

**DEVELOPMENT OF A LIBRARY MANAGEMENT INFORMATION SYSTEM FOR
MOUNTAIN TOP UNIVERSITY(MTU-LMIS)**

BY

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CERTIFICATION

This project titled, DESIGN AND IMPLEMENTATION OF A LIBRARY INFORMATION MANAGEMENT SYSTEM FOR MOUNTAIN TOP UNIVERSITY (MTU-LIMS, prepared and submitted by **ACHIEF PATRICIA OTSEIZHE** of matriculation number 18010301028 in fulfilment of the requirements for the degree of **BACHELOR OF SCIENCE (Computer Science)** is hereby accepted.

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DEDICATION

This project work is dedicated to God Almighty.

ACKNOWLEDGEMENT

I sincerely want to acknowledge the presence of God Almighty with me throughout my four years degree program me in this wonderful university for his protection, provision, love and encouragement cannot be bought with money. For his mercy endureth forever (amen).

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ABSTRACT

The aim of this study was to develop an information system required for managing the flow of books or materials in and outside the library of Mountain Top University. The study identified the various user and system requirements, specified the system design and implemented the system.

The prototyping methodology was used and a review of literature was being done to identify and understand existing system being used which was OPAC. The user and system requirements of the system were identified from system users using informal interviews. The implementation of the frontend was done using HTML, CSS, and JavaScript. The backend was implemented using MySQL and PHP.

The results of the system showed the implementation of the system's database for storing the information alongside the front-end of the web application. The results revealed that the system was able to uniquely identify each user that had been registered and to easily view their status to know when a book has been borrowed, returned or if a fine was issued to the user.

The study concluded that using the system will help the librarian/staff mitigate most of the challenges associated with books in and out of the library especially with event of accounting for the amount of book/material present in the library.

KEYWORDS

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The word library was formed from a Latin name, LIBER meaning book. In a traditional sense, a library is a place where books/materials are being stored or kept in collections. It includes both digital sources, resources and services. The materials can be of visual and nonvisual materials i.e. audios, journals, reports etc. The places where this material is stored can from all the different types of libraries and stored on computers or accessible over the internet. Libraries also provide the services of librarians who assist in finding and organizing information for easy access to these materials. Advancement in technology brings about the need to upgrade the traditional format of the library into digital one. According to a study, traditional methods of library maintenance are no longer effective (Neelakandan, Duraisekar, Balasubramani, & Srinivasa, 2010). Quick and easy retrieval of information/materials and use of modern day technology has become a necessity to apply in the library (Neelakandan, Duraisekar, Balasubramani, & Srinivasa, 2010).

The efficiency of a library is determined based on how the books are organized as well as how easily anyone could obtain access to the bibliography of their choice. In general, what we see today is a manual library management system with a slow and hectic operation process. A library is a place where people can get information in various formats and from diverse sources. This involves the utilization for processing, accessing and retrieving the information that can effectively support the process of student's learning, decision-making and scholastic approaches.

Access and retrieval in the library can be simple due to the effective organisation and systematic handling of information.

An information system is a collection of interconnected elements or components that acquire, utilize, store, and disseminate data and information, while also serving as a corrective reaction (feedback mechanism) to achieve a goal (Reyolds & Stair, 2010). An instance of an information system is a library management system. An model that represents objects in a physical system, such as e - resources in a bibliographic record, is an information system, whether automated or not.

Library management information system (LMIS) known as an integrated Library System is a system that is programmed to handle the functionality of a normal library, and provides a digital format in which the library can be accessed. These functions range from; tracking the materials held by the library, managing lending/borrowing, lessens the daily work. These systems are used in applied almost all the types of libraries.

Books undoubtedly are the bridge to knowledge and culture. Thus, book management becomes a primary concern in all infrastructures that store books as a source of information. As a result, a library information management system (LMIS) is critical for a variety of valid reasons. For starters, an LMIS improves overall productivity. Librarians can keep track of the books without doing any manual work, which significantly reduces human errors as well as repetitive tasks.

Second, LMIS saves a significant amount of time. The librarian will find the desired books and their availability much faster now that the work is automated and digitally organized. Similarly, this applies to the student. As a result, the system benefits both individuals. And also, LMIS serves and suits this generation's students. In this modern day and age, information is not difficult to find, but difficult to filter and decide which piece of it is trustworthy.

To comply with the fast pace of young students, an LIMS would be a reliable place where students can quickly search for the books that relate to the topics they are interested in with minimal effort (Datir, 2018).

1.2 **Statement of the Study Problem**

Using Mountain Top University (MTU) as a case study, library management has become an issue due to the manual approach being used. Student encounter problems because materials are limited and only few students can have access to them. Students are unable to identify certain books which are available in the library.

Though, the library has a database: OPAC (Online Public Access Catalogue). OPAC is a public catalogue system, in a university library a private system is highly recommended. In a public system, problems cannot easily be located/handled if one should arise, but in a private system, even after implementation, modification can be made, problems can be located/handled more efficiently due to the fact that it was created for/by the university. There is a need to develop an information system that support the storage and retrieval of information about resources within the Mtu-library, hence this study.

1.2 **Aims and Objectives of the Study**

The aim is to develop a system for easy maintenance, retrieval and access to the library by students and staff of Mountain top University (MTU).

The specific objectives are:

- i. identify systems,
- ii. identify users and system requirements;
- iii. design the system based on (ii);

- iv. implement the system and
- v. test the system.

1.3 Methodology of the Study

In order to meet with the aforementioned objectives the following methods was adopted.

- a. Existing works was identified through a review of literature;
- b. User and system requirements was identified from literary staff;
- c. System design was specified using unified modeling language(UML);
- d. System was implemented using web technologies such as HTML, PHP, CSS, JavaScript and SQL.

1.4 Scope and Limitation

The scope of this study focuses on an information system for an academic library of a tertiary institution. This project is limited to the acquisition section of Mountain Top University library.

1.5 Significance of the Study

Library management information system will enable the staff/librarian to operate the library more efficiently. It will reduce cost, i.e., some books are expensive to acquire, therefore making the book limited to students. The LMIS provides a means to acquire softcopy, which is much cheaper and LMIS provides a way to have more materials i.e. past question (can be duplicated). This project will assist in some of the problems embedded in the traditional management approach.

1.6 Definition of Terms

- a. **Application:** Any content, item, or software that is intended for end users to utilize is referred to as an application. The computer software that delivers instructions and gives the user the means to carry out a job.
- b. **Computer:** an electrical device that processes data and does computations; it executes instructions from a program to carry out a series of mathematical and logical operations.
- c. **Database:** Software that stores, retrieves, and modifies databases is known as a database.
- d. **Information:** Information is a term used to describe text that is instructive to the reader or the machine processing it. It is shortened as info. Text that is instructive to a human reading it or a machine processing it is referred to as information, or info.
- e. **Management:** This is the process of organizing, planning, directing, carrying out, and monitoring any system.
- f. **Software:** This is a read-write memory that is used to hold written instructions, rules, or processes that govern how a computer system operates.
- g. **Server:**A server is a device that provides access resources that are made available such as files and printers to client stations on a computer network.
- h. **User:** The term "user" in this context refers to either library patrons or library workers. Additionally, it refers to the user of the application (e.g., library staff).

