Chapter IV

Methodology

This chapter discusses the methods and approach used to gather information and data that will help and contribute to the development of the proposed system. The proponents will make use of interviews to come up with ideas in developing the proposed system.

System Design

System Development Life Cycle Processes

The systems development life cycle (SDLC) is a conceptual model used in project management that describes the stages involved in an information system development project, from an initial feasibility study through maintenance of the completed application. (Gillis, n.d).

Various SDLC methodologies have been developed to guide the processes and the proponents used the Spiral Model for the system development. Since this method involves validation or verification between phases, any discrepancies can be remedied right away, ensuring client satisfaction throughout the System Development Life Cycle (SDLC).
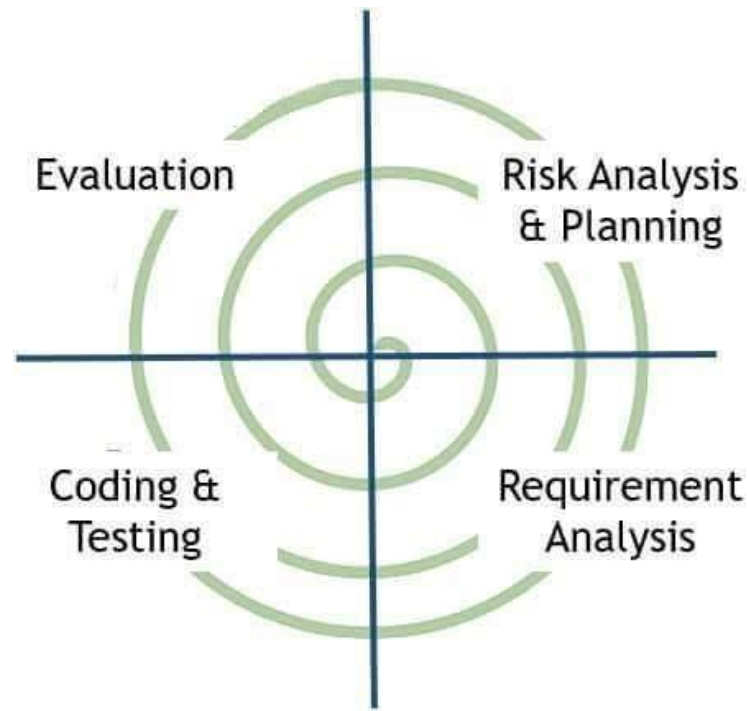
Figure 4: System's Development Life Cycle (Spiral Model)

Requirement Analysis & Definition Phase

In the initial stage of this phase, where the proponents sought advice for a system proposal, the proponents were recommended to help the graduate school dean's office with their current system for pre-enrollment, so the proponents had an idea to make a web system for online pre-enrolling graduate students to help both the graduate school staff and students.

The user's computer will have at least 2 GB or more of RAM and a minimum of a quad-core 1.3 GHz processor or higher to start developing the system. It runs Microsoft Windows 7 or later. There is no expenditure on the system's development unless one of the said requirements is inadequate in the group because the system cannot be started. If the group meets the development requirements, they can start designing the user interface (UI) of the system and other processes.

Risk Analysis and Planning Phase

In this phase, the proponents designed it to be easy to use and more efficient than using a Google Form for pre-enrollment so that each time enrollment comes for graduate school, they can use it efficiently as such and not input their information for pre-enrollment each semester. The proponents used Bootstrap 5 for designing the web system, including the layout, UI, buttons, forms, and more.

Coding and Testing Phase

In the coding and testing phase, the proponents use PHP as the frontend, Laravel as the backend, and MySQL as the database, programming the proposed system with Visual Studio Code. Before launching it at Leyte Normal University's graduate school, several tests were carried out to ensure that the system's quality satisfied not only the students but also the graduate school's staff. Once the proposed system is done, it will be implemented at Leyte Normal University for use in graduate school.

Evaluation Phase

After launching the system, there will be an evaluation of the web system, which will be done with feedback from the students. When necessary, the developers will update the system according to the end-user's feedback.

Black box and White box Testing

White box Testing

In white box testing, this is the method where a software testing strategy is used to check input-output flow, improve design, usability, and security by looking into the underlying structure of the software. End-users are unaware of the internal structures.

Pass: ✓ Fail: ✗

Action	Test 1	Test 2
Creating Account	✓	✓
Login Admin/Staff	✓	✓
Check the overview in the Dashboard	✓	✓
Pre-enrollment (New and Continuing Student)	✓	✓
Pending Students (Approving the New Continuing Student)	✓	✓
Advising & Assigning Subject (New and Continuing Student)	✓	✓
View Enrolled Students	✓	✓
Creating Students Account	✓	✓
Change Student Password	✓	✓
View Student Users	✓	✓
Adding, Updating, and Deleting of Programs	✓	✓
Adding, Updating, and Deleting of Subjects	✓	✓
Adding, Updating, and Deleting of Instructors	✓	✓
Exporting Data of Programs	✓	✓
Exporting Data of Subjects	✓	✓
Exporting Data of Instructors	✓	✓

Table 4. White Box Testing

Black Box Testing

In the black box testing, this is the viewpoint from the standpoint of the end-user. This mostly focuses on the input and output of software and is wholly reliant on the requirements and standards of software. This will strengthen the security, and usability of the software.

Action	Test 1	Test 2
Test if the user can pre-register	✓	✓
Test if the user can login	✓	✓
Test if the user can change password	✓	✓
Test if the inputted data will reflect on the database.	✓	✓
Test if the inputted information can be seen through the dashboard of the system.	✓	✓
Test if the announcement uploaded by the admin can be seen by the users	✓	✓
Test if the frequently ask questions uploaded by the admin can be seen by the users	✓	✓
Test if the users can view the enrollment process on the landing page	✓	✓
Test if the users can edit and update information on the student profile	✓	✓
Test if the users can view the monitor enrollment	✓	✓
Test if the users can view the thesis management	✓	✓

Table 5. Block Box Testing

Gantt Chart

Legend: Red = Critical Path, Black = On-Time

No	ACTIVITIES	NO. OF DAYS	Jun W1	Jun W2	Jun W3	Jun W4	Jul W1	Jul W2	Jul W3	Jul W4	Aug W1	Aug W2	Aug W3	Aug W4	Sep W1	Sep W2	Sep W3	Sep W4	Oct W1	Oct W2	Oct W3	Oct W4	Nov W1	Nov W2	Nov W3	Nov W4	Dec W1	Dec W2
1	Project Proposal	17	▦	▦																								
2	Approving Proposal and Adviser	14			▦	▦																						
3	Gather Information	31					▦	▦	▦	▦	▦																	
4	Chapter 1	25							▦	▦	▦																	
5	Chapter 2	5						▦																				
6	Chapter 3	9							▦																			
7	Chapter 4	21								▦	▦																	
8	Revision Chapter 1 - 4	5								▦																		
9	System Development	32				▦	▦	▦	▦	▦																		
10	Coding	35				▦	▦	▦	▦	▦	▦																	
11	Debugging	7									▦																	
12	Pre-oral defense	1									■																	
13	Papers and System Revision	13										▦	▦															
14	Re-defense	1												■														
15	Papers and System Revision	3												▦														
16	Final re-defense	1													■													
17	Papers and System Revision	14													▦	▦	▦											
18	System Development	28																	▦	▦	▦							
19	Chapter 5	7																				■						
20	Revision of Chapter 5	3																					▦					
21	Chapter 6	5																						▦				
22	Revision of Chapter 6	3																						▦				
23	Final Defense	1																							■			
24	System Testing	2																								▦		
25	System Development	12																								▦	▦	
26	Final re-defense	5																										■

Legend:

Critical Path	(red)
On-Time	(black)

Table 6: Gantt Chart

PERT Chart

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Predecessors	-	1	2	3	4	5	4,5,6	7	8	9	9,10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Duration	17	14	31	25	5	9	21	5	32	35	7	1	13	1	3	1	14	28	7	3	5	3	1	2	12	5

Legend:

Critical Path	(red)
On-Time	(black)

Task		
T=days	ES	EF
	LS	LF
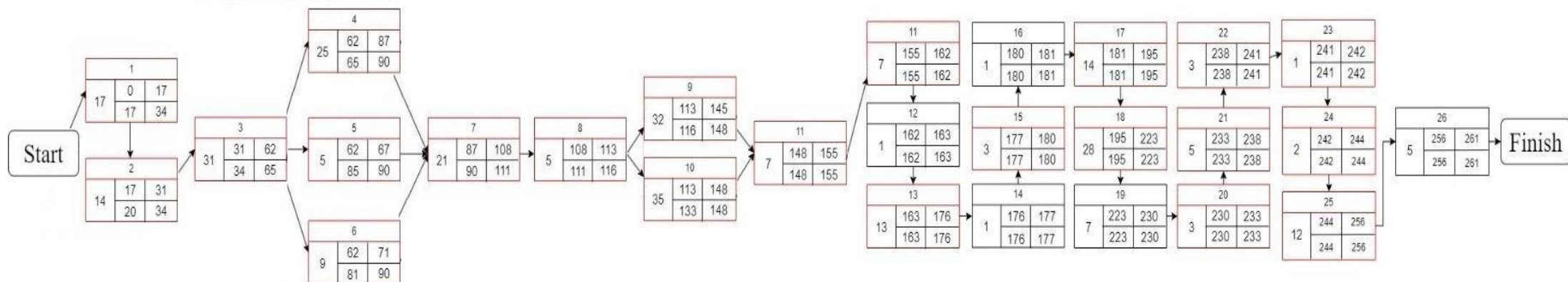
Table 7: Pert Chart

Activity List

Activity No.	Activities	No. of days	Predecessor/s
1	Project Proposal	17	-
2	Approving Proposal and Adviser	14	1
3	Gather Information	31	2
4	Chapter 1	25	3
5	Chapter 2	5	4
6	Chapter 3	9	5
7	Chapter 4	21	4,5,6
8	Revision Chapter 1 - 4	5	7
9	System Developing	32	8
10	Coding	35	8
11	Debugging	7	9,10
12	Pre-oral defense	1	11
13	Papers and System Revision	13	12
14	Re-defense	1	13
15	Papers and System Revision	3	14
16	Final re-defense	1	15
17	Papers and System Revision	14	16
18	System Development	28	17
19	Chapter 5	7	18
20	Revision of Chapter 5	3	19
21	Chapter 6	5	20
22	Revision of Chapter 6	3	21
23	Final Defense	1	22
24	System Testing	2	23
25	System Development	12	24
26	Final Re-Defense	5	25

