

# **REQUIREMENT ANALYSIS AND DESIGN**

## **Introduction**

This chapter describes the requirement analysis and the design of the system. Analysis of essential functional and non-functional requirements gathered during the design process is also discussed in this chapter. Essential Design Elements are discussed in this chapter. For example, a use case diagram is used to understand the requirements of the whole system. Other diagrams like sequence and activity diagrams are used to represent the use case in further detail. The chosen architecture style, database design and the interface designs will also be discussed in this document.

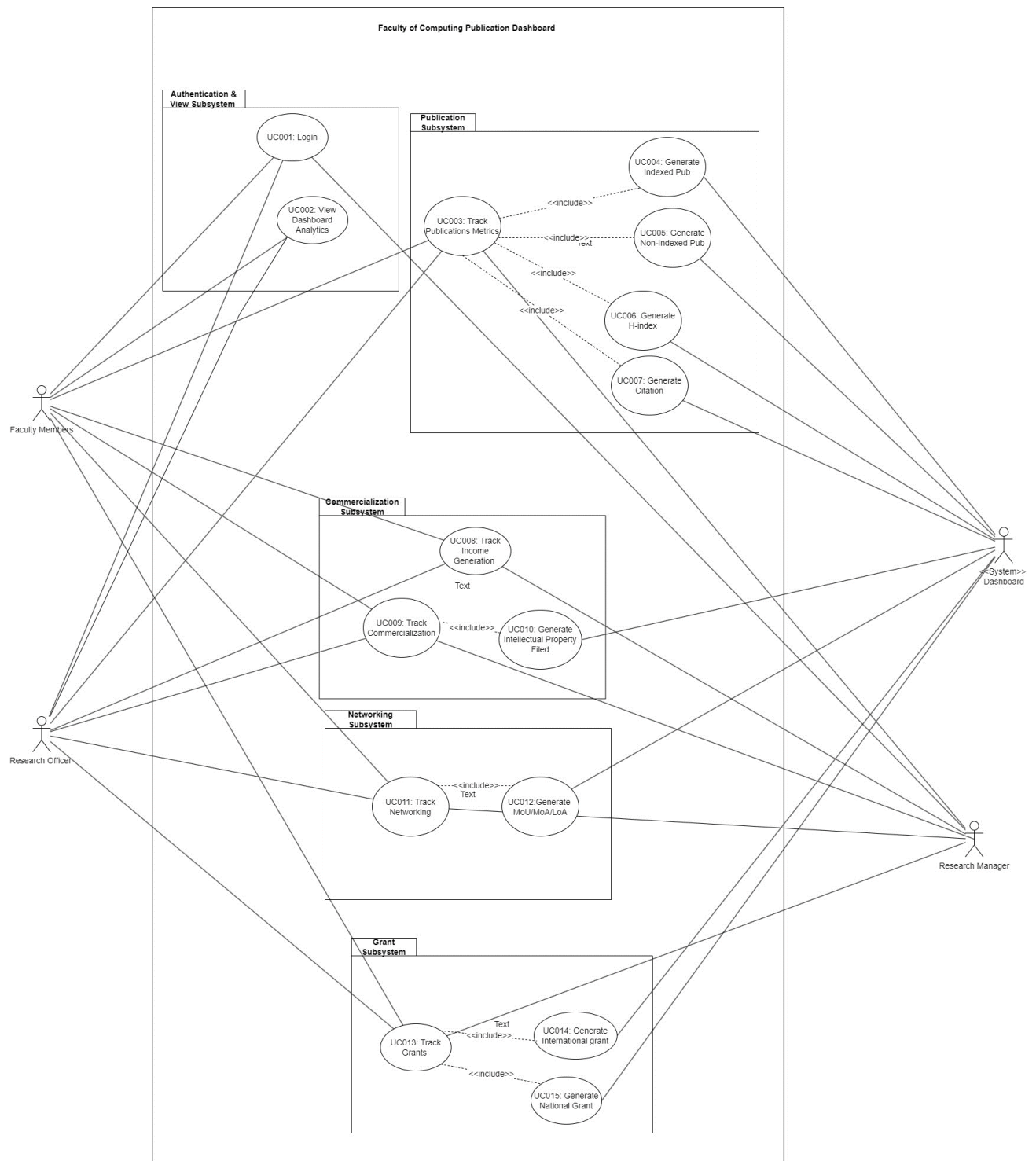
## **Requirement Analysis**

The functional and non-functional requirements of the system are discussed in this section. These requirements were gathered from the stakeholders of the system.

## **Functional requirements**

## **Use Case Diagram**

The use case diagram represents all the requirements of the system. The system features and functions are shown in the use case diagram as well. The requirements are set after finalizing with the stakeholder. The use case diagram is the primary diagram for depicting all the necessary features and functions of our system.