CHAPTER 2

LITERATURE REVIEW

2.1 Information System

Information can be described as processed data. An elementary definition of information would be raw data that has been processed to convey a meaning. Information is a meaning a person can express or extract from a representation of facts or an idea and does this by interpreting known standards of conventions applicable to the area of study in question (Zoikocey, 1981).

According to O'Brien (2004), information is simply symbols such as: data, text, images, voices, etc. that convey meaning through their relative ordering, timing, shape, and context. Information is the raw material for making decisions for creating knowledge and fueling the modern organization. For any organization to survive, it requires information; this information is a necessary tool or resource which can be derived. There is no such thing as an information system that does not include people.

As a result, an information system can be defined as any systematized collection of people, hardware, software, network services, data resources, and policies and protocols that stores, retrieves, modifies, and distribute information within a company (O'Brien & Maraka, 2007).

An information system, according to (Potterson, 2005), is a collection of interconnected elements that perform input, processing, storage, output, and control functions to translate data into information that may be utilized to promote prediction, planning, control, interoperability, decision making, and operating processes in an organization.

According to Shim (2000), an information system is a computerized system that processes data (facts) and produces information. This is referred to as an information processing cycle (IPC).

Four processes comprise the information processing cycle. They are as follows: input, process, output, and storage.

2.1.2 Types of information system

There are various types of information systems that are adapted to specific business specifications or business types. There are six (6) major types of information systems, each enhancing a different organizational level. Among these systems are:

a. Transaction processing system (TPS)

Transaction processing systems (TPS) are the basic business systems that serve the operational level of the organization. A transaction processing system is an automated system that processes and records the daily routine transactions required for business operations (Laudon & Laudon, 2006). The transaction processing systems that facilitate the day-to-day operations of the business are found at the bottom of the organizational hierarchy (Belle, Eccless, & Nash, 2001).

b. Management Information system(MIS)

Management information systems are a kind of computer information systems that could collect and process information from different sources in institute decision- making in level of management (Heidarkhani, khomami, Jahanbazi, & Alipoor, 2013). Management information systems Provide information in the form of pre-specified reports displays to support business decision making (O'Brien & Maraka, 2007). The next level in the organizational hierarchy is occupied by low level managers and supervisors. This level represents systems created to aid operational management in tracking and controlling clerical level transaction processing activities. Management information systems (MIS) use the TPS data to generate the necessary control reports for supervisors (Belle, Eccless, & Nash, 2001). Management information systems, according to Hasan,Y, (2015), are types of information systems that take intramural

data obtained from the system and contextualise it into valuable and relevant forms as management reports to support management operations and decision making.

c. Decision Support system (DSS)

A Decision Support System is a computer-based system intended for use by a particular manager or usually a group of managers at any organizational level in making a decision in the process of solving a semi structured decision (Asemi, Safari, & Zavareh, 2011). According to Heidarkhani, et al. (2013) Decision Support Systems are a Kind of organizational information computerize systems that help manager in decision making that needs modeling, formulation, calculating, comparing, selecting the best option or predict the scenarios. According to Khanore, et al. (2011), Decision-support systems are explicitly designed to assist management in decision making when the feasible objectives of those decisions are uncertain. According to Shim (2000), a decision support system is a computer-based information system that assists managers in making many complex decisions, such as decisions needed to solve poorly defined or semi-structured problems.

d. Expert system

Expert systems are the category of AI which has been used most successfully in building commercial applications (Belle, Eccless, & Nash, 2001). According to O'Brien & Marakas (2007), Expert systems are Knowledge-based systems that provide expert advice and act as expert consultants to users. According to Patterson (2005), an expert system is a computer program that tries to emulate human reasoning. According to Shim (2000), Expert System is a set of computer programs that perform a task at the level of a human expert.

2.1.3 Component of information system

The digital revolution devised a new concept to businesses, universities, and a wide range of other organizations: the information system, a collection of components that deals with storing and retrieving data and information. An information system is divided into five components.

a. Computer hardware

This is the external technology that deals with information. Hardware can be as small as a mobile device that fits in a pocket or as vast as a building-sized supercomputer. Hardware also includes computer-related peripherals such as keyboards, external hard disks, and routers. With the rise of the Internet of things, in which anything from home appliances to cars to clothes will be able to receive and transmit data, sensors that interact with computers are permeating the human environment.

b. Computer software

The role of software is to instruct the hardware on what to do. There are two types of software: system software and application software. The operating system, such as Windows or iOS, is the main part of system software that runs the hardware's operation. Software application is intended to perform specific tasks such as excel manipulation, document creation, and Web page design.

c. Telecommunication

This component incorporates the hardware to establish a network. Connections can be made via wires, such as Ethernet cables or fibre optic, or wirelessly, via Wi-Fi. Through a local area network, a network can be designed to connect computers in a specific domain, such as a facility or an university (LAN). When computers are spread out, the network is referred to as a wide area network (WAN). The Internet is a chain of networks in and of itself.

d. Databases and data warehouses

This component is where the “material” that the other components work with resides. A database is a place where data is collected and from which it can be retrieved by querying it using one or more specific criteria. A data warehouse stores all of an organization's data in any format it requires. With the emergence of "big data," a concept used for an immense amounts of data that can be gathered and analyzed, databases and data warehouses have inferred significant relevance in information systems.

e. Human resources and procedures

The definite, and possibly most significant, component of information systems is the human element: the people required to run the system and the techniques they apply so that the insight in the massive databases and data warehouses can be converted into learning that can analyze what has occurred in the past and recommend a course of action.

2.2 Related Works

Shiferaw(2022) develop a library management system that enables reservation, lending and the return of books automated on the web. The implementation of the project was by using PHP, MYsql and some javascript code. The project examines how system flow and work process on the library management system. It shows and solves the process of the library system and make it automated. A system that enables users daily transaction was created using the right requirements and model.

(Remya, Susan, Jerril, Navaneeth, & Justin, 2014) ,The ANDROCLIBERION library system is an android cloud based library management and authentication system, it was created in a way which solves any library problem/procedure. The system helped customer to know the

availability of books, to be able to order a book, to reserve a book when not available and the customers can comment and rate different books, providing good feedback. Customer who don't own an android phone can use web application. The modules used where: Central Admin, Local librarian, Customers with their various. It has three main application: web, desktop and android. In Web application features like library management, book management and so on were added. In Desktop application, QR code for easier transactions, automatic calculation from due date to current date, list of reserved books, delivery services and other various features were added. In Android, user friendly and efficient features were added making it easier to search, comment, and to reserve books. ANDROCLIBERION makes the library easier to use, simpler to understand and faster. ANDROCLIBERION, if implemented accurately provides an efficient library management system.

