of the student
studentID	BIGINT	Foreign Key	Unique ID of the Student table

Table 4.3: Data dictionary of KnowledgeMark Table

KnowledgeMark table			
Field Name	Datatype	Constraint	Description
knowledgeMarkID	BIGINT	Primary Key	Unique ID of the KnowledgeMark table
knowledgeMark	INT	not null	Knowledge mark of a student for a subject
knowledgePredicate	CHAR	not null	The predicate of the knowledge mark that the student got for a subject
knowledgeDescription	TEXT	nullable	The Description of the knowledge mark that the student got for a subject
subjectMarkID	BIGINT	Foreign Key	Unique ID of the SubjectMark table

4.5 Interface Design

Interface design will be shown in this section. The section will be separated into two parts, Site map or page navigation diagram and the mock up user interface design.

4.5.1 Page Navigation Design

There are three users/actors in the system which mean there will be three different dashboards for each user. The following figures are the page navigation design for teacher, student and admin.

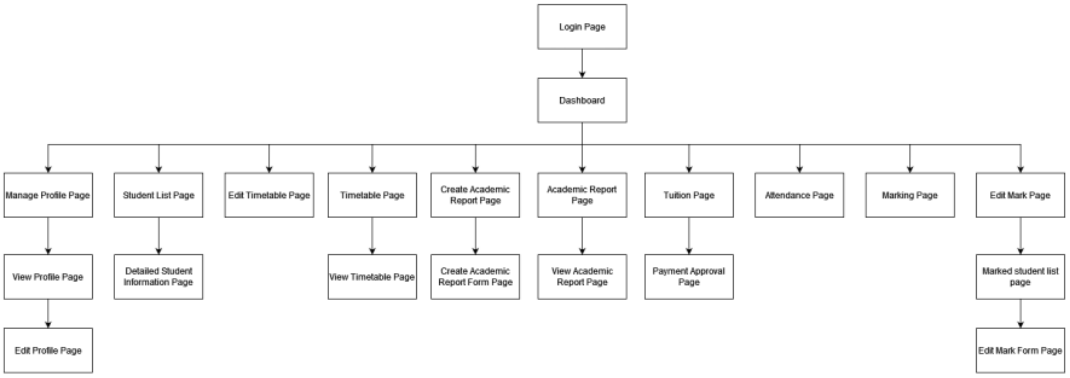

Figure 4.6: Page Navigation for Teacher in SAMS

After entering the system successfully through login, the teacher will be redirect to their own dashboard. From this dashboard the teacher can access all kind of different functions from creating academic report page to managing their profile.

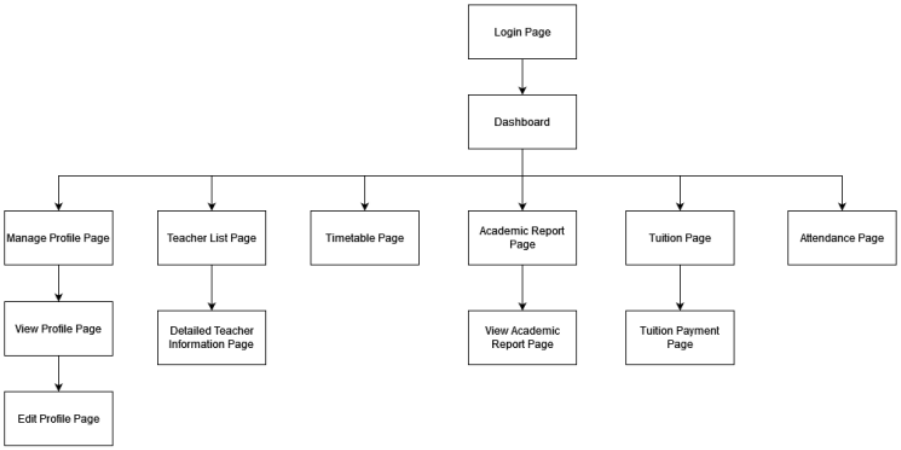

Figure 4.7: Page Navigation for Student in SAMS

After the student login into the system, they also welcomed with their own dashboard. From the dashboard the student can access manage profile page, teacher list page, timetable page, academic report page, tuition page and attendance page.