**Figure Error! No text of specified style in document.1: Use Case Diagram of Dashboard**

## Actor Description

The description of the actors of the use case given above is given below:

**Table Error! No text of specified style in document..1: User Description**

No.	User	Characteristics
1.	Faculty Members	This user is the main part of the system. The system is basically built for the usage of the faculty members. The faculty members will be able to get an insight of their research work and what measures can be taken to do improvement on research by the faculty of computing staff.
2.	Research Officer	Research officer plays a crucial role in our system design. All the data that will be collected will have to go through the research officer for filtering it properly before displaying in the system. This role is one of the major parts of the project. Research officer will help in data filtering before displaying in the form of a dashboard.
3.	Research Manager	Research manager will help in collecting the data that will be displayed in the dashboard. Research manager is the one who manages the data related to research. So, the role of the research manager is very important for carrying out the development of the system.

## Use Case Description

The elements of the use case are described in the table below:

**Table Error! No text of specified style in document..2: Use Case Description**

Module	Product Function	Description
Authentication and View	Login	It will allow the user to login to the system.
	View Dashboard Analytics	It will allow the user to view the dashboard analytics of different research related data.

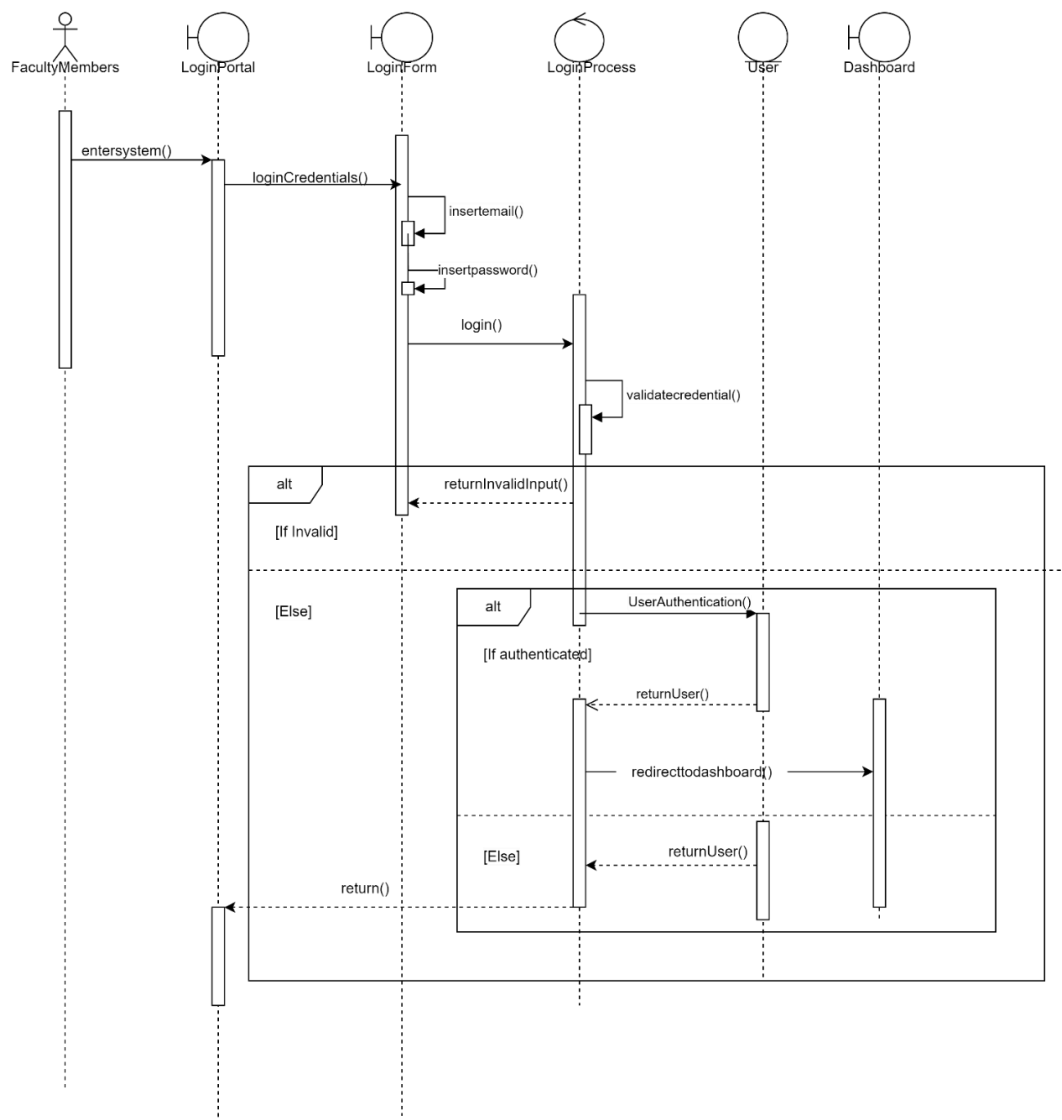
Publication	Track Publication Metrics	This will allow the research staff to track the publication metrics by reviewing the data related to publication.
	Generate Indexed Publication	This will be generated by the system dashboard by using data science techniques for the users to view their update.
	Generate Non-Indexed Publication	This will be generated by the system dashboard by using data science techniques for the users to view non-Indexed publications.
	Generate H-Index	This will be generated by the system dashboard by using data science techniques for the users to view H-Index data generated.
	Generate Citation	This will be generated by the system dashboard by using data science techniques for the users to view Citations made data.
Commercialization	Track Income Generation	This will allow the research staff to track the Income generation by reviewing the data related to income generation.
	Track Commercialization Data	This will allow the research staff to track and edit the Commercialization data by reviewing the data related to commercialization.