(Shanmugam A.P, Ramalakshmi A, Sasthri G, and Baalachandran S 2020),In traditional libraries, students/users must look for books, which is a time-consuming procedure, and there is no proper database management of issues/fines. The general pace of work is slow, and it is hard to produce a timely report. The librarians must labor in the book sales, arranging and classifying volumes. Simultaneously, they must examine and monitor the lend/borrow book information with its fine. Working in many areas at the same time is a time-consuming task.The Library Management System (LMS) was built with Dot Net technology; the C# language was utilized to create the front-end application, and the SQL server was used as a database.The technique helps provide a new method for setting up digital libraries.And said in their future work,they intended to improve the LMS by fusing it with the LAN, which boosts the system's effectiveness.

Tan Chaur Chuan (2010) created a library management system. The system was created to monitor daily book transactions and members, as well as to enhance the administration of the library's book property. The Waterfall model was used as the technique for developing the system. In comparison to the present library system, this method offers several advantages and disadvantages, such as the lack of smart card technology. In the future, we can improve the system by including smart card technology.

(Khan Mohammed Talha Z, Choudhary Mahendra L, Kapadia Rashida M, Kadwaikar Jaffar J, and Shah Dr. Varsha 2021). They designed a Library Management System with SMS Auto Reply. The Library management system is designed in such a manner, that it completely computerizes the whole traditional library process. It will help in keeping the information about the members, books, and all other operations. It will also help in the maintenance at any instance, which reduces almost all the human workload which is required for the management of traditional library.

Chaun(2010) proposed the development of a library management system that was developed to manage the daily book transaction and manage the member, books record more efficiently. The SDLC methodology used was the waterfall model. Html, CSS, PHP and phpMyAdmin.

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN

3.1 Introduction

After analyzing the requirements of the task to be performed, the next step is to analyze the problem and understand its context. The first process in the stage is to examine the current system in order to recognize the new requirements of the system and domain. Both operations are vitally valuable, but the first serves as the foundation for providing required functionality and then successfully designing the proposed system. Understanding a new system's properties and requirements is complex and requires critical ideas. It also necessitates a knowledge of the existing system, which is complex. Improper understanding of present system and its problems could lead to an unsatisfying solution.

In the requirement phase, systems requirements are gathered. This phase is the main center of attention of the project managers and stake holders. Meetings with managers, stake holders and users are held in order to determine the requirements. The general questions that require answers during a requirement gathering phase are: Who is going to use the system? How will they use the system? What data should be input into the system? What data should be outputted by the system? A list of functionalities that the system should provide, which describes functions the system should perform, business logic that processes data, what data is stored and used by the system, and how the user interface should work is produced at this point. The requirements phase may be divided into four stages: requirements elicitation (collecting criteria from stakeholders), analysis (evaluating the consistency and completeness), specification (documenting the requirements), and verification (making sure the specified requirements are correct).

3.2 Types of Requirements

Requirements are categorized as:

a. Functional requirements which describe the functionality that the system is to execute; for example, formatting some text or modulating a signal.

b. Non-functional requirements which are the ones that act to constrain the solution.

Nonfunctional requirements are sometimes known as quality requirements or Constraint requirements. No matter how the problem is solved the constraint requirements must be adhered to.

It is important to note that functional requirements can be directly implemented in software.

The non-functional requirements are controlled by other aspects of the system.

3.3 System Analysis

System Analysis is the process of investigating a system's operation with a view to changing it to meet new requirements or improving its current operation. It is also known as the study of collections of interacting things, which includes computer system analysis. This is a subfield of requirements analysis or operations research. It is also "an specific formal inquiry conducted to assist someone (known as the decision maker) in identifying a satisfactory method of proceeding and making a better conclusion than he could have otherwise."

3.3.1 The requirement for system analysis

Business systems are typically complicated. Applying modifications in a system without considering the implications on other subsystems or present working patterns may outcome to the system degrading rather than improving. System analysis will reveal.

a. Outputs and processing needed.

b. Data required in processing the output.

- c. Role of people in the process.
- d. Security aspects to ensure the efficient continuation of the activities.
- e. Costs of providing the system.

This study was carried out at Mountain Top University, the main purpose of the study was to find out how the process of recording library operation data are carried out, how the activities of the library are running. The current system is entirely manual.

3.3.2 Information gathering

Information gathering can simply be referred to as the act of collecting information. The gathering of relevant and up-to-date information is a key business process. Information consists of organized facts and figures that have meaning within the context that the information is intended to be interpreted by people.

A strategy should be evolved by the analyst to gather information. The strategy consists of identifying information sources, evolving a method of obtaining information from the identified sources and using an information flow model of organization.

The main source of information for this project was designed for the librarian, lecturer, and the students that make use of it. The methods used for data collection include:

Oral Interview: The interview included the librarian, staff, student of Mountain Top University.

Form Evaluation: Forms used in the library which are useful and available were accessed. These forms include; the, registration forms. which helped in the design and implementation of the new system.

3.4 Analysis of the Existing System.

Research has been carried out and discoveries made that this kind of system (Automated Library Management System) does have Mountain Top University. Presently, in Mountain Top University, when a student, staff, lecturer comes into the library, all they do is to write down basic information about them and some relevant books details. This information is kept manually in files according to the yearly into the university. There is no special security feature other than locking up the files to protect to student, staff, lecture information and no way of avoiding redundant files.

3.4.1 Challenges of existing system

Observations have been made that the non-existence of Automated Management System poses some challenges which includes some of the following;

- a. Lack of immediate retrieval of student, staff, lecturer, members information
- b. Time consuming
- c. Redundancy in files
- d. Increased paper overloads
- e. Human prone errors.

3.5 Analysis of the Proposed System

As a result of the few problems faced with the existing system, there would be a need to design a system which would be able to address them. The proposed system would be able to collect student, staff, lecturer data, store these data and provide the data when it is needed.

3.5.1 Feasibility study

A feasibility study evaluates a system proposal based on its feasibility, organizational productivity, capacity to achieve necessities, and the efficient utilization of resources. It emphasizes the following key issues:

- a. What are the user's demonstrable needs and how does a user system meet them?
- b. What resources are available for given user system?
- c. What are the likely impacts of the user system on the organization?
- d. Whether it is worth to solve the problem?

During feasibility analysis for this project, following primary areas of interest are to be considered;

Technical Feasibility: Can the work for the project be done with current equipment & available personals? Yes, the proposed System does not need a large number of library staff for its functionality, a server system and few library systems should be enough for minimal performance. Can the system be upgraded if developed? The System will be designed such that additional modules can be added to the existing modules with ease. Codes are clearly written with inline comments for understanding. If new technology is needed then what can be developed? A system large enough to keep patient records including digital images, video coverage of surgery for referencing, link to AMS of other library centers and a centralized database for staff, student, lecturer, etc.