Table 8: Activity List

Context Diagram
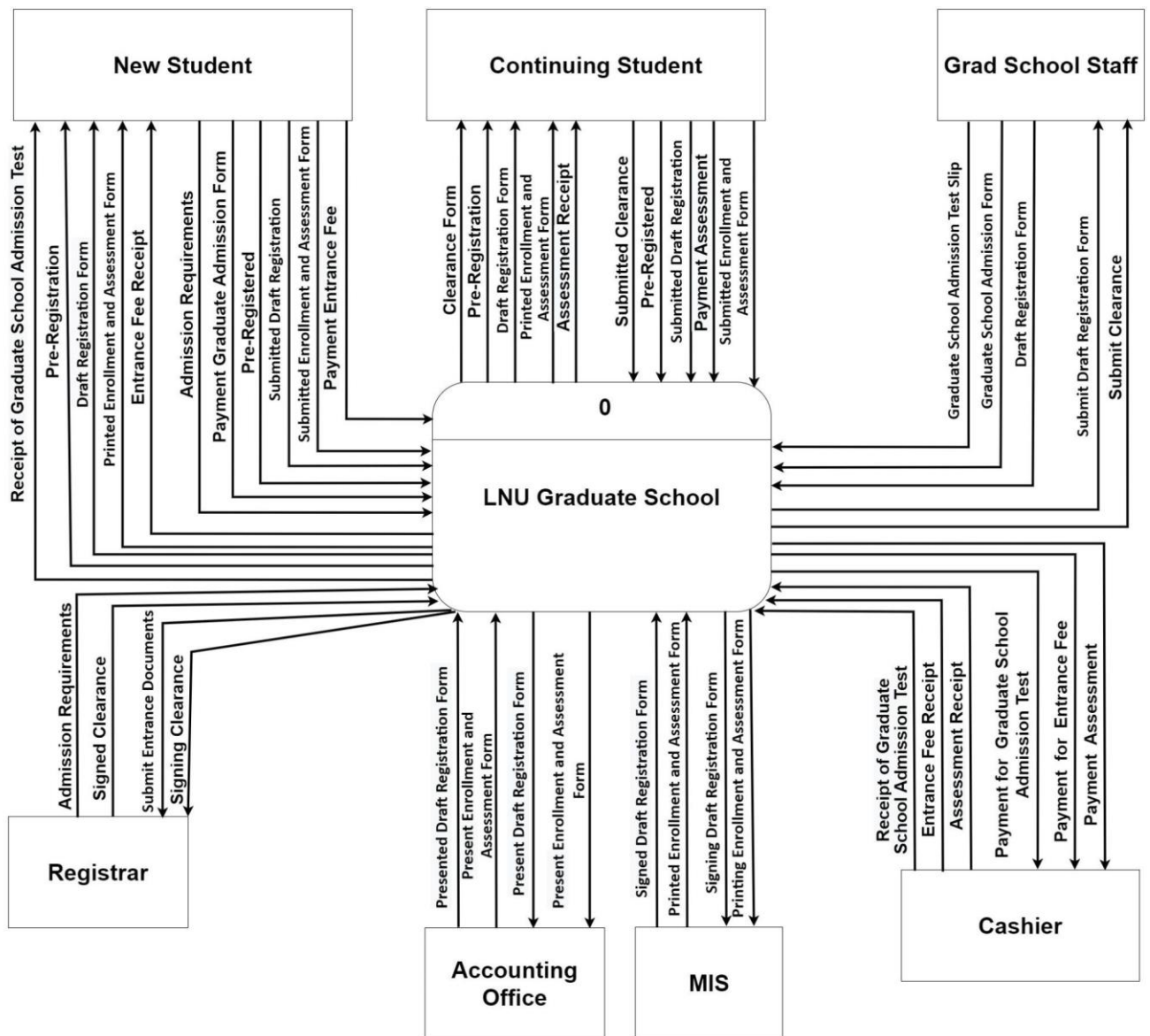
Figure 5: *Current Process*
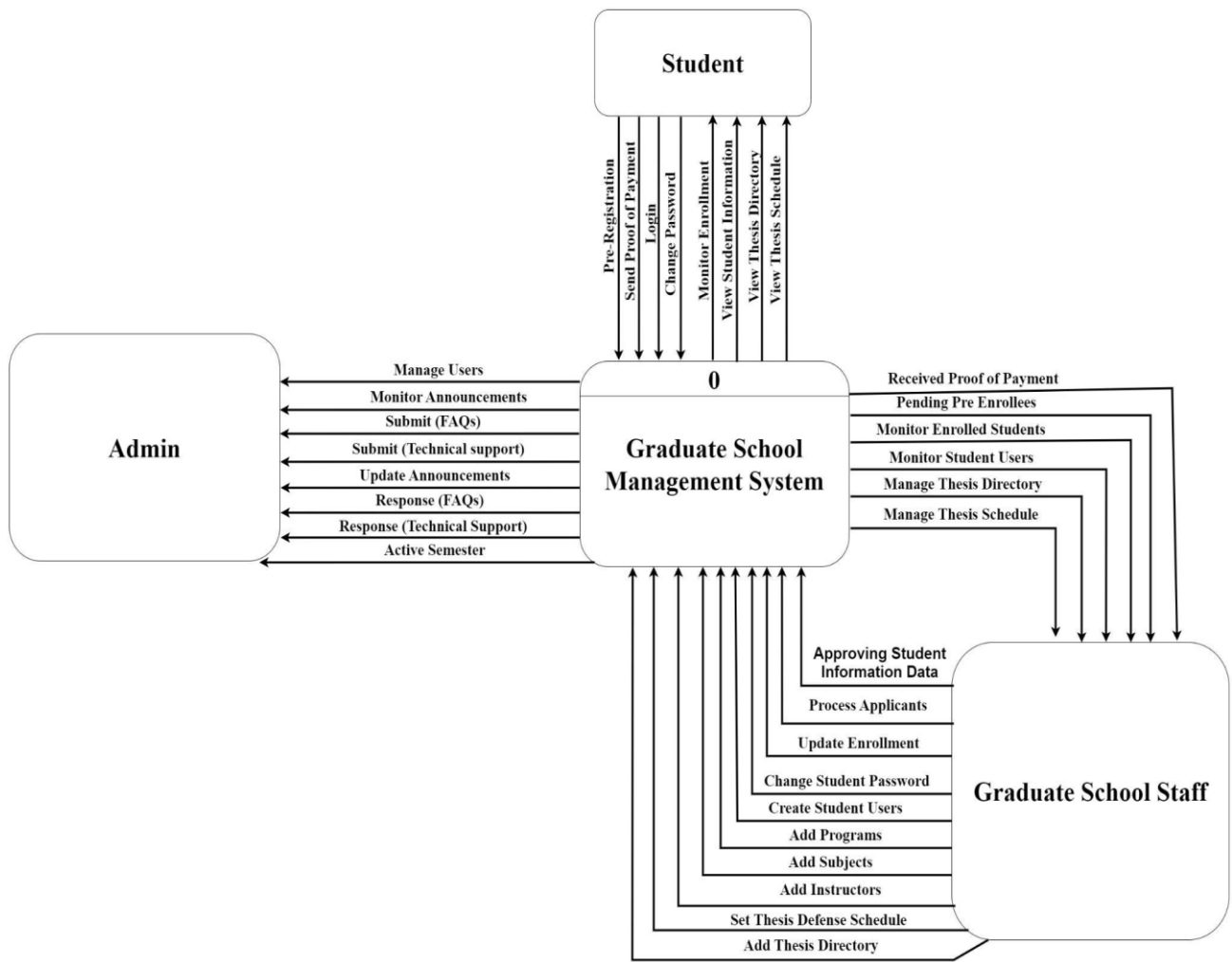
Figure 6: *Proposed System*

Data Flow Diagram Proposed System
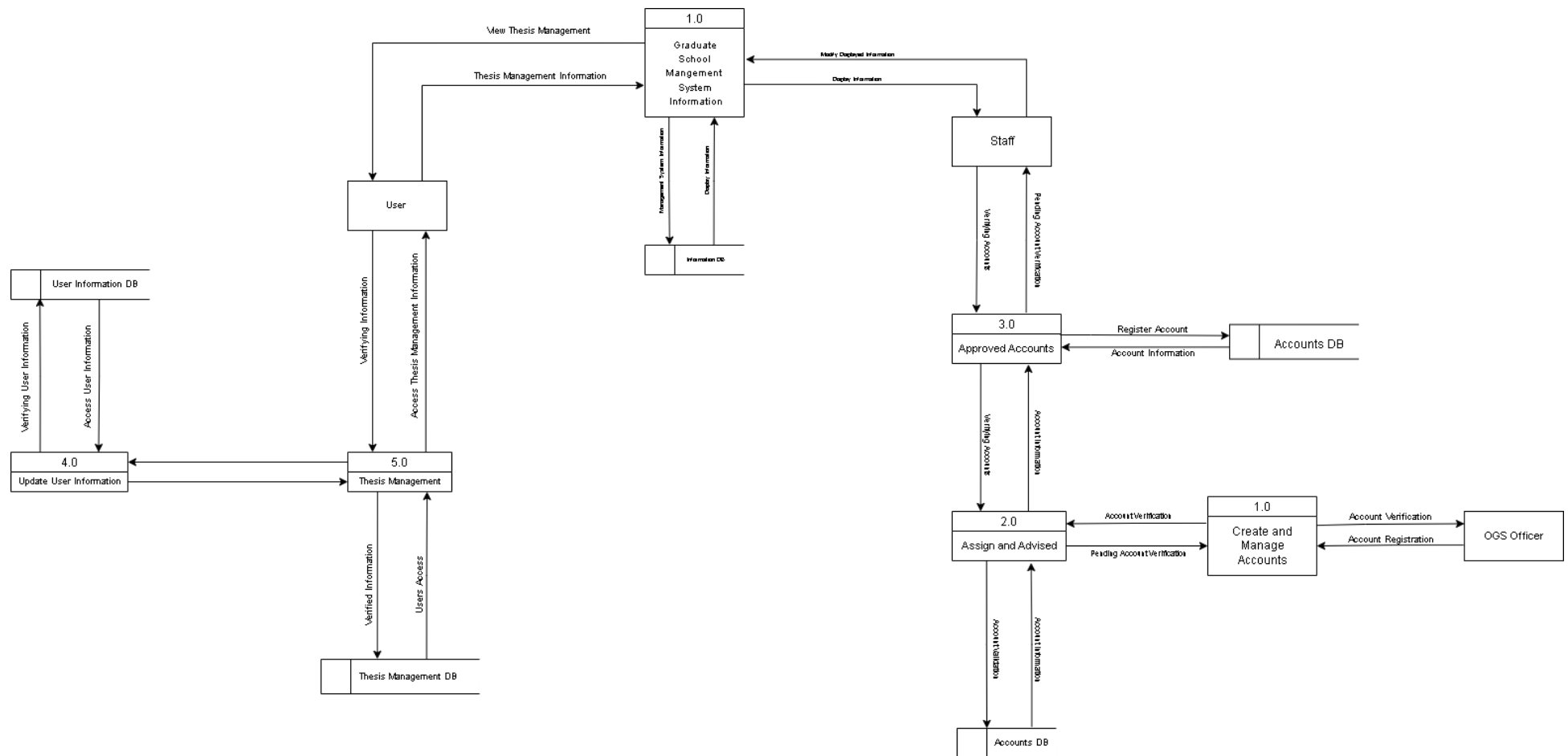
Figure 7: Data Flow Diagram