	Generate Intellectual Property Filed	This will be generated by the system dashboard by using data science techniques for the users to view the number of intellectual property filed for the researchers.
Networking	Track Networking	This will allow the research staff to track and edit the Networking data by reviewing the data related to networking.
	Generate MoU/MoA/LoU data	The system dashboard will generate data related to the agreement/letter of undertaking by using data science techniques for the users to view and evaluate on the current condition.
Grant	Track Grant	This will allow the research staff to track and edit the Grant data by reviewing the data related to Grant management.
	Generate International grant Data	The system dashboard will generate data related to the international grant that has been received by using data science techniques for the research staff to view and evaluate on the current condition.
	Generate National grant Data	The system dashboard will generate data related to the national grant that has been

		received by using data science techniques for the research staff to view and evaluate on the current condition.
--	--	---

## Sequence Diagram

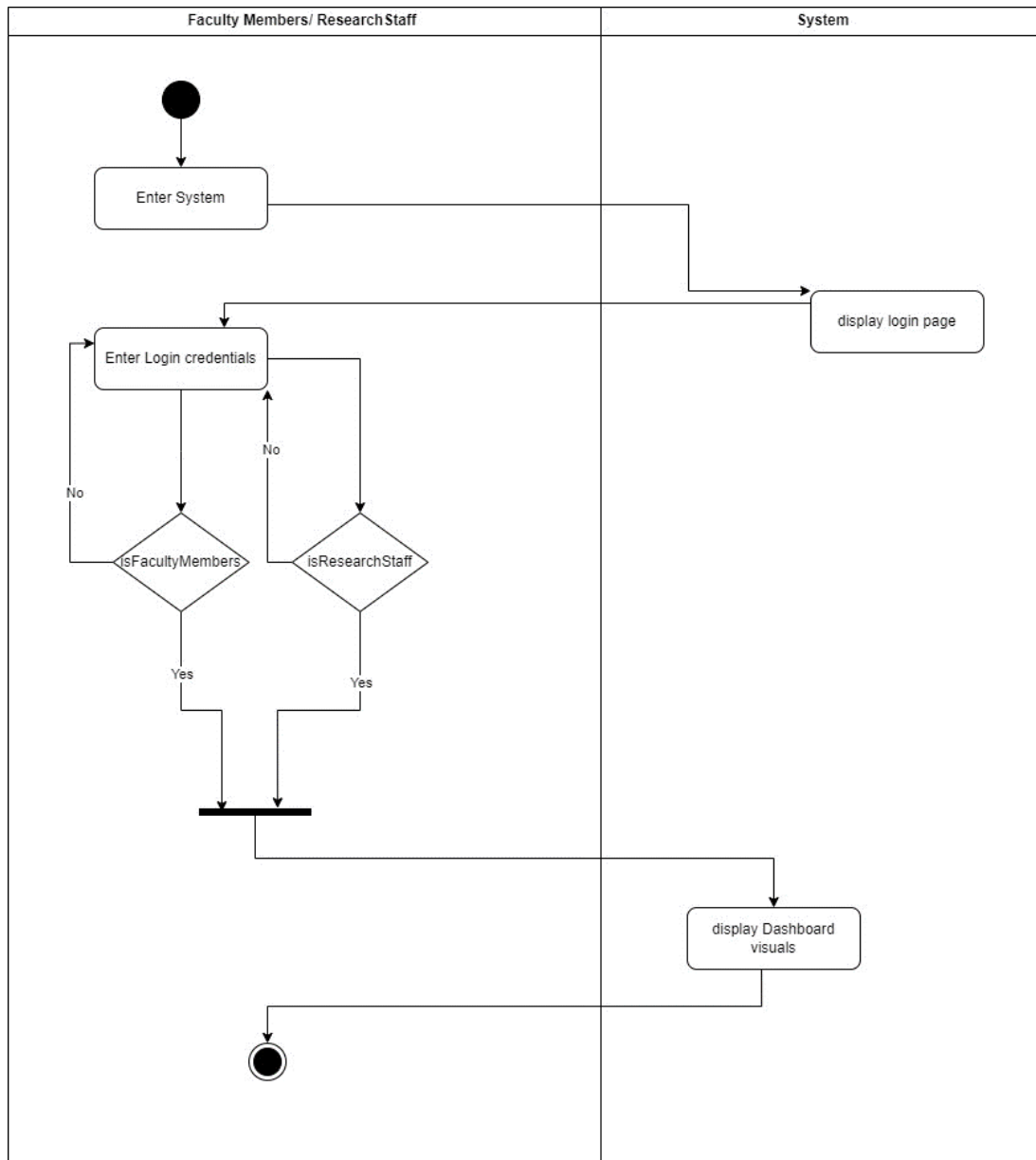
Sequence diagrams are detailed design of a use case should work. The sequence of events that'll be happening while using the system are depicted in sequence diagrams. For each use case, a sequence of events is maintained. The sequence of events for each use case are depicted in sequence diagrams. Detailed sequence diagrams are given in the SRS.