3.5.2 Functional and non-functional requirements

a. Functional Requirements: These are statement of services the system provides, how the system should react to particular inputs and how the system behave in particular situation. The functional requirements of this system are;

- i. Every user must have a unique username and password, and the system must be able to create new users with different access rights.
- ii. The admin can access all modules of the system, whereas other staff members are not privileged to view some modules.

iii. No Log-in is allowed without authentication (password).

b. Non-Functional Requirements: These are the constraints encountered in the development of the system. Some of these constraints includes;

i. Setting up a network within the university clinic will be quite expensive, but the application needs to be hosted on a good network.

3.6 The Prototyping Methodology

The prototyping methodology is a methodology that involves an early approximation of the final system or a prototype. The prototype is built, tested, and adjusted until it is deemed fit enough for the final system by the user. This simple process could be used iteratively for a long range of time until the desired product is reached.

The prototyping methodology is mostly used in scenarios where the project requirements are not properly understood or where some details need to be clarified. It is also used for the development of online interactive transaction processing systems, web-based developments and other real time projects. It helps users to quickly confirm design requirements as the development is ongoing.

The model has a basic five step execution approach. They are:

- a. Requirement gathering
- b. Development of initial prototype
- c. Review of prototype (by users)
- d. Making the needed changes on a new prototype
- e. Iterate 4 and 5 until the final system is developed

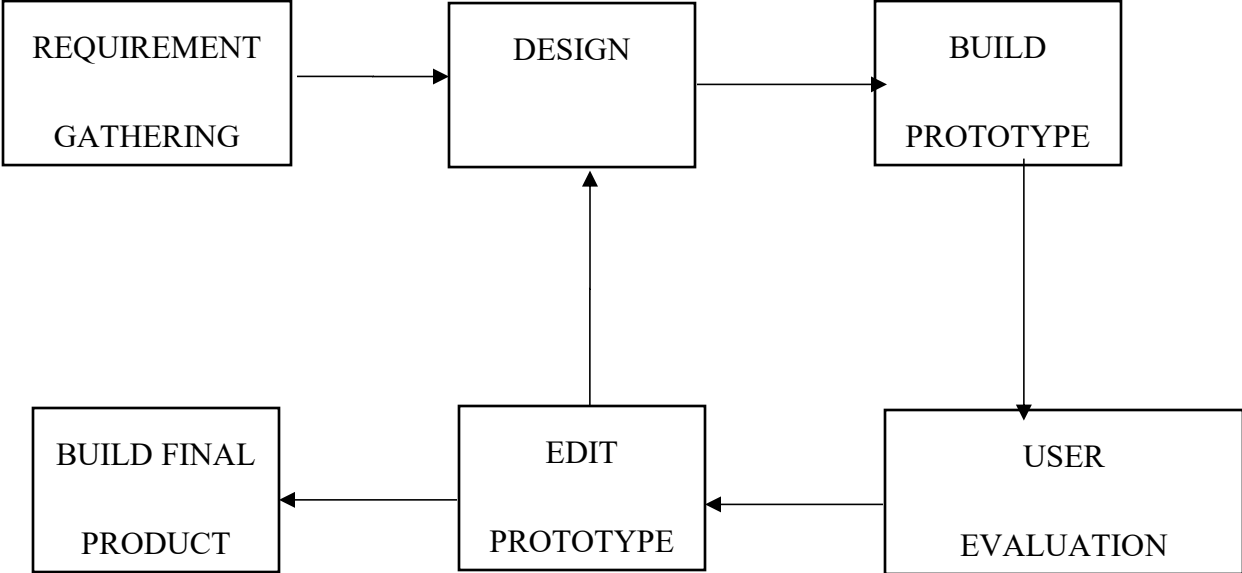


Figure 3.2: The prototyping methodology

3.6.1 Specification and Justification for the proposed methodology

The advantages of the methodology include:

- a. Increased involvement of the user in the product during implementation.
- b. The users get a better understanding of the system being developed.
- c. Reduced resource budget due to prior quality evaluation.
- d. User feedback is available more quickly, resulting in more suitable solutions.
- e. Spot out errors and mistakes easily.
- f. Unclear requirements or functions can be identified.

Since the system is a web-based project that involves a lot of user interactions with the users and some real time processing, the prototyping methodology appears among others to be the best methodology to use among others.

3.7 System Design

The design phase's goal is to implement an approach to the issue required by the specifications.

The objective of system design is to recognize the components that should be in the system, their specifications, as well as how they communicate with one another to produce the result.

The design process's goal is to create a prototype or illustration of a system where it can eventually be used to assemble that system. The model that is created is known as the system design.