System Flowchart
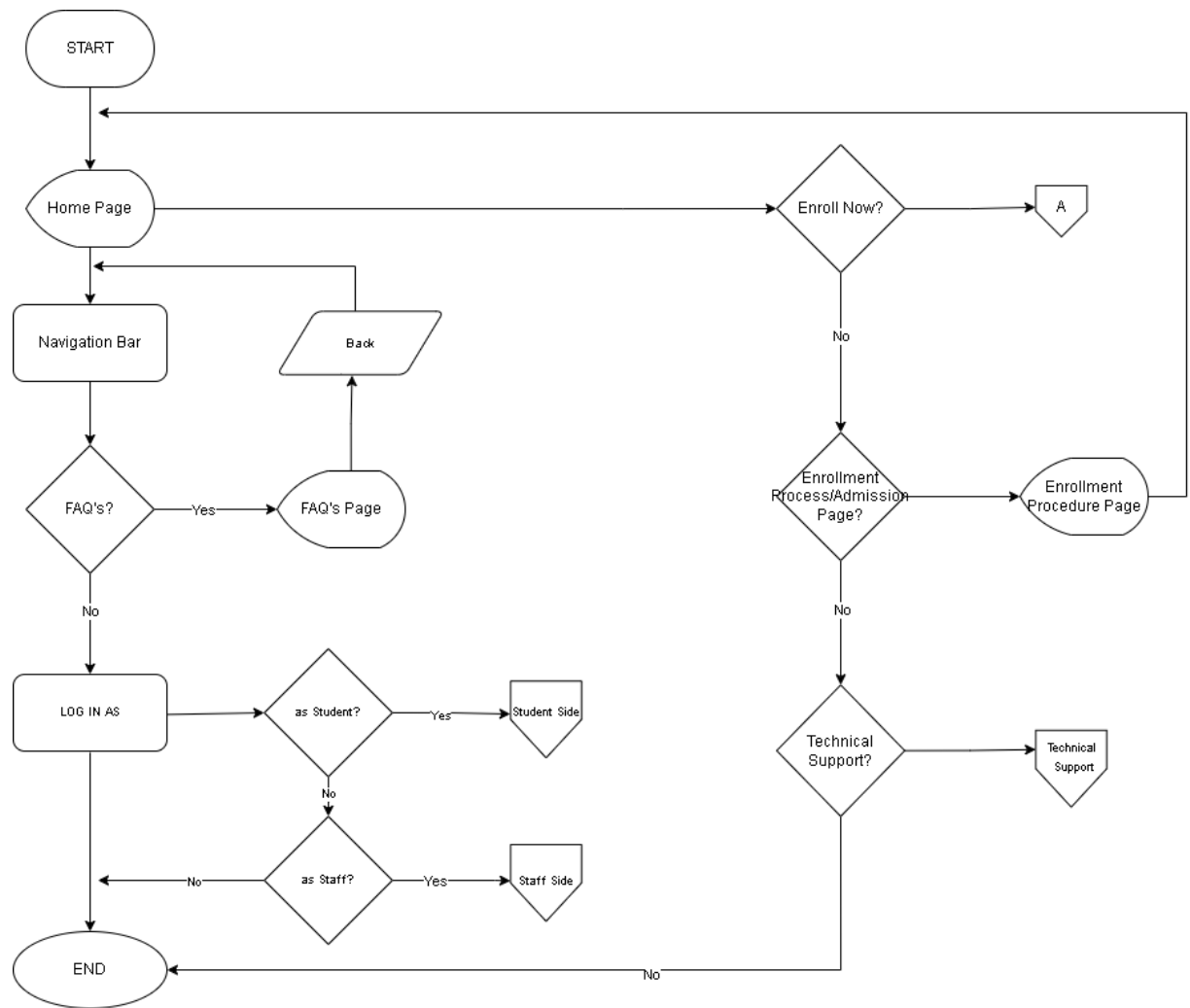
Figure 8: Home Page
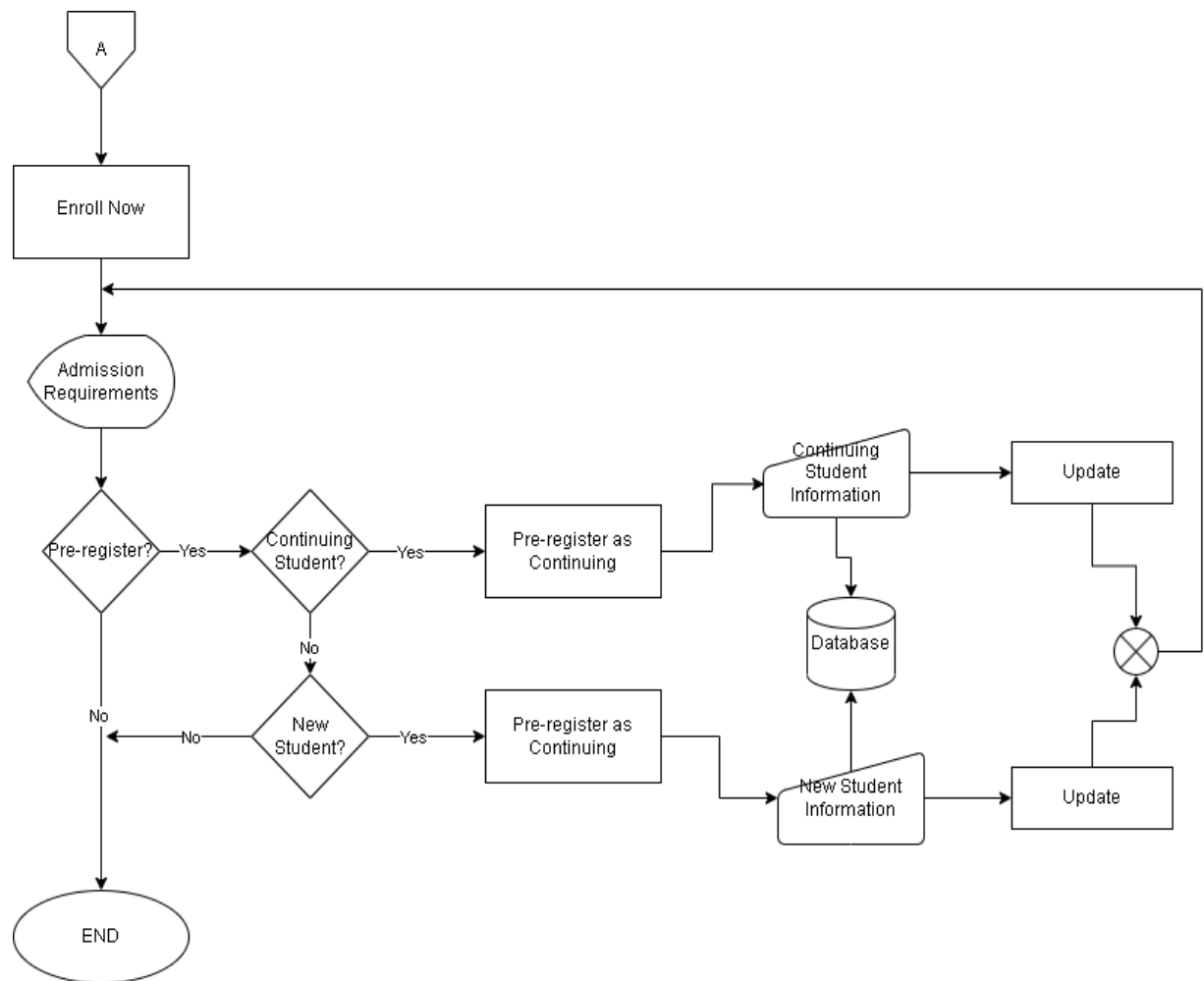
Figure 9: Enroll Now
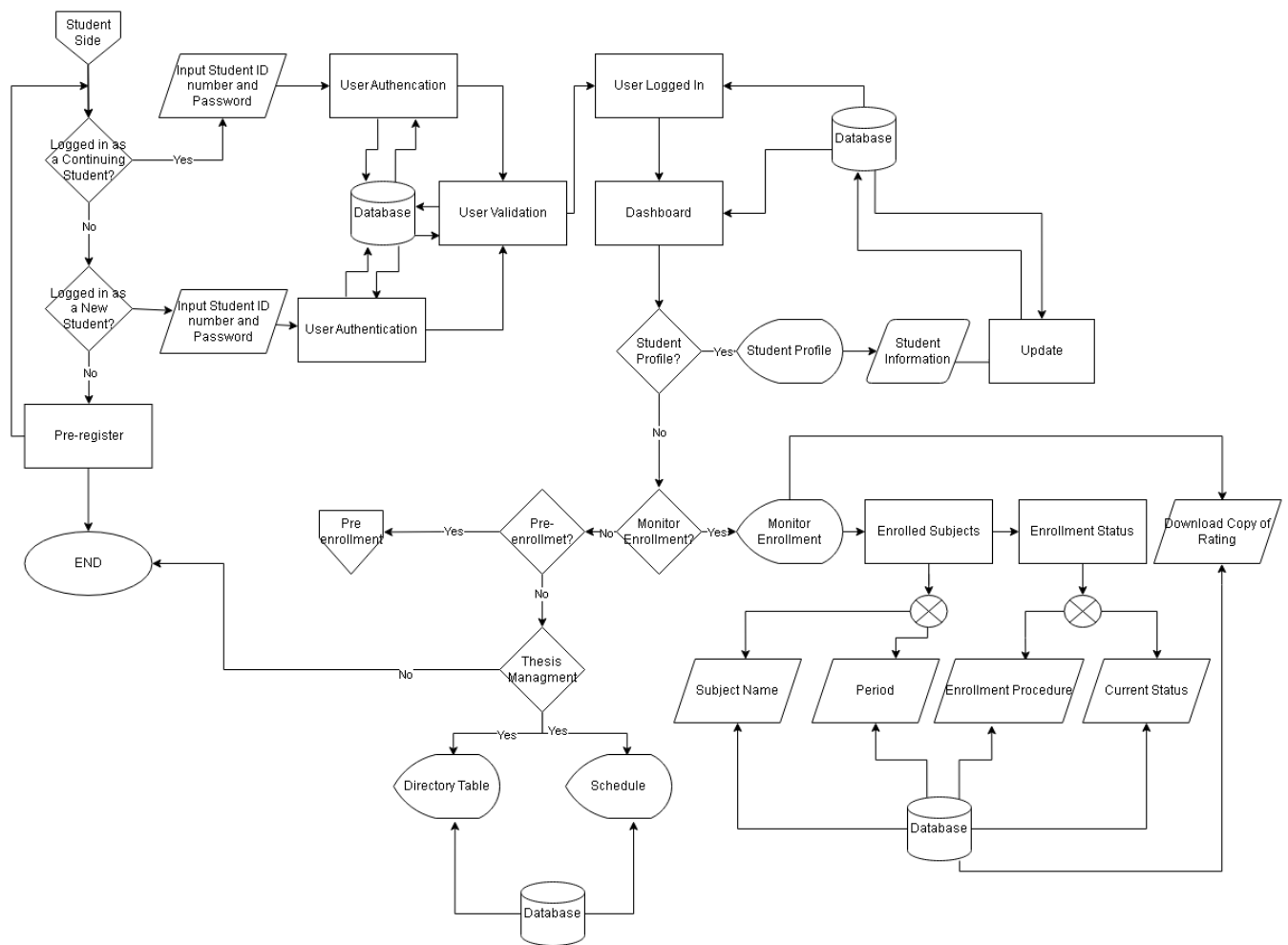