**Figure Error! No text of specified style in document..2: Sequence Diagram for Login**

## Activity Diagrams

The activity diagrams are illustrations of the workflow of a use case diagram. The activity diagram depicts the flow of the system while a user is making the system. Below is just one example of the activity diagram for this system.



**Figure Error! No text of specified style in document..3: Activity Diagram for Login**

## Use Case Specifications

Use case specifications are tabulated form of in-depth analysis of each of the use cases. The Use Case Specifications consist of the normal, alternative and exception flow through which flow of the use case are organized. It also consists of all the details related to the use case. The actors related to the use case are also shown in the Use Case Specifications. Below is an example of the Use Case Specifications for our system:

**Table Error! No text of specified style in document..3: Use Case Specifications for Login**

<b>Use case ID</b>	UC001
<b>Use case name</b>	Login
<b>Description</b>	This use case describes flow for user log in into the system.
<b>Actor</b>	Faculty Members, Research officer and Research Manager
<b>Pre-condition</b>	1. There is an active network connection to the platform
<b>Normal Flow(s)</b>	<ol style="list-style-type: none"><li>1. User enters the system.</li><li>2. Login page is displayed.</li><li>3. User enters the email and password.</li><li>4. User clicks on the 'Login' Button.</li><li>5. System validates the user.</li><li>6. If user enters wrong or invalid email or password, then exception flow 1 and exception flow 2 are performed. Otherwise proceed to normal flow 7</li><li>7. User is logged in.</li><li>8. Use case ends</li></ol>
<b>Alternative Flow(s)</b>	-
<b>Exception Flow(s)</b>	<ol style="list-style-type: none"><li>1. <b>Invalid email</b><ol style="list-style-type: none"><li>1.1 The system displays invalid email message.</li><li>1.2 Normal Flow 3 is executed again.</li></ol></li><li>2. <b>Invalid Password</b><ol style="list-style-type: none"><li>2.1 The system displays invalid password message.</li><li>2.2 Normal Flow 3 is executed again.</li></ol></li></ol>
<b>Post-Conditions</b>	<ol style="list-style-type: none"><li>1. User successfully login to the system.</li></ol>
<b>Related Requirement</b>	<ol style="list-style-type: none"><li>1. View Dashboard Analytics</li></ol>



## **Non-Functional Requirements:**

The non-functional requirements are those requirements that help a system to work better. Some of the non-functional requirements required for our system are given below:

- 1) **Reliability:** Reliability: The system should be dependable, with consistent and accurate operation. It should elegantly manage mistakes and exceptions, recover from failures, and minimise data loss or corruption. The system should also have backup and recovery techniques to prevent data loss and assure system availability.
- 2) **Security:** The system must prioritise data and user information security. It should put in place proper authentication and authorisation methods to ensure that only authorised people may access the data. In addition, the system should use secure data transmission methods to protect data during transit and comply with applicable data protection and privacy standards.
- 3) **Usability:** The system should be simple to use and intuitive, allowing faculty and research staff to explore and engage with the dashboard and its features. The user interface should be developed in way that will ensure users can simply obtain needed information, perform actions, and comprehend visualisations without confusion or excessive complexity.
- 4) **Portability:** The system should be built to be portable, allowing it to work on multiple operating systems or environments. It should make use of technologies and frameworks that are cross-platform compatible, ensuring flexibility in deployment options.

## **Project Design**

The chosen architectural style for this system is the MVC architecture. The MVC architecture refers to the Model-View-Controller architecture. The MVC architecture brings numerous benefits to the system. The system component is divided into three major parts. The three parts are model, view and controller. This architecture pattern makes it easier to manage code because of its structure.