3.7.1 System Flow Chart

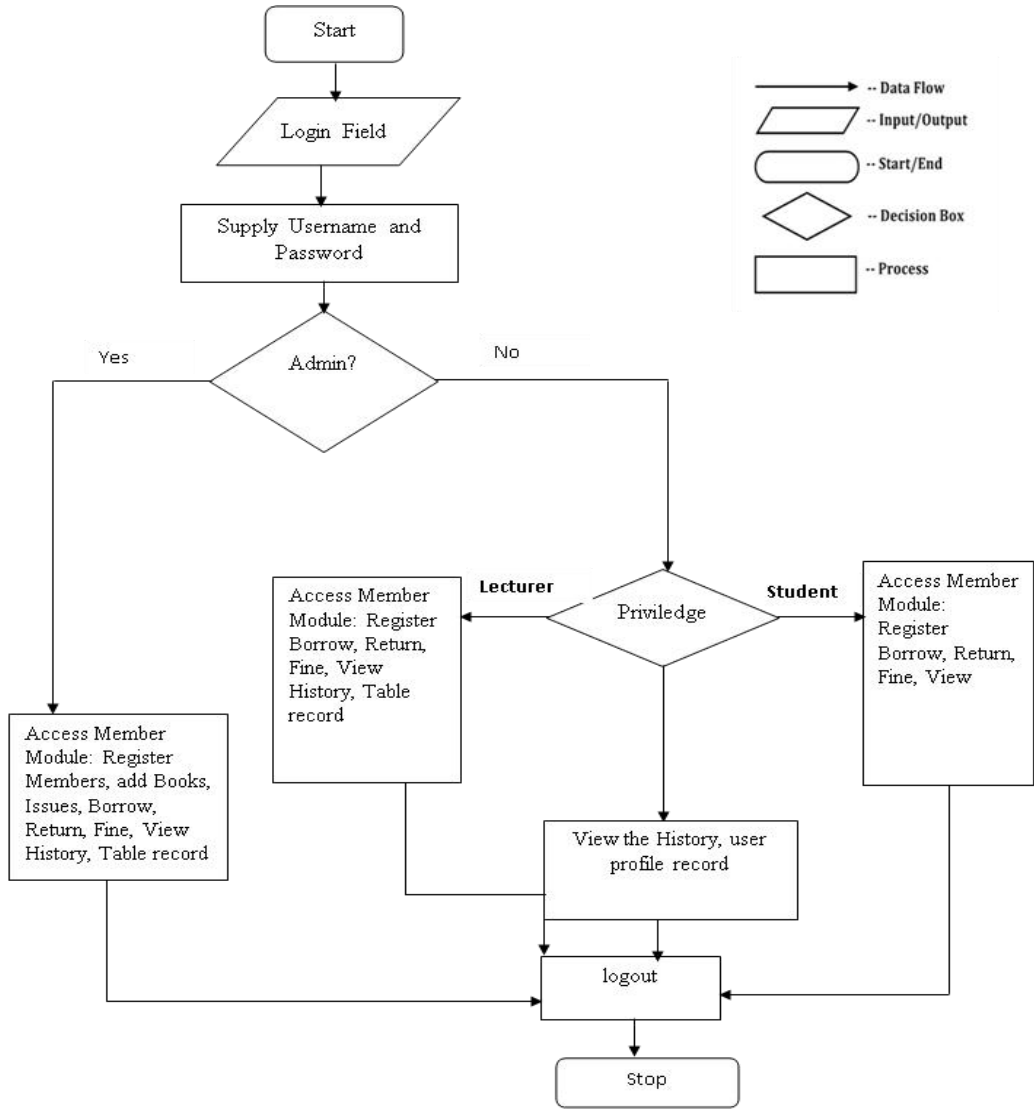


Figure 3.3: Proposed System Flowchart.

3.7.2 Context Flow Diagram

A context flow diagram is a 0th level DFD. And only has one process node that generalizes the entire system's functions in relation to external entities. Figure 3.4 shows the interaction between the admin and the system, where the admin verifies a member id from the system which goes to the database to fetch the member details.

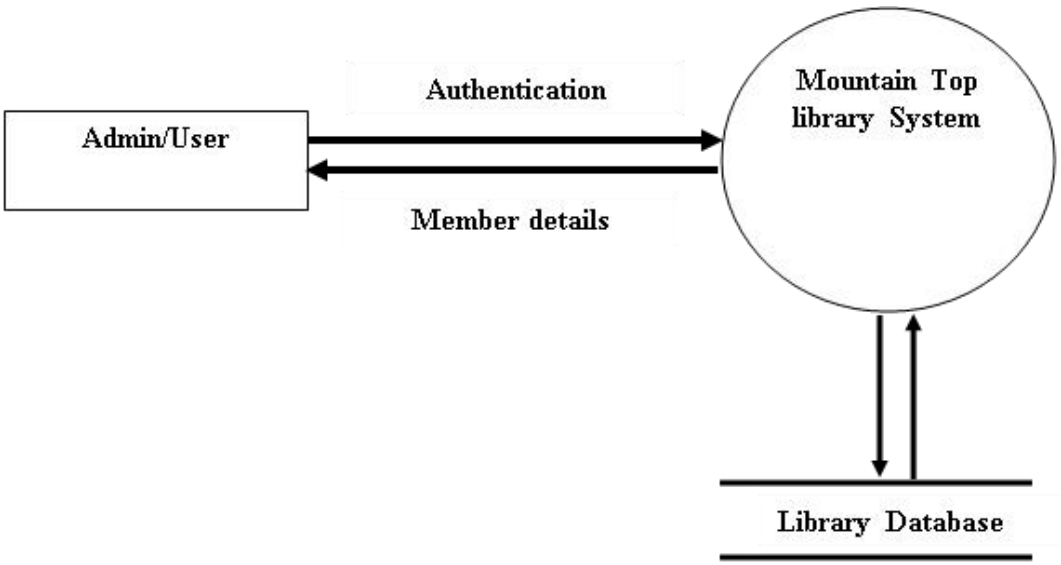
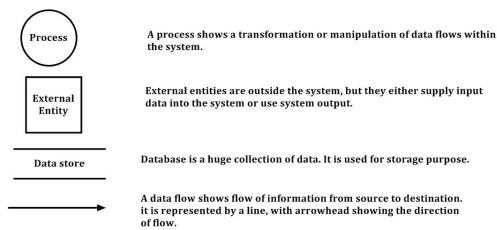


Figure 3.4: Context flow diagram

3.7.3 Data Flow Diagrams

Data flow diagrams (DFDs) show the relationships between and among the major factors of a program or system. DFDs are a useful method for simulating the high-level detail of a system by demonstrating how input data is converted to output results via a series of functional transformations. Entities, processes, data stores, and data flows are the four major components of DFDs. Figure 3.5 depicts how transactions are performed out in the system. It shows how the system verifies the admin login, where the admin check on a valid member in order to acquire information from a member to show issued material and other results regarding a member. Figure 3.6 show how a user register into the system database.

DFD use a number of symbols to represent systems. Most Data flow modeling method use 4 kinds of symbols to represent four kinds of system components:



1st Level DFD

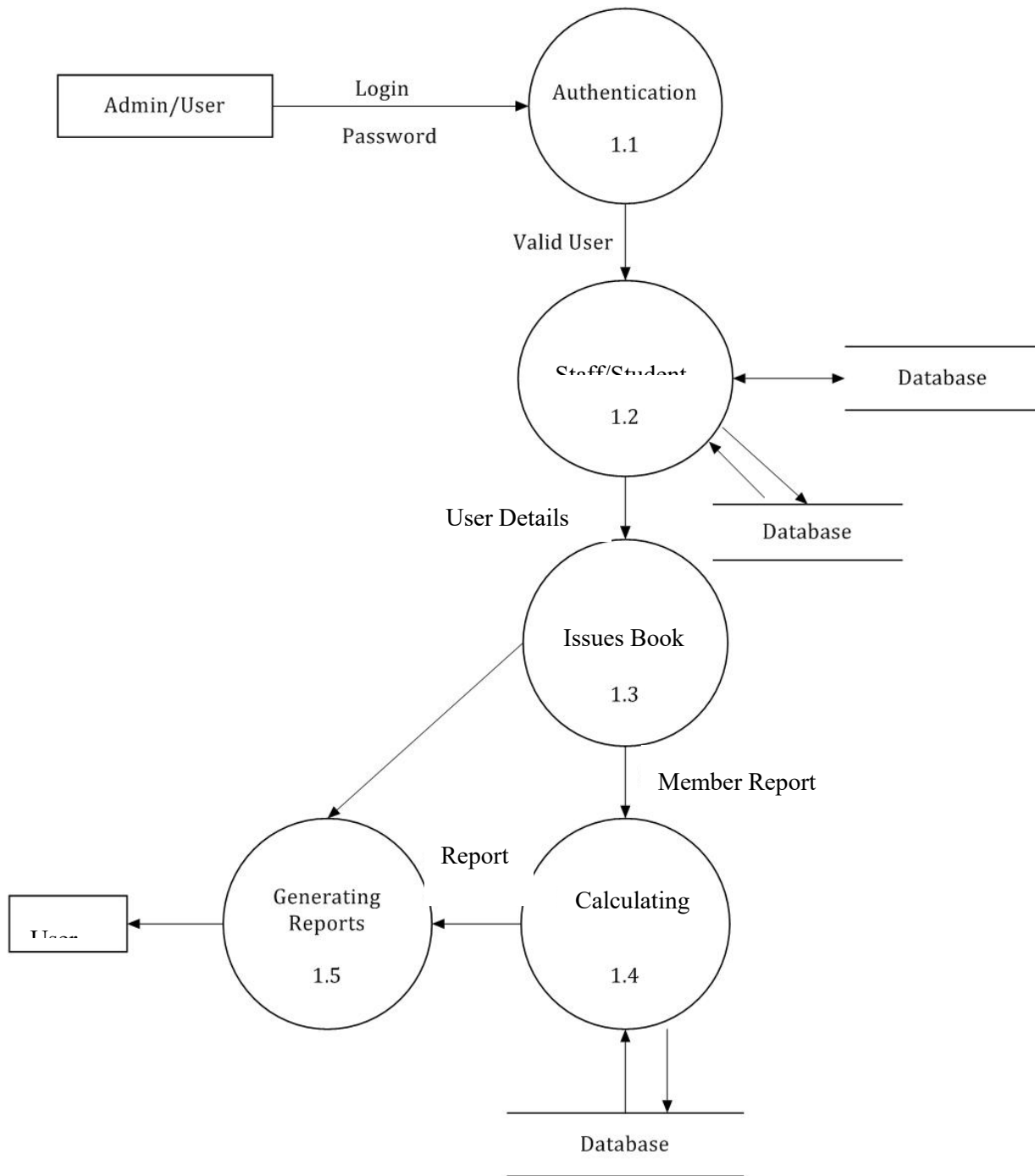


Figure 3.5: Data flow design of the system

User Log-in DFD

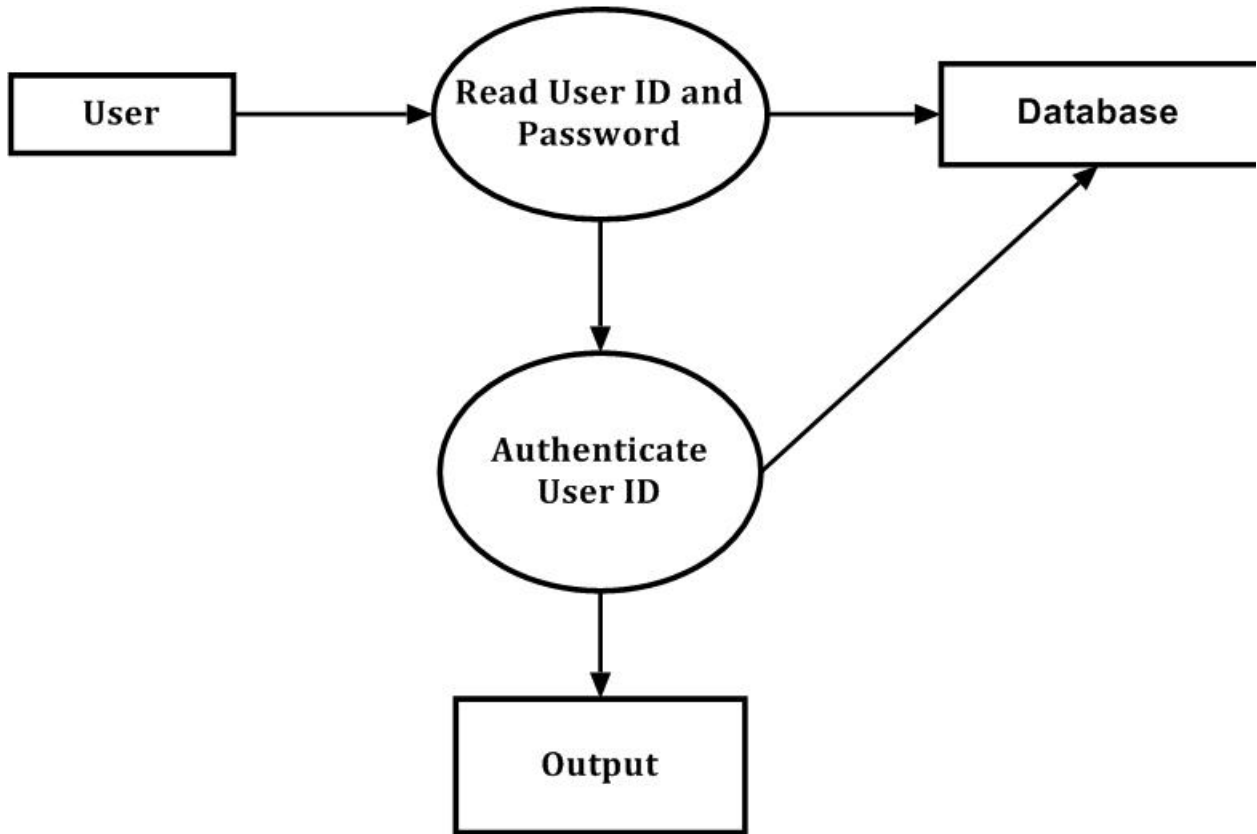


Figure 3.5: User Log-i

3.8 **Data Tables**

Data tables is a visual instrument comprised of labeled columns and row,used to arrange information contained in a database.

Table 3.1Admin Table

Field	Type	Constraint
Admin_id	INT(11)	Primary key
Admin_name	VARCHAR (50)	Not Null
Admin_user	VARCHAR (50)	Not Null
Admin_pass	VARCHAR (50)	Not Null

Table 3.2:Members Table

Field	Type	Constraint
Member_id	INT(11)	Foreign
Staff_id	INT(11)	Primary
date_of_issued	DATE	Not Null
time_of_return	TIME	Not Null
status	VARCHAR(50)	Null
reason	VARCHAR(250)	Not Null

Table 3.3:Lecturer Table

Field	Type	Constraint
Lecturer_id	INT(11)	Not Null, Primary
IDnumber	VARCHAR(50)	Unique
Firstname	VARCHAR(50)	Not Null
Surname	VARCHAR(50)	Null
Gender	VARCHAR(50)	Null
DOB	DATE	Not Null
Address	TEXT	Not Null
phone	INT(20)	Null
Occupation	VARCHAR(50)	Null
Marital	VARCHAR(50)	Null

Table 3.4: Student Table

Field	Type	Constraint
Studentid	INT(11)	Not Null, Primary
ID number	VARCHAR(50)	Unique
Firstname	VARCHAR(50)	Not Null
Surname	VARCHAR(50)	Null
Gender	VARCHAR(50)	Null
DOB	DATE	Not Null
Address	TEXT	Not Null
phone	INT(20)	Null

CHAPTER FOUR

SYSTEM IMPLEMENTATION AND TESTING

4.1 System Implementation

System implementation is the development, installation and testing of system components and delivery of that system into production. The purpose of system implementation is to build a system, install it, and replace an old system, preparing system and user documentation and train users.