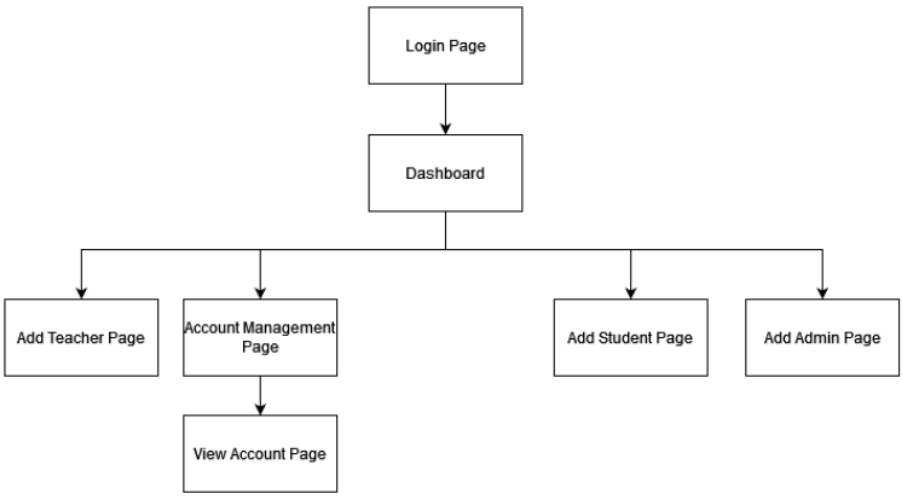

Figure 4.8: Page Navigation for Admin in SAMS

From the figure above, the admin can access to multiple pages after successfully enter the system. These pages are added teacher page, account management page, add student page and add admin page.

4.5.2 User Interface Design

In this part, some of the mockup UI design will be shown, the complete mockup design can be found in the SDD in appendix B.

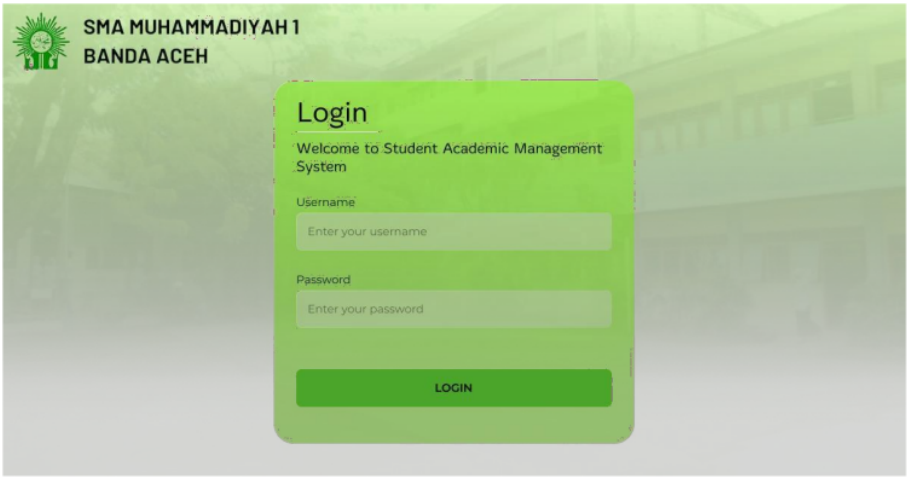

Figure 4.9: Login Page for SAMS

This page is used for the user to enter the system. The username and password will be provided by the admin since they are the only one who can make users account. After successfully login using valid credentials, each user will be redirected to their own dashboard.