The description of its three different parts is given below:

### **Model:**

The business logic of the application is represented by the model layer. It focuses on the data structures and data operations which is one of the crucial factors for this system. Its sustainability is one of the big factors in choosing this architectural style.

- Represents the business logic of the application.
- Data storage and retrieval is handled in this layer.
- If there is any change in data, this layer notifies the observer.

### **View:**

The presentation layer is represented by the view layer. It is responsible for displaying the interface and data to the user. It receives data from the model and works as a presentation layer of the collected data in the form of tables, charts and so on.

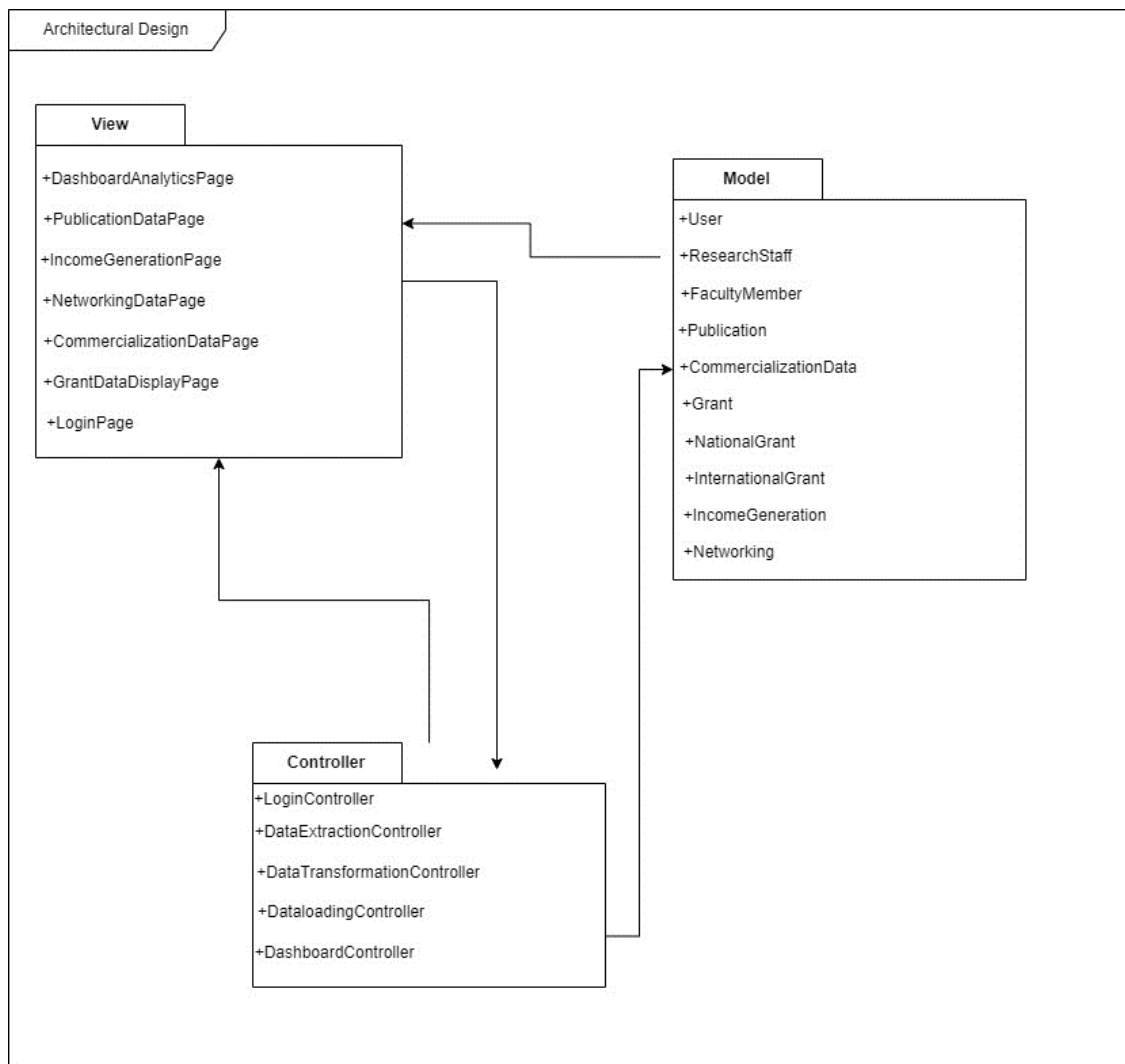
- The data is displayed by this layer.
- Works as a presentation layer.
- User interface elements are rendered in this layer.
- It passes user input to the controller.

### **Controller:**

The controller acts as a bridge between the model and view layer. It interacts with the model layer to update or retrieve data and interacts with the view layer to reflect the changes made.

- It receives user input, and it performs actions based on the user input.
- Interacts with the model to collect data.
- Interacts with the view layer to reflect changes made in the model layer.
- It controls the data flow between the model and the view layer.