System implementation has several major activities. This phase includes five major tasks: coding, testing, implementation, documentation, and training. The objective is to incorporate the physical system requirement into functional and efficient software and hardware, document the work done, and provide assistance to prospective and current clients.

4.2 System Requirements

4.2.1 Hardware (minimum requirement)

Computer Configuration:

- i. Pentium II processor
- ii. Keyboard
- iii. Mouse
- iv. 500 MB Random Access Memory (RAM)
- v. Hard disk space of 500MB.

4.2.1 Computer network

Server: There will be need for a computer to serve as the server for the system. This is where the database server and webserver will be installed.

Workstations: Other computers on the LAN from which the system will be administered and updated. There will be need for at least one work station.

4.2.2 Software

- a. My SQL database server
- b. Apache Webserver
- c. PHP
- d. A text editor
- e. A web browser

4.3 Justification of Tools Used

In making this management system web-based, quite a number of tools were available but, a choice had to be made among them. I have chosen to use the following combination of tools for my design: Web Server: Apache, Database Sever: MySQL, Scripting Language: PHP.

4.3.1 APACHE

The Apache Project is a cohesive rapid application development effort designed to develop a sturdy, commercial-grade, and readily accessible source code HTTP web server implementation. The project is managed collaboratively by a global collection of individuals who communicate, strategy, and develop the server and its relevant documentation via the Internet and the Web. The Apache Group is a group of volunteers. Multiple users have also made a suggestion, code, and information to the project.

Since April 1996, according to the Netcraft web servers survey, Apache has been the most widely used web server on the Internet. This comes as no surprise due to its many characteristics, such as the ability to run on various platforms, its reliability, robustness, configurability and the

fact that it is free and well-documented. Apache has many advantages over other web servers, such as providing full source code and an unrestrictive license. It is also full of features. For example, it is compliant with HTTP/1.1 and extensible with third-party modules, and it provides its own APIs to allow module writing. Other interesting features that have made it a popular web server include the capability to tailor specific responses to different errors, its support for virtual hosts, URL rewriting and aliasing, content negotiation and its support for configurable, reliable piped logs that allows users to generate logs in a format they want.

Apache supports a variety of features, many implemented as compiled modules which extend the core functionality. These can range from server-side programming language support to authentication schemes.

This is the most popular webserver used on the web. It is easy to use and is compatible with many platforms.

4.3.2 **MySQL**

MySQL is in the class of software called “Open-source software”. It is the back-end for the system. Some of MySQL’s main competitors are PostgreSQL, Microsoft SQL server, and Oracle. MySQL however has many strengths.

MySQL is undeniably fast. Many benchmarks show MySQL to be orders of magnitude faster than the competition.

MySQL is available for no cost, under an Open-Source License, or at low cost under a commercial license if required for your application.

Most modern databases use SQL. If one has used another Relational Database Management System (RDBMS), one should have no trouble adapting to this one. MySQL is also easier to set up than many similar products.

MySQL can be used on many different UNIX systems as well as under Microsoft Windows.

4.3.3 PHP (hypertext preprocessor)

This is a server-side scripting language. It also falls under the group of software called “open-source software”. It is distributed free of charge. PHP generates HTML pages, which are rendered in web browsers. Some of PHP’s main competitors are Perl, Microsoft Active Server Pages (asp), Java Server Page (JSP), and Allaire Cold Fusion.

In comparison to this product, PHP has many strengths, including the following:

High performance: PHP is extremely efficient. You can serve millions of requests daily from a single low-cost server.

Interfaces to many different databases: Many tools are natively supported by PHP. In contrast to MySQL, you can connect directly to PostgreSQL, mySQL, Oracle, dbm, Informix, and Sybase databases.

Using the Open Database Connectivity Standard (ODBC), you can connect to any database that provides an ODBC driver.

Built-in libraries for common web tasks: Because PHP was designed for use on the web, it has many built-in functions for performing many useful Web-related tasks.

Low cost: PHP is free. Its latest version can be downloaded at any time from <http://www.php.net> for no charge.

Ease of Learning and use: The syntax of PHP is based on other programming languages, primarily C and Perl. If one already knows C or Perl, or a C-like language such as C++ or Java, you will be productive using PHP almost immediately.

Portability: PHP is readily accessible for a wide range of operating systems. PHP code can be written on free Unix-like operating systems such as Linux, commercial versions which include

Solaris, or various versions of Microsoft Windows. The code will run without modification on a different system running PHP.

4.3.4 Other tools used

Notepad++: Notepad++ is a free source code editor and Notepad replacement that supports several languages. It is easy to use and provides some syntax checking facility to facilitate the coding process.

Internet Explorer: One of the most popular web browsers, it is versatile.

XAMPP Server: is an integrated server package of Apache, MySQL, PHP and Perl. Everything is pre-configured and ready to go just by unzipping or installing it. It provides a graphical web-based interface for working with MySQL called PHPMyAdmin.

4.4 System Testing

The primary testing objectives is to check and confirm the system. Verification means checking the system to ensure that it is doing what the function is supposed to do and Validation means checking to ensure that system is doing what the user wants it to do.

No program or system design is perfect; communication between the user and the designer is not always complete or clear, and time is usually short. The result is errors and more errors. In theory, a newly developed system should have every one of its components operational, but in practice, each component operates independently. It gives the moment to combine all of the parts into a single system and test it to verify that it satisfy the needs of the user. This is the best opportunity to recognize and fix errors before implementing the system. The goal of system testing is to think about all of the possible variations to which the system will be subjected and then push the system to its limits. If we implement the system without proper testing then it might cause the problems.

4.4.1 Unit testing

This is the smallest testable unit of a computer system and is normally tested using the white box testing. The author of the programs usually carries out unit tests.

I examined each unit to ensure that it is functional as required and all operations are sent to the database when required. The success of each individual unit laid foundation for the next step of integration testing. All errors at the unit level were dealt with.

4.4.2 Integration testing

In integration testing, the different units of the system are integrated together to form the complete system and this type of testing checks the system as whole to ensure that it is doing what is supposed to do. The testing of an integrated system can be carried out top-down, bottom-up, or big-bang. This type of testing plays very important role in increasing the systems productivity. I have checked my system using the integration testing techniques. For example, when a user logs in, he/she should go to the appropriate page and get access to only the pages to which he/she is privileged to access.