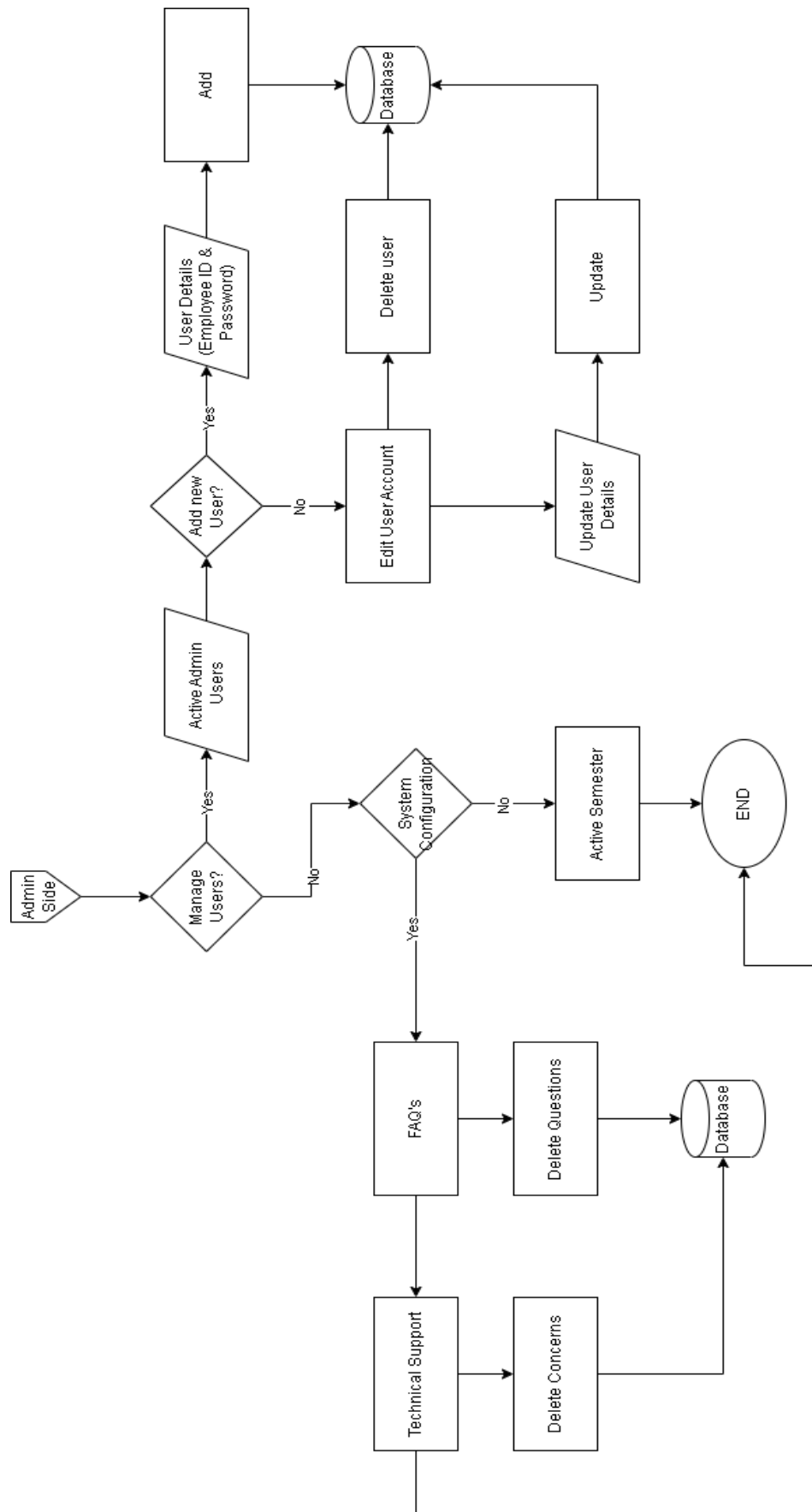
Figure 10: Student Side
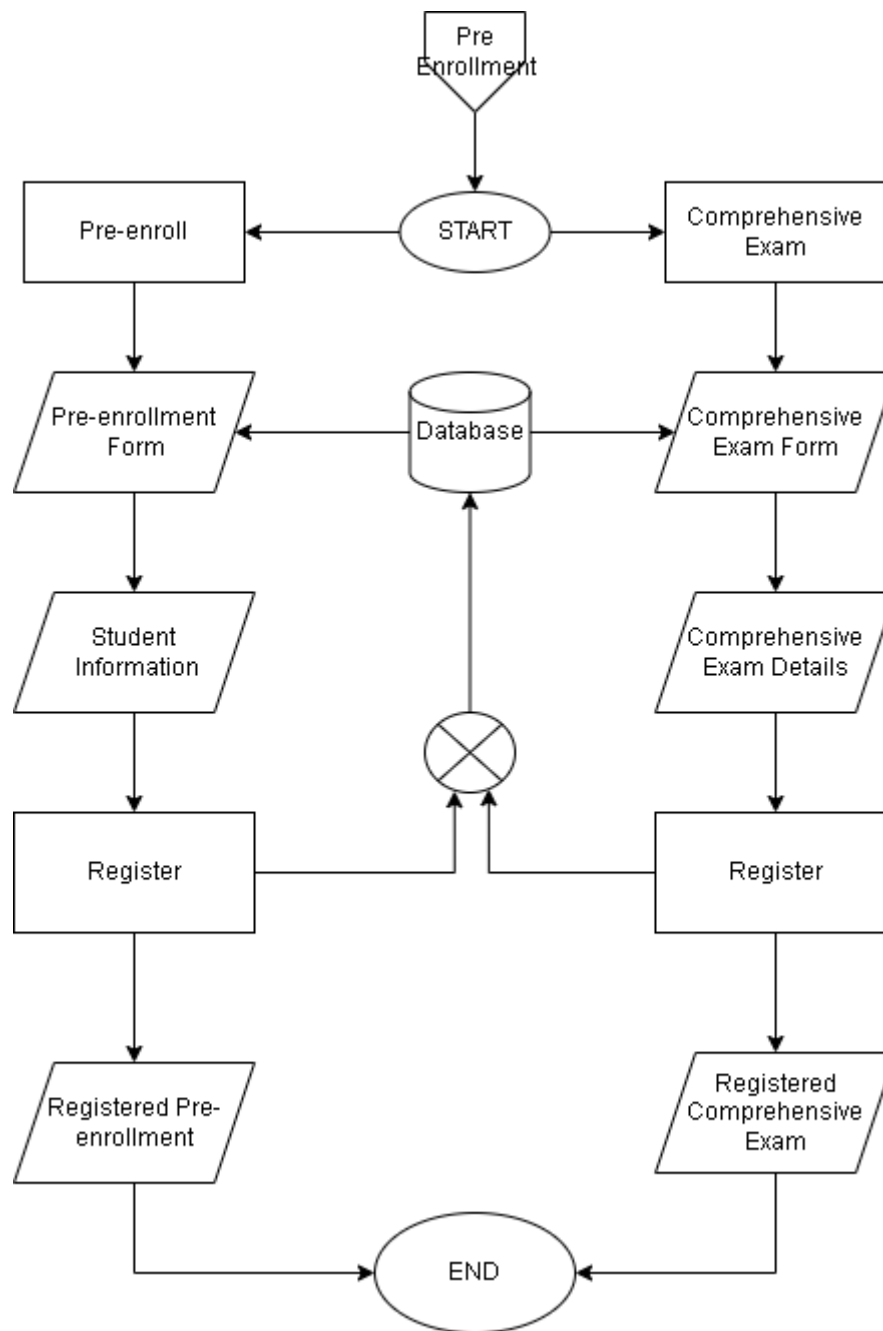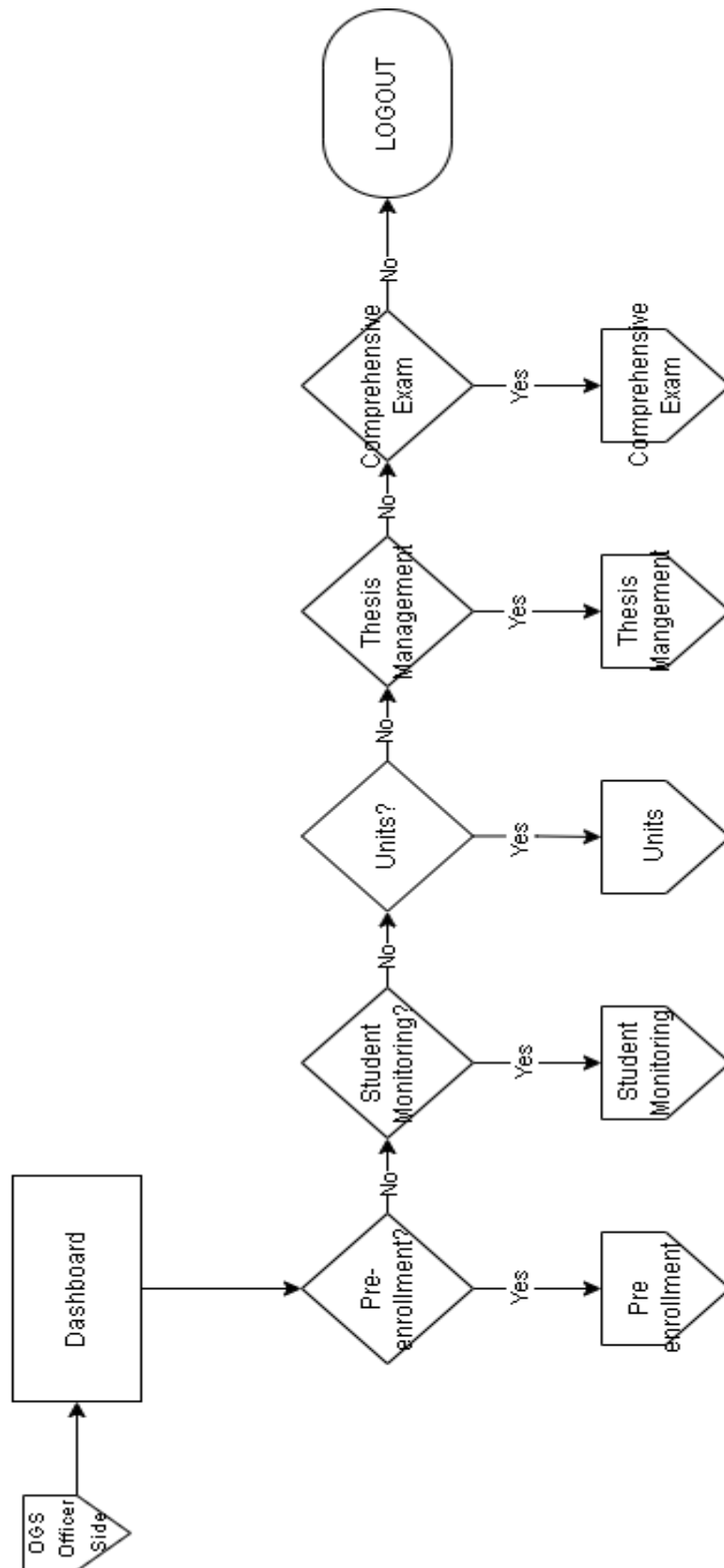