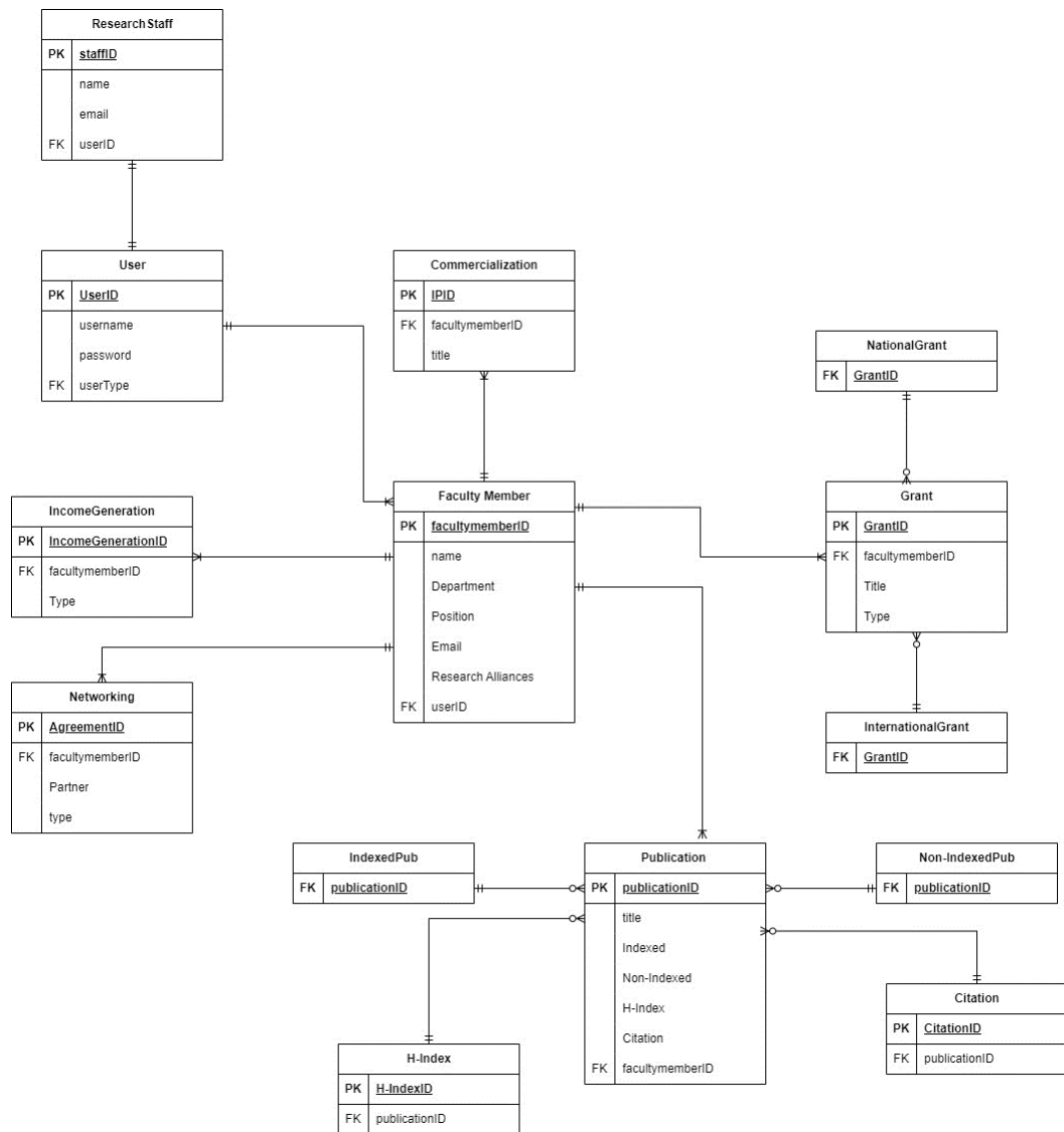
The reason for choosing this architectural model is due to its durability, testability, reusability, and flexibility.