4.4.3 System Testing

Apart from testing the system to validate the functionality of software against the requirements, it is also necessary to test the non-functional aspect of the system. Some examples of non-functional tools include tests to check performance, data security, usability/user friendliness, volume, load/stress .etc. which I used in my project to test the various modules.

4.4.4 Changeover Procedure

The system will be run along with the existing manual system while the change-over is underway. The initial stage of the change-over requires a lot of data entry to build up the database.

After that, there will be need for a training session for the staff of the clinic that will be using the system. The system administrator will monitor the changeover procedure providing reports on failures and efficiency/proficiency of users.

4.4.5 System Installation

The system is a web-based application. Thus, it works based on the basic web architecture. The Web-server serves as a mediator between the web pages (i.e. web browser) and the database server.

The web pages loaded by the browser make up the front-end of the application i.e. the application's interface with the user. It renders pages (files) in HTML format. The database server is the back-end i.e. it stores the web content. In between the front-end and the back-end lies the web-server, which runs the scripts to query the database, collect from the HTML page or display information on the HTML page for the end user. All requests from any HTML page must pass through the web-server.

Installing such an application will require us to first install and configure the database server (MySQL), the web-server (Apache 1.3) and the scripting language interpreter (PHP). For this, the application XAMPP server was used. XAMPP is a ready-made application which when run automatically installs and configures MySQL, Apache and PHP on the system.

After the installation of XAMPP, the program should be copied to the htdocs folder inside the XAMPP folder on the server system, i.e. for local host servers. The program file should be copied to the directory C:\xampp\htdocs which is the XAMPP directory for most systems.

4.5 System Interfaces

Figure 4.1 shows the result of the web interface where the users, that is, the admin can login using their username and password. Figure 4.2 shows the result of the web interface used by

the admin. It displays the dashboard used by the admin to navigate the interface. It shows the number of returned, issued and not returned books. Figure 4.3 shows the interface of the membership page, it shows the admin the total number of registered members in the system. Figure 4.4 shows the interface of book registration. It displays books being registered on the system. Each book is being registered in individual rows, where each column comprises of ISBN number, book title, book name, author name, edition, quantity, purchase date, pages and publisher.

Figure 4.5 shows the interface of the books issued. It stores and shows the admin the books that were issued which were either returned or not. When a book is issued to a member, a return date is set and when not returned within the deadline, a fine will be paid. Figure 4.6 shows the interface of returned books. It shows the book number, title, issued date, due date, returned date, member id, fine and status, i.e. cleared or pending. Figure 3.7 shows the interface of the fine module. It shows the admin either or not a fine has been paid by a member.

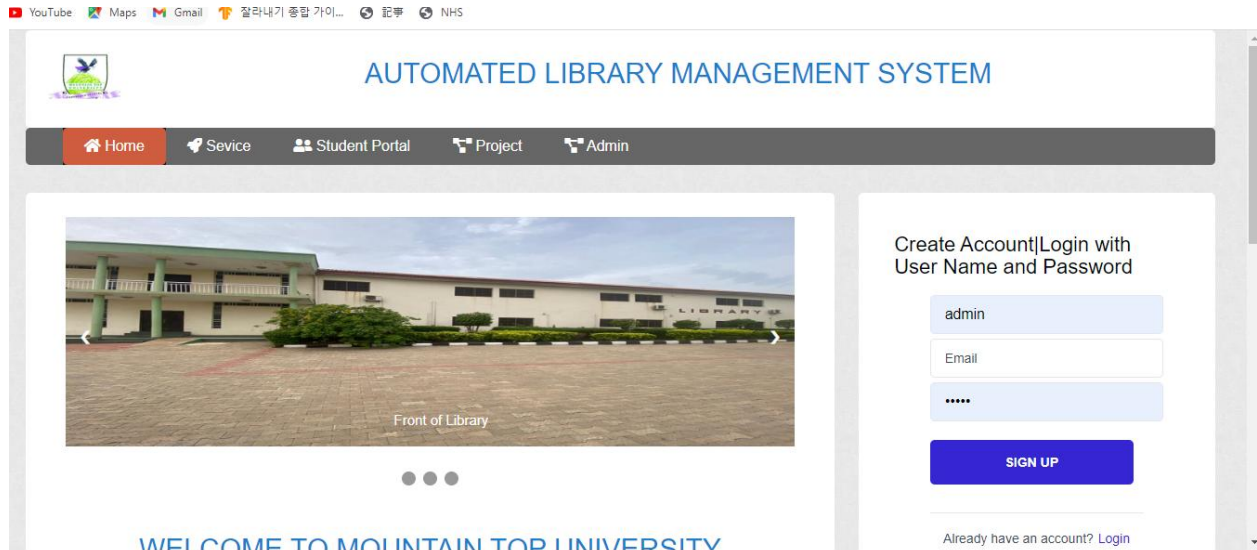


Figure 4.1 :Home Page

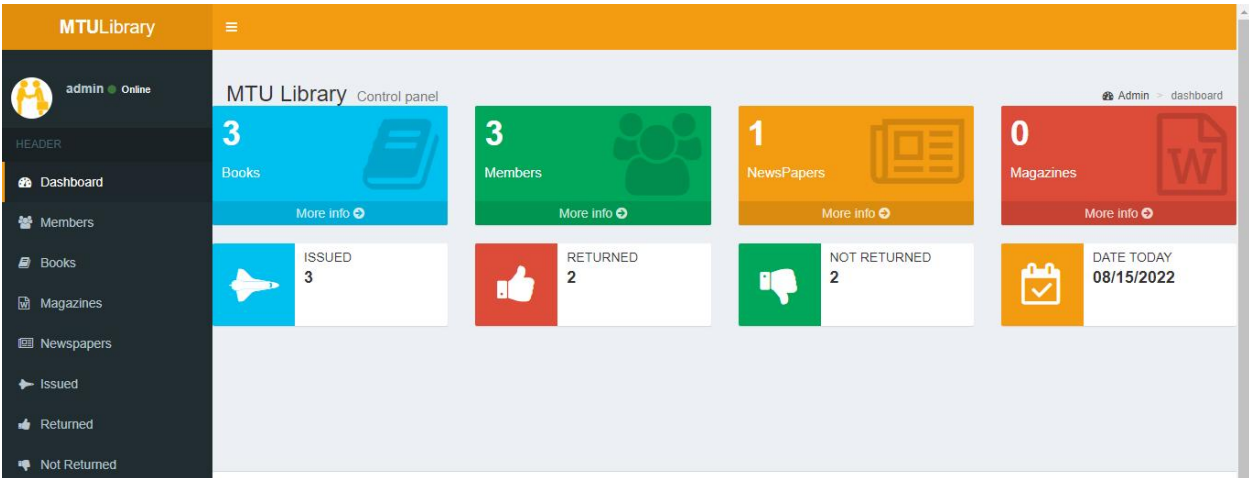


Figure 4.2: Dashboard