Figure 11: A1
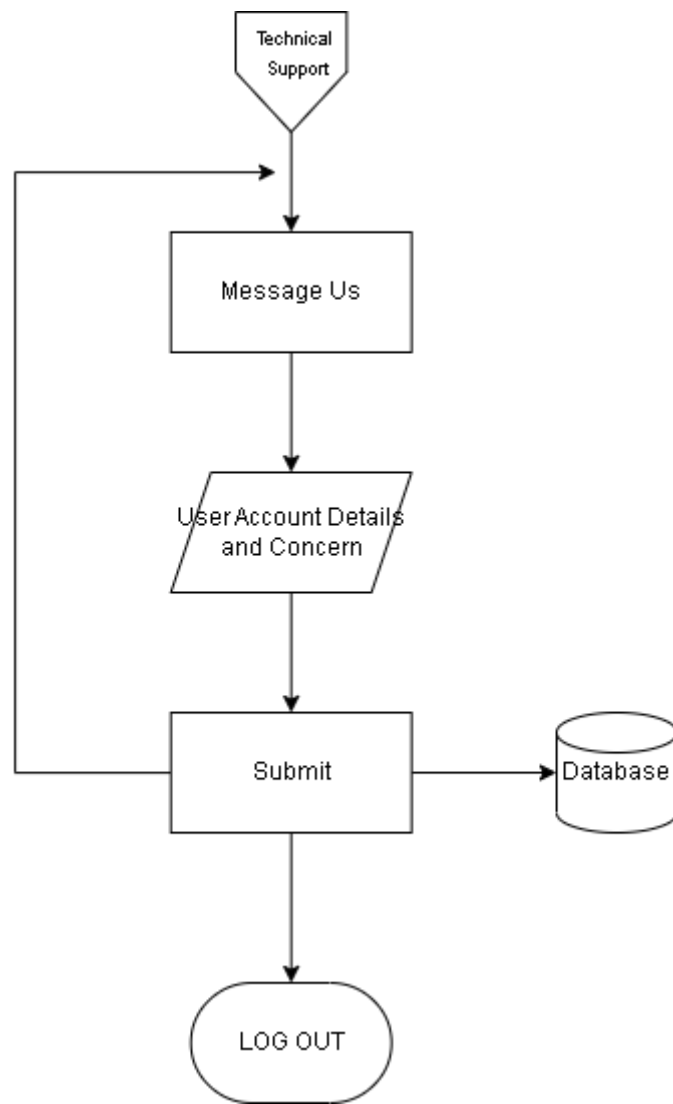
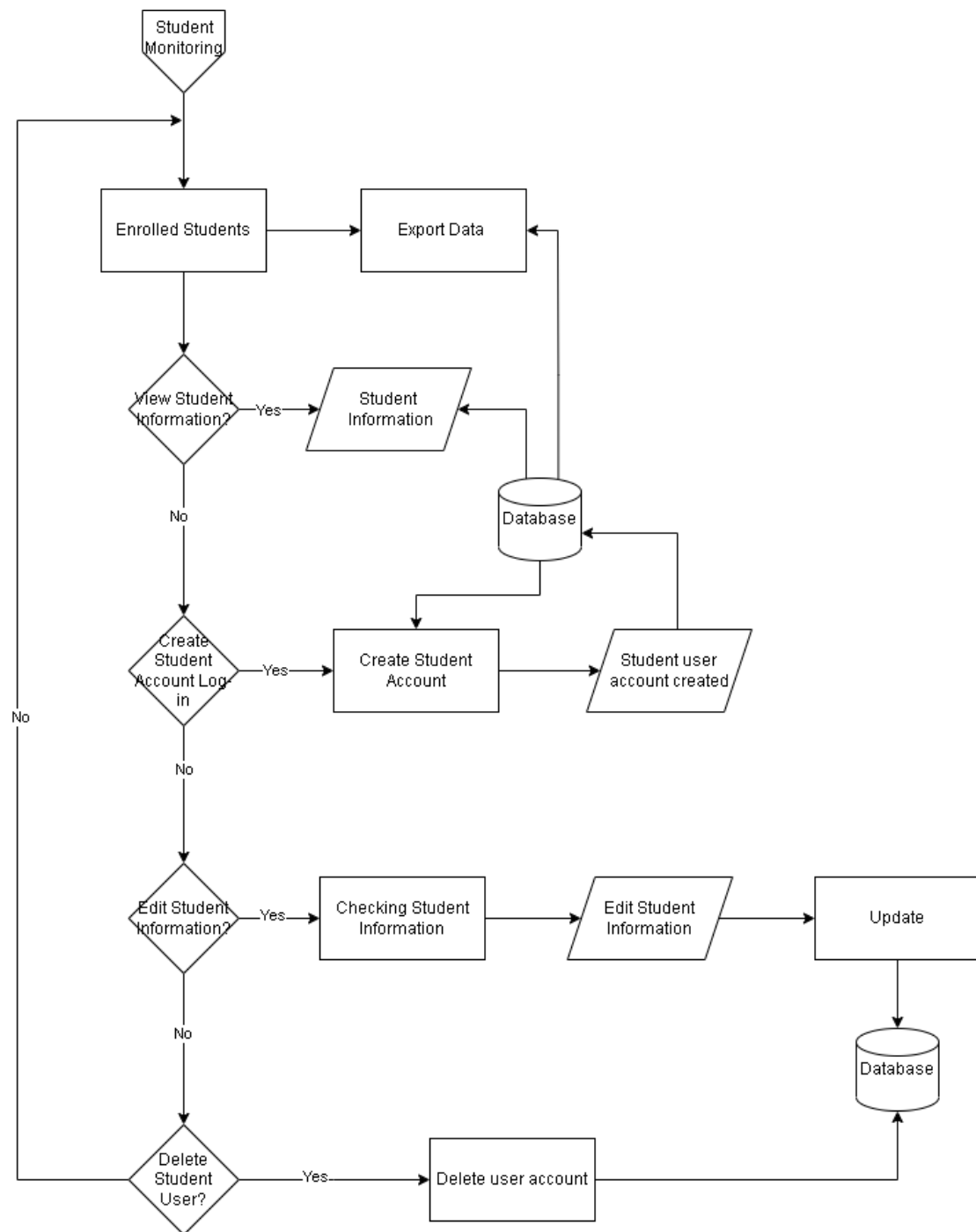**Figure 12:** Technical Support
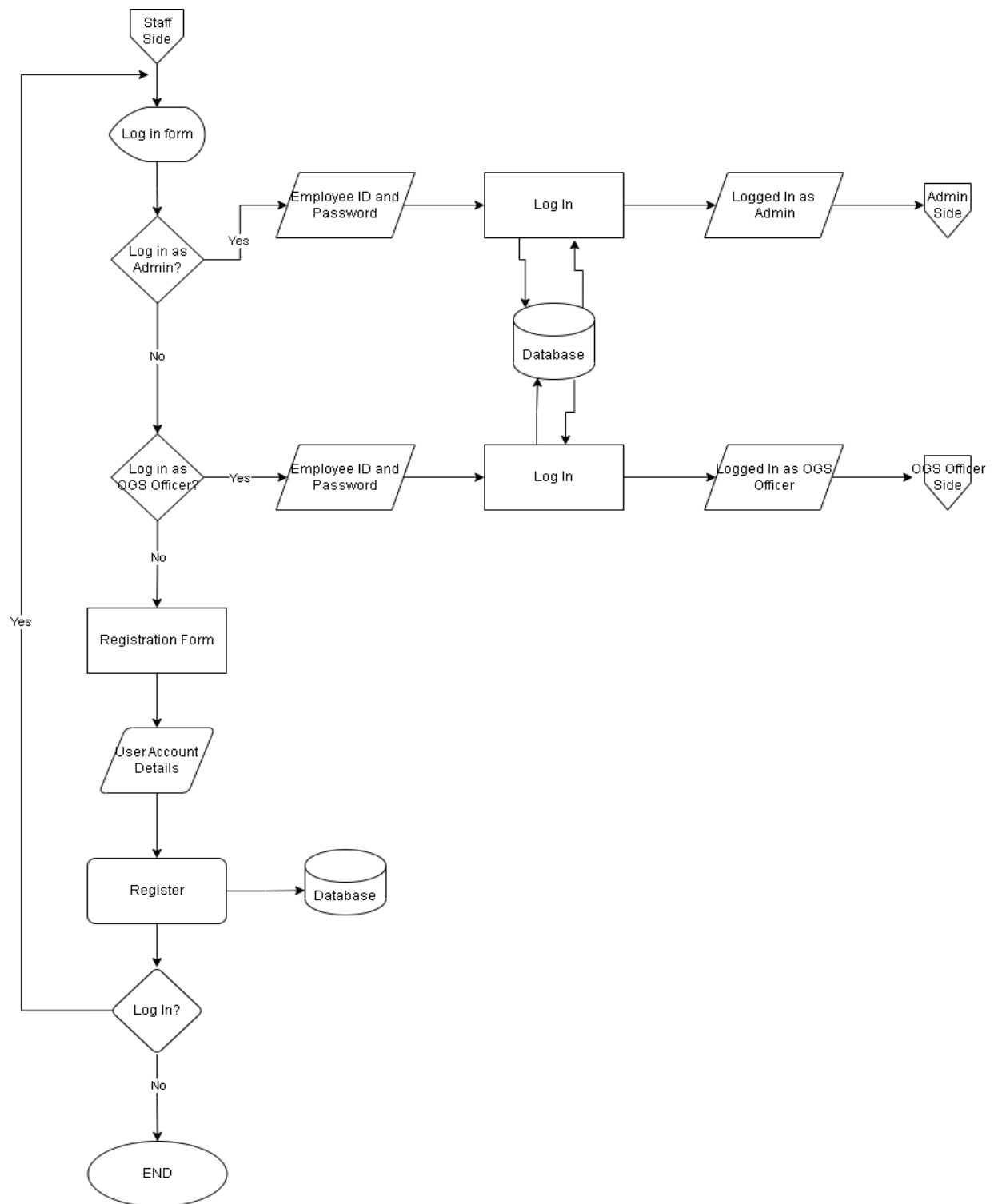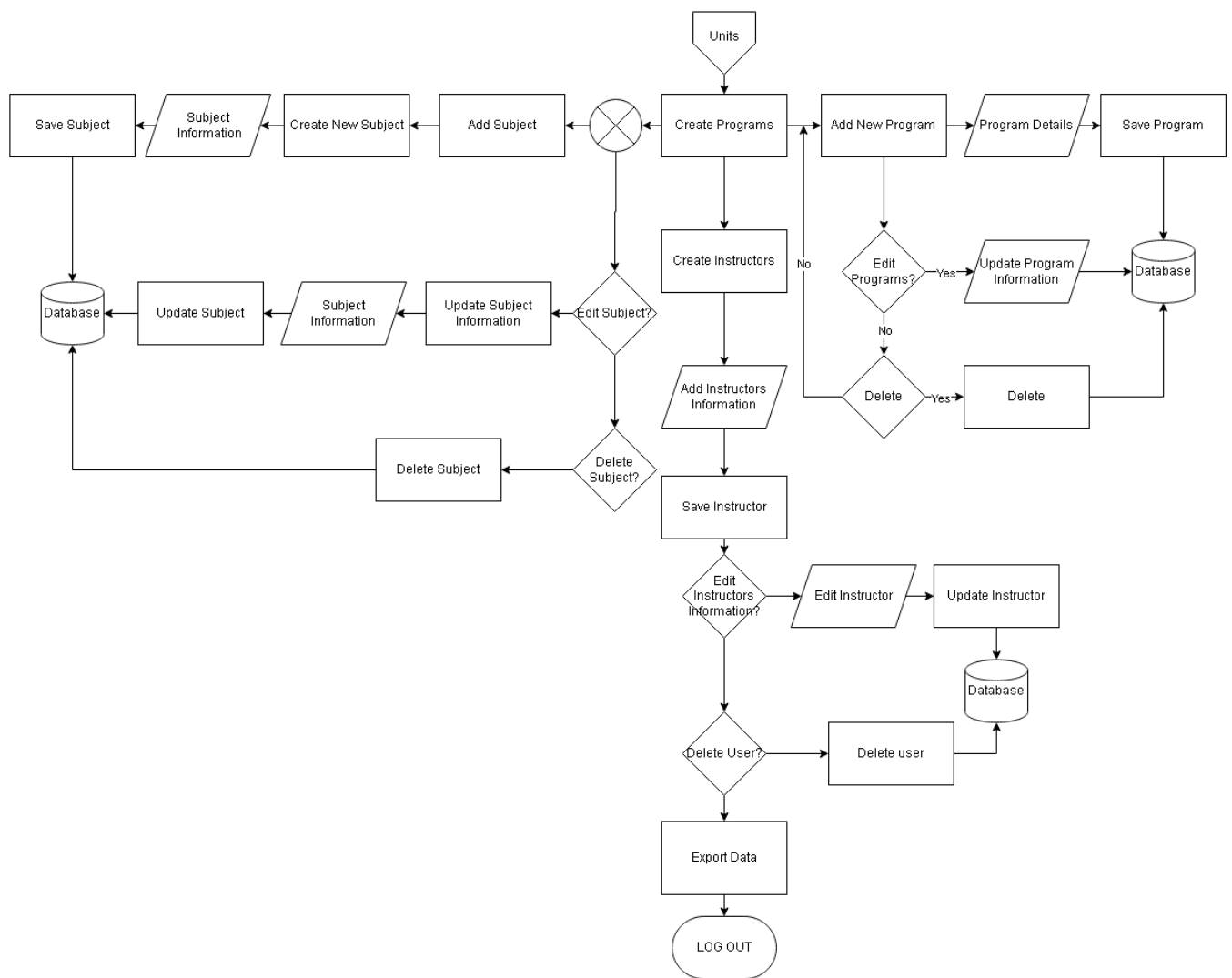
Figure 13: Staff Side
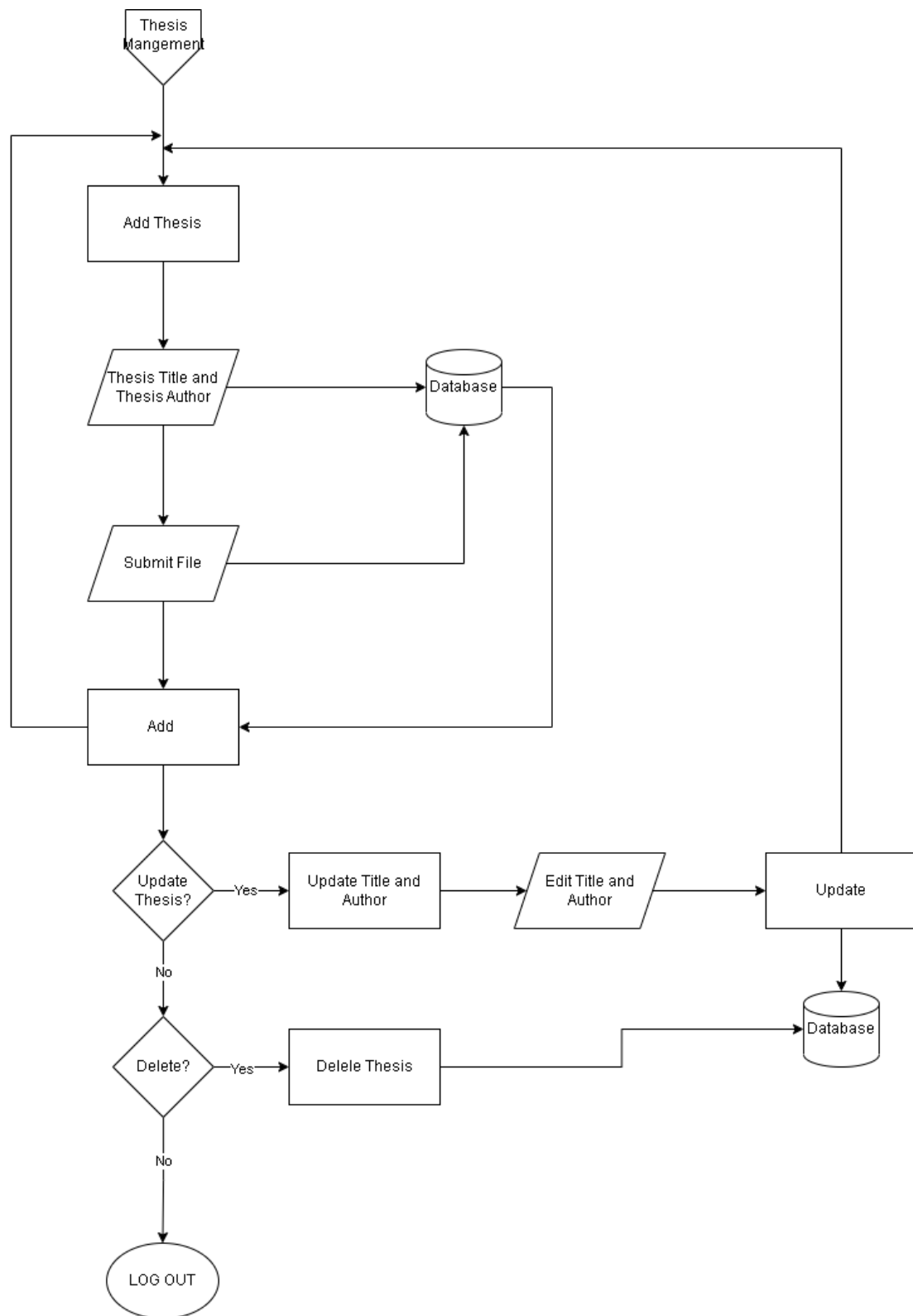
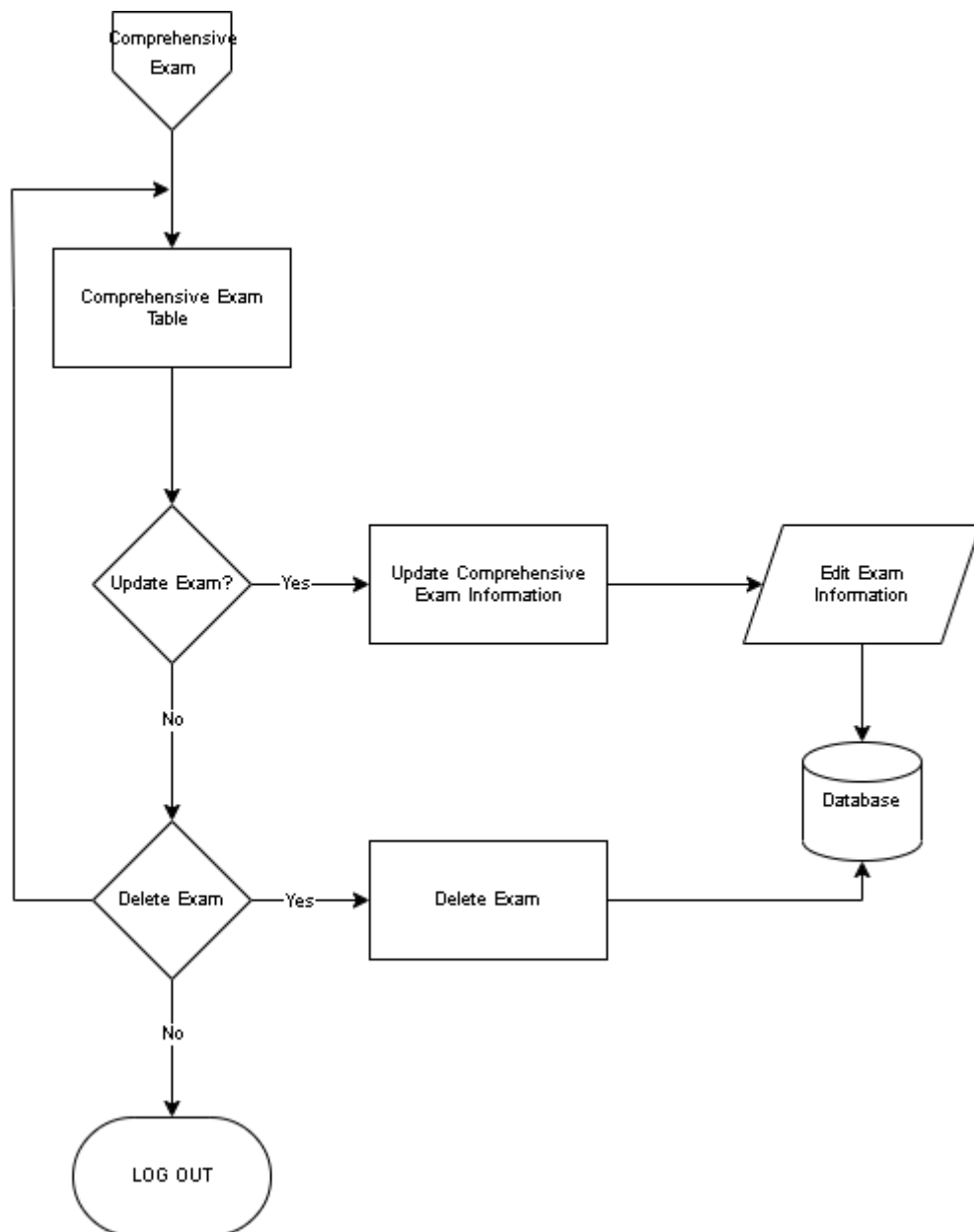**Figure 14:** Admin Side

Figure 15: OGS Officer

Figure 16: Pre-enrollment

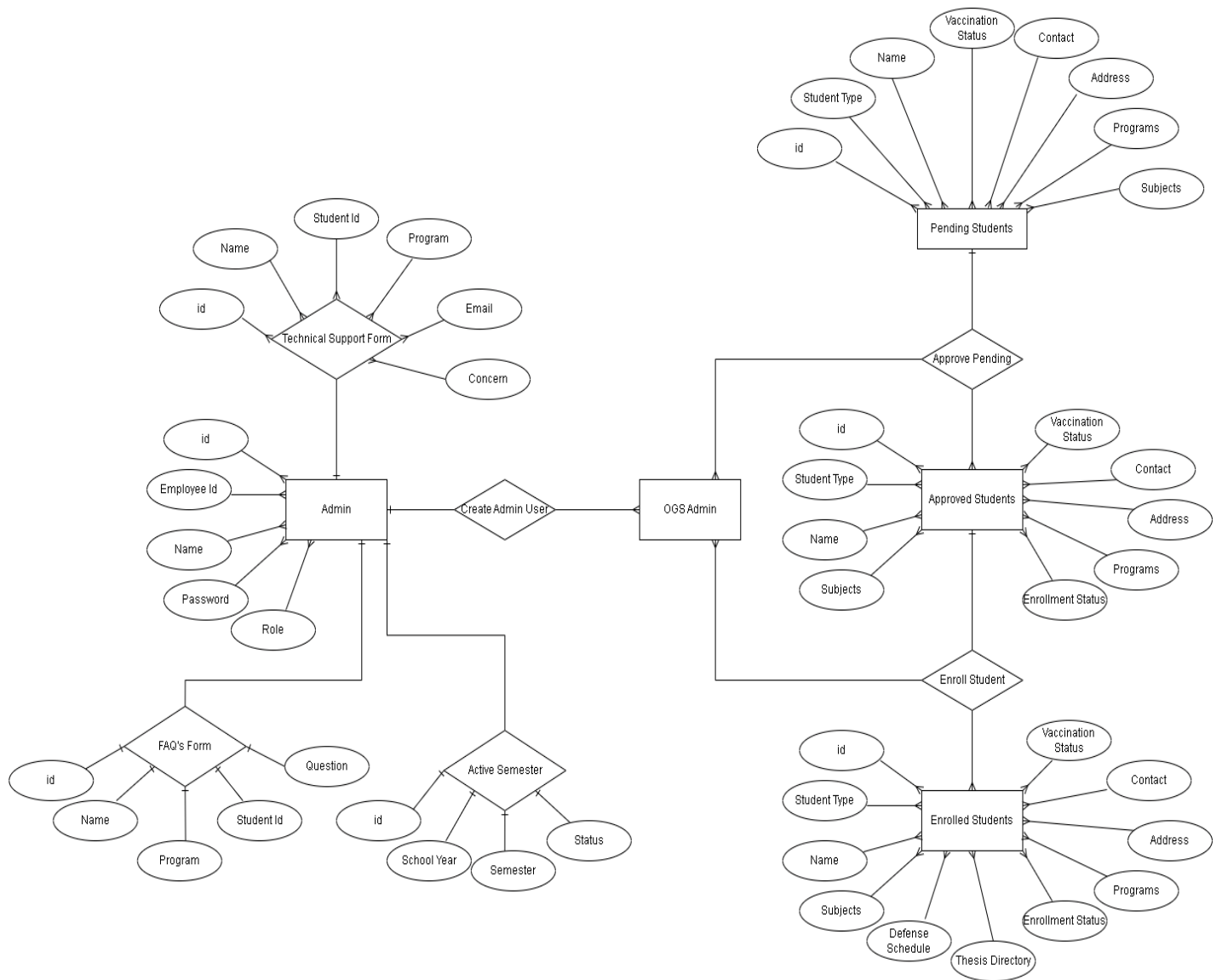**Figure 17:** Student Monitoring

Figure 18: Units

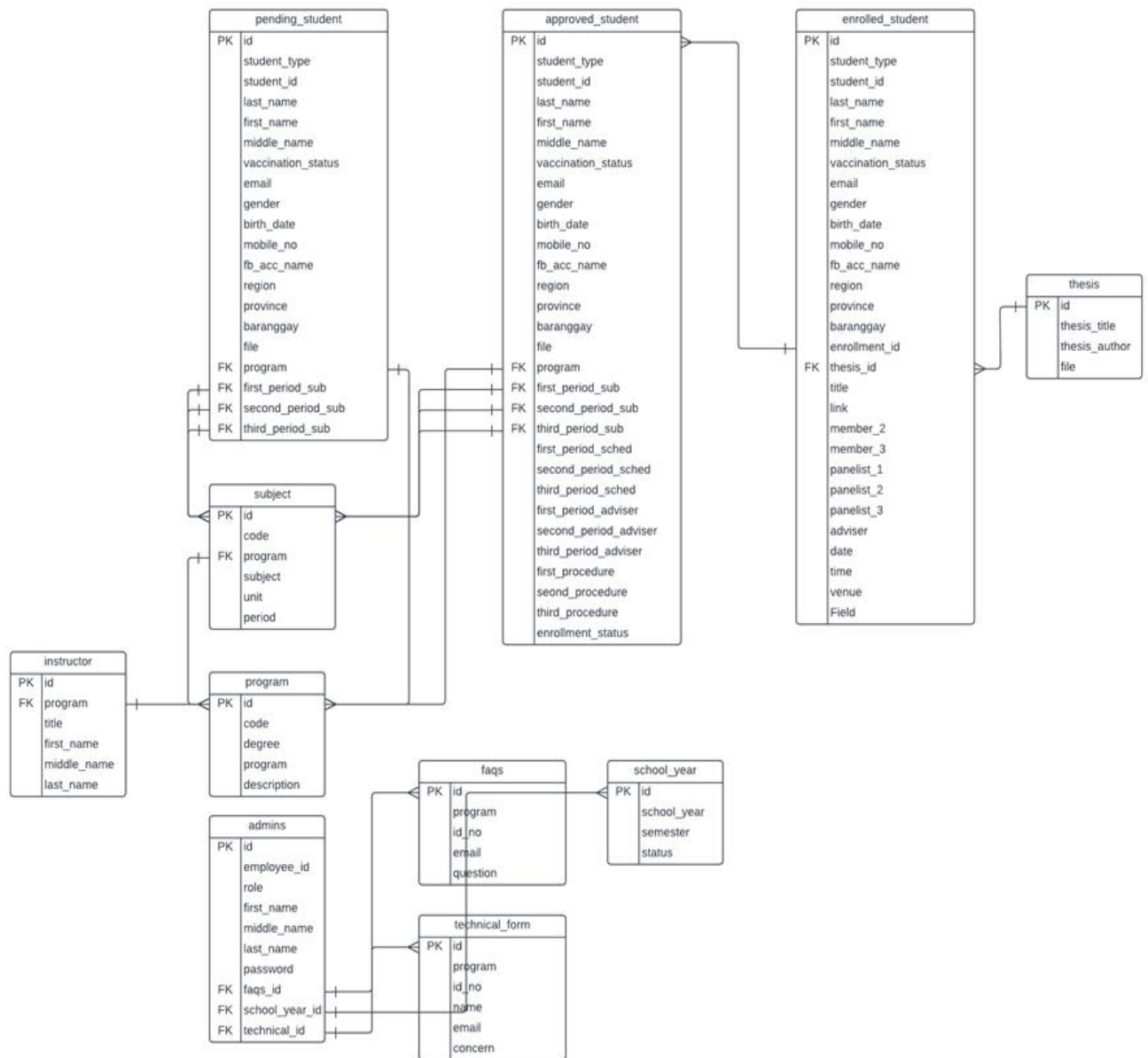**Figure 19:** Thesis Management

Figure 20: Comprehensive Exam

Entity Relationship Diagram

Figure 21: Entity Relationship Diagram

Database Normalization

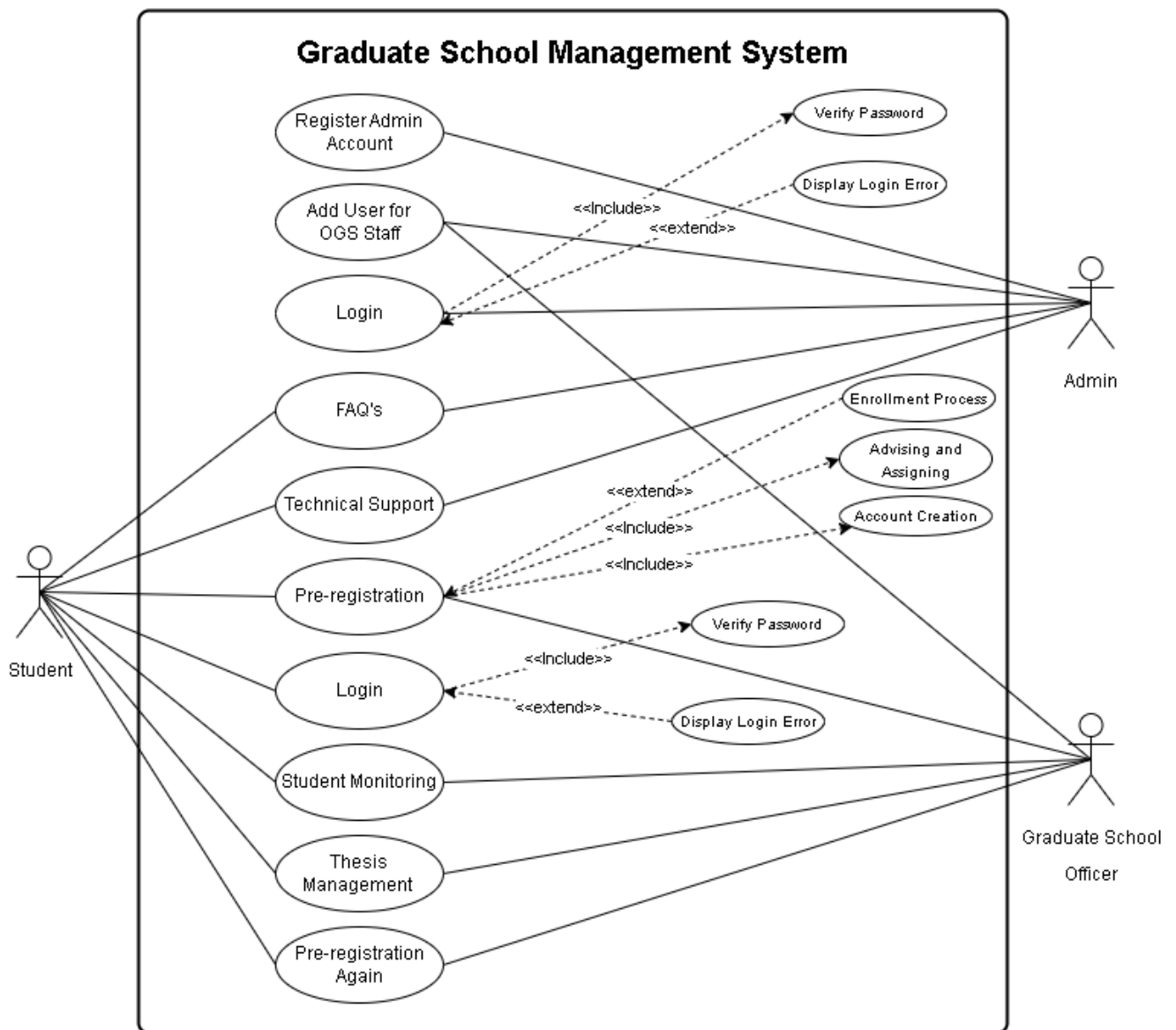

Figure 22: Database Normalization
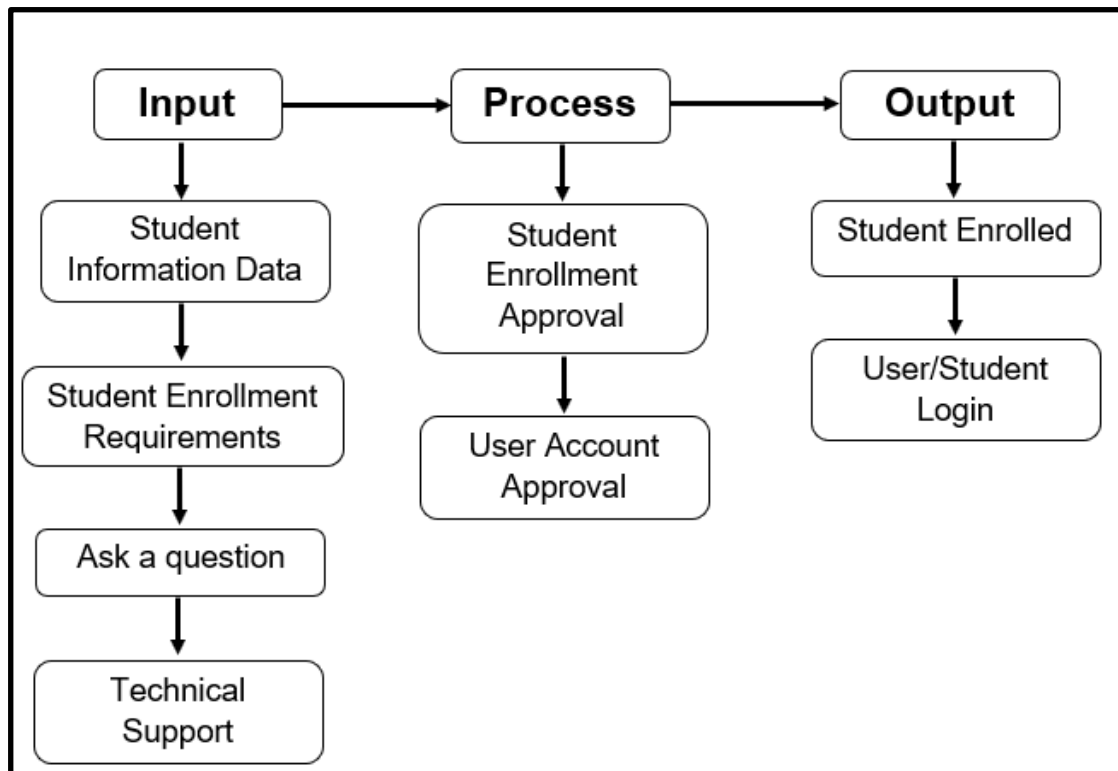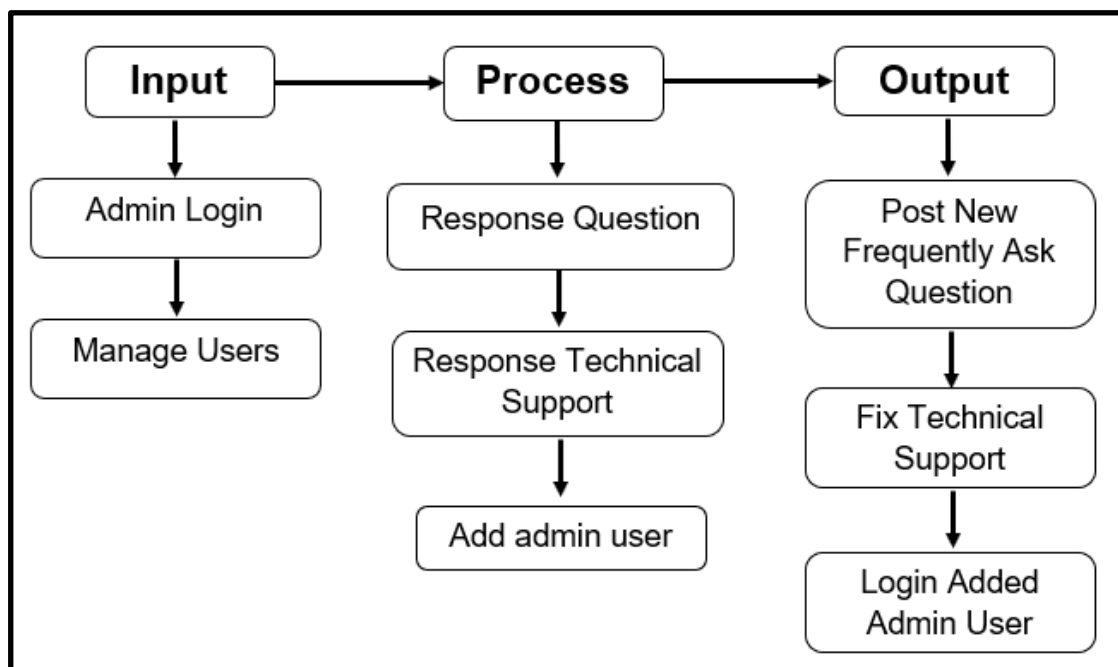
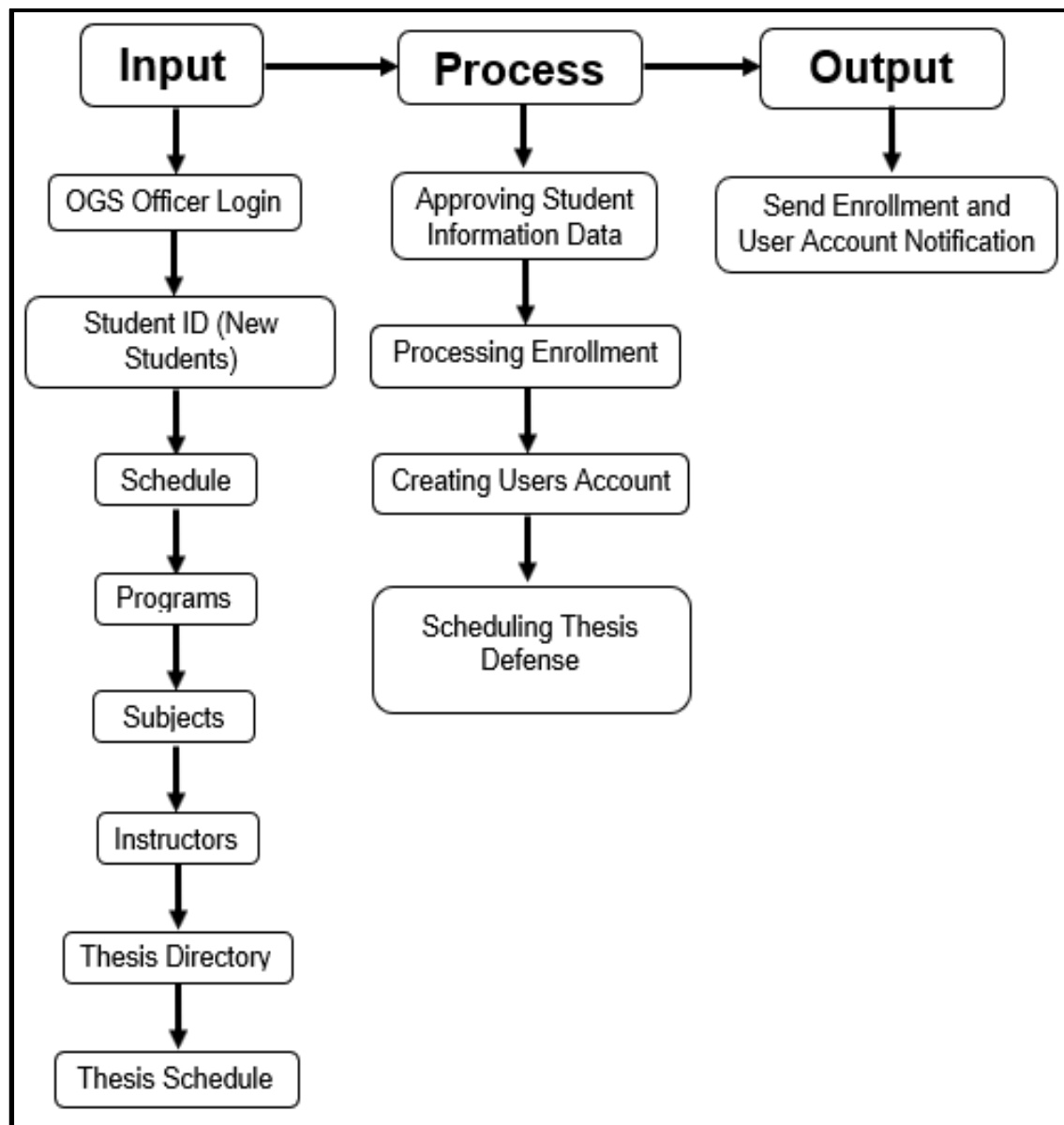**Use-Case Diagram**

Figure 23: Use case diagram

Input-Process-Output Diagram

Figure 24: Graduate School Management System User

Figure 25: Graduate School Management System Admin

Figure 26: Graduate School Management System OGS Officer

Program Considerations/Issues/Tools

The Graduate School Management System proposes a system that is a user-friendly, easy to use and understandable system. The GSMS can only be used by the Leyte Normal University Employees for administration and students for client-user use. To fully show its best result in using the software the software and hardware must be followed in order to function properly and the System is only in limited use by the Leyte Normal University.

- The developed system will support Computer windows 7 and up on operating system and it will also support mobile device
- The devices must at least have 1.6 GHz CPU or above and have at least 2 GB RAM or Higher
- The devices must have a working internet connection in order to access the web-system

Program Issues

- The system is an online base system. It requires internet connection to access the system.

Program Tools

The following are the tools used to develop and design the system.

- Microsoft Visual Studio (Visual Studio) - A powerful integrated development environment used for writing, debugging, and testing codes of the system.

- Laravel - a PHP framework used as a backend as a Service for the developed web system.

- PHP - A general-purpose scripting language used to develop dynamic and interactive websites.

- MySQL - an open-source relational database management system. Its uses for the developed system are to add, access, and process data stored in a computer database; it also needs a database management system such as MySQL Server.

Software Requirement Specification

The requirement to use the software is showed below:

- Operating System – Windows 7

- Chrome or any latest browser.

Hardware Requirement Specification

Hardware requirements specification must be followed in order to function properly and show the best result in using the system:

- Laptop or Desktop

  o Processor Intel Core i3 or above
  o RAM 2GB or Higher
  o Hard Drive: at least 250GB or above

- Android
  o Processor – Quad-core 1.3GHz or faster
  o RAM 2GB or Higher
  o LTE 4G upwards

System Evaluation Procedure

Instrument

The main method for gathering information for system evaluation feedback from respondents is a survey questionnaire using google forms modified from ISO/IEC 25010:2011 standards. The purpose of the survey is to evaluate how the new system communicates with end users. The built-in questionnaire has four (4) categories: functionality, usability, portability, and reliability, and it is based on ISO/IEC 25010:2011 standards.

The ISO/IEC 25010:2011 standard first defines functionality as the extent to which a product or system satisfies stated and implied demands when used under specific circumstances. This standard evaluates the system's capacity to carry out the tasks for which it was designed. The expected performance is being evaluated in this category. Second, usability is described as the extent to which certain users can make use of a product or system to accomplish particular goals with efficacy, efficiency, and satisfaction in a particular usage environment. This speaks to the standard of a user's interaction with the created system. As a result, the system ought to respond to gesture inputs from the user. Thirdly, portability refers to how easily a system, product, or component can be transferred from one operational or consuming environment to another, regardless of the hardware, software, or other factors involved. As long as the hardware complies with the hardware criteria, the system should be able to run on a variety of hardware devices. This includes using the website without the User Interface being distorted (UI). The standard

also defines reliability as the degree to which a system, product, or component satisfies established functional requirements over a predetermined time period under predetermined circumstances.

Validation

The proponents used a semi-structured interview for data gathering, one of the instruments in research. It is essential for the instrument's result to be reliable and accurate. A semi-structured interview is a method of data collection that relies on asking questions within a predetermined thematic framework. However, the questions are not set in order or in phrasing. In research, semi-structured interviews are often qualitative in nature. They are generally used as an exploratory tool in marketing, social science, survey methodology, and other research fields. They are also common in field research with many interviewers, giving everyone the same theoretical framework but allowing them to investigate different facets of the research question. The proponents conducted an interview with the staff and students at Leyte Normal University Graduate School.

Data Gathering Procedure

The Graduate School Management was created by the proponents using data gathered from interviews with graduate school staff. During this phase, the proponents asked questions to the staff about pre-enrollment. In gathering data, the proponents interviewed the staff, including the one who recommended the development of the system. When we interview the staff, we

always prepare our phones and ask them if they are okay when their interview is recorded. If they refuse to have their interview recorded, we always prepare a notebook and a ballpoint pen. We do the same for other students in graduate school. After consolidating the data and evaluating the system, the proponents performed an analysis and interpretation to validate the system and its functionalities, taking their recommendations into consideration. The proponents also prepared questions for the interview with the staff of the dean's office graduate school. Another method we use is through Google forms. We try to find graduate students and prepare a laptop for them to directly answer.

Statistical Tool

The proponents adapted and applied the Likert scale as one of the methods for assessing the reactions of the respondents to the functionality and performance of the framework. The Likert scale is often used to measure respondents' elevation by asking the degree to which they agree or disagree with a particular question or statement. It is effective if the study or questionnaire contains attitude, belief, or behavior items. The Likert scale was invented by American psychologist Rensis Likert in the 1930s. It is often used to measure respondents' attitudes by asking the extent to which they agree or disagree with a particular question or statement. The scale is effective if the study or questionnaire contains attitude, belief, or behavior items.