**Figure Error! No text of specified style in document..4: Architectural Model**

## Database Design

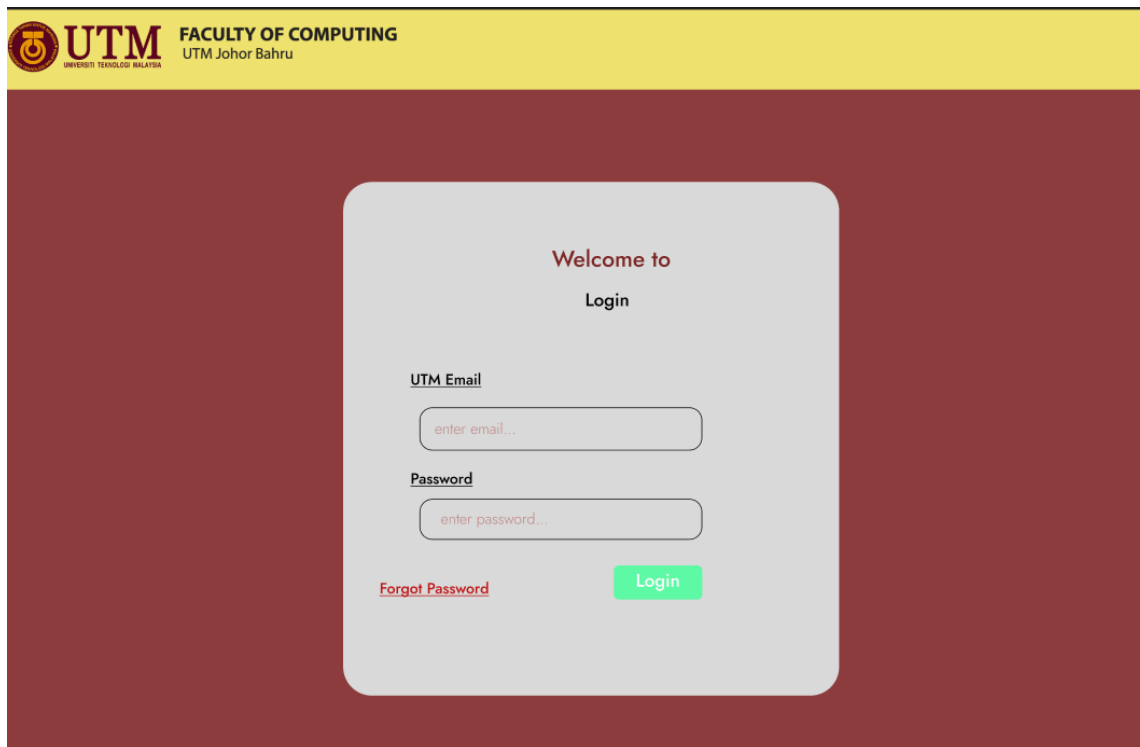
The database design is one of the main parts of our system. Database requires the data to be saved in a proper format. The format is depicted in the database design. For developing our system, database design is a major part. The database design of our system is given below:



userType	VARCHAR	Foreign Key	Unique type of user
<b>Research Staff</b>			
staffID	INT	Primary Key	Unique ID for user
name	VARCHAR	Not NULL	Name of the user
email	VARCHAR	Not NULL	Email of the user
userID	INT	Foreign Key	Unique ID for user
<b>Income Generation</b>			
IncomeGenerationID	INT	Primary Key	Unique ID for Income Generation field
facultymemeberID	INT	Foreign Key	Unique ID of the faculty member
Type	VARCHAR	Not NULL	Type of Income Generation

## Interface Design

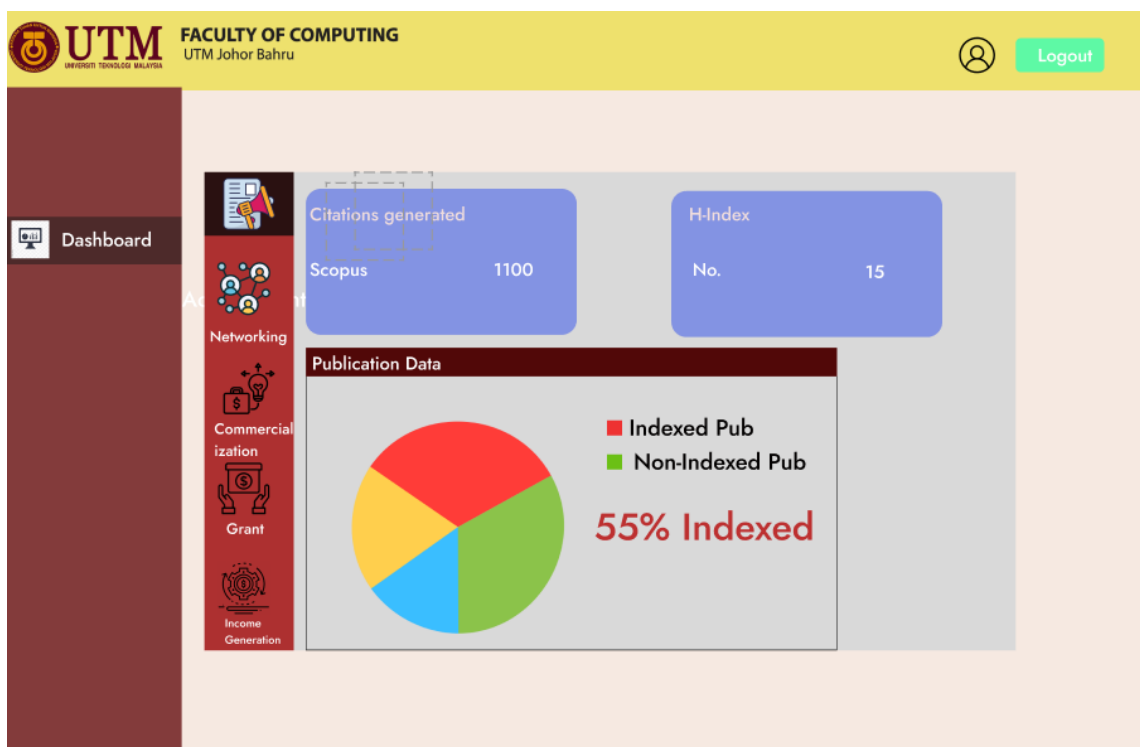
Users will be taken to a login page to enter the system. From the login page, the user will be taken to a dashboard home page.