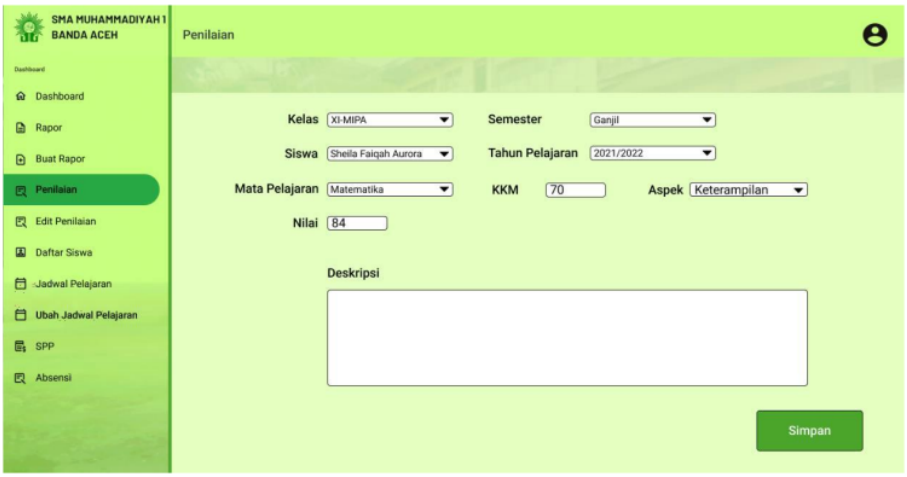

Figure 4.10: Marking Page for Teacher in SAMS

In this page, the teacher can begin marking students. They can select between two type of marks which are knowledge mark and skill mark. They can also set the KKM which mean passing grade.

Figure 4.11: Academic Report Page for Teacher in SAMS

In this page the teacher can sort and search the student that they want to view or download their academic report. The view academic report page is available under appendix B.

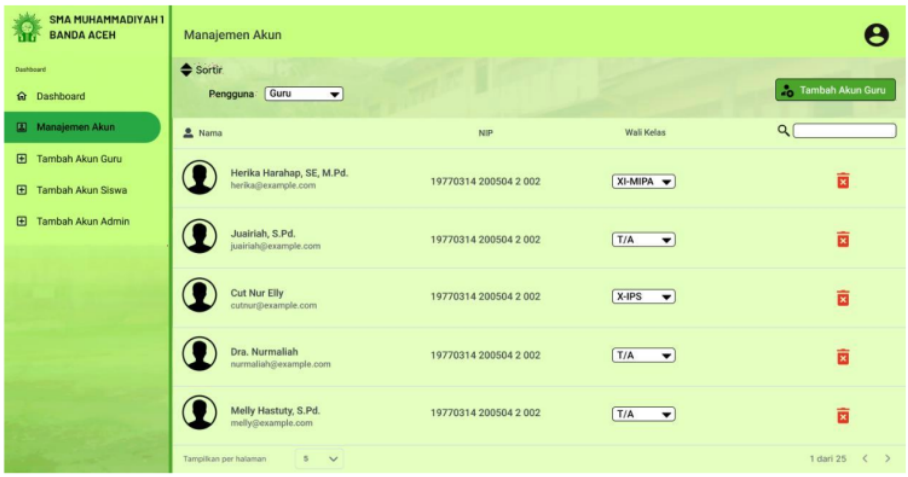

Figure 4.12: Account Management for Admin in SAMS

An admin can choose which user to view in this page. In this case the teacher account list is displayed. The admin then can set the teacher to be a homeroom teacher for a specific class or they can delete unused teacher account.

4.6 Chapter Summary

This chapter consist of requirement and designs for the proposed system. The requirement stated whether functional or non-functional will act as a standard for the system. The Model-View-Controller based system architecture design, database design and mockup interface design are also included in the chapter that will provide some basis for when developing the system later.

Chapter 4

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