The login page features a yellow header with the UTM logo and 'FACULTY OF COMPUTING UTM Johor Bahru'. The main content area is maroon. A light gray rounded rectangle in the center contains the login form. The form has the title 'Welcome to Login', followed by 'UTM Email' and 'Password' labels. Below these are two input fields with placeholder text 'enter email...' and 'enter password...'. At the bottom of the form are a red 'Forgot Password' link and a green 'Login' button.

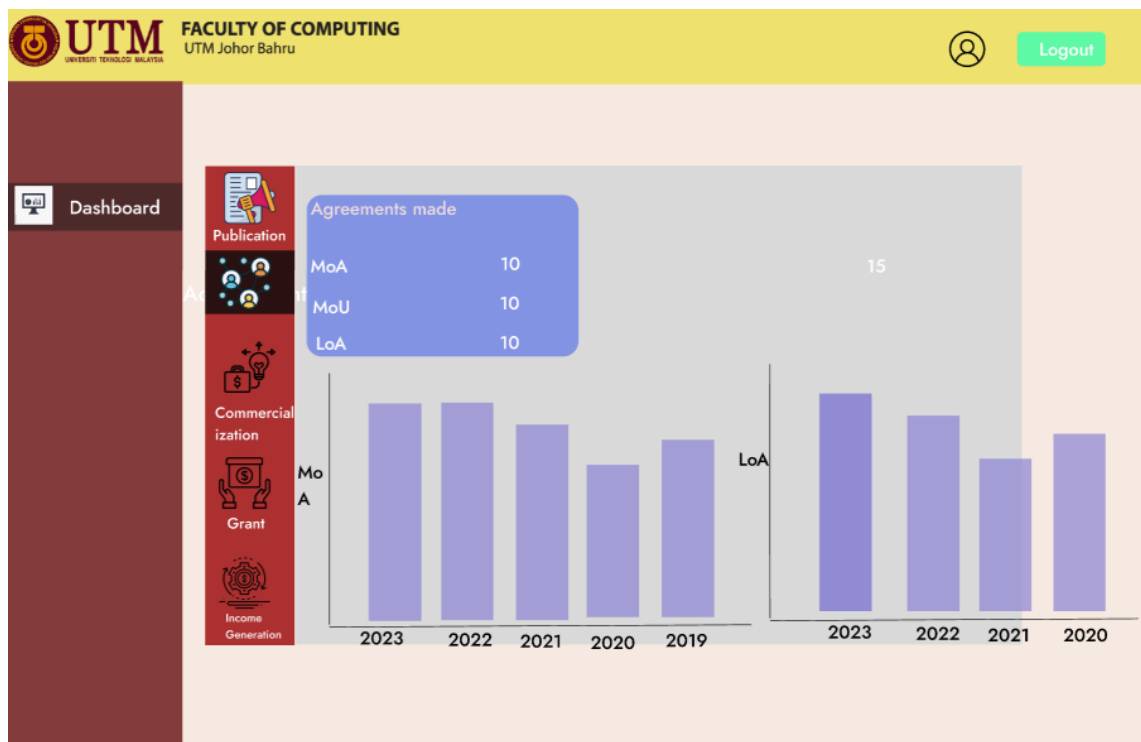
**Figure Error! No text of specified style in document..6: Login Page**

From the dashboard, the user can choose what data they want to view. If they want to view the publication data, they'll be able to view it.



**Figure Error! No text of specified style in document..7:Publication Page**

The user can view other data like networking data as well.



**Figure Error! No text of specified style in document..8: Dashboard for Networking**

## Chapter Summary

This chapter discusses all the important diagrams and methods that are required to develop the system. The requirements are the initial phase of the system. But it is just a part of the process. For developing the system, the development process is broken down into different phases. The diagrams depict a detailed description of the system features and functions. To summarize, this chapter includes all the important steps that are required to develop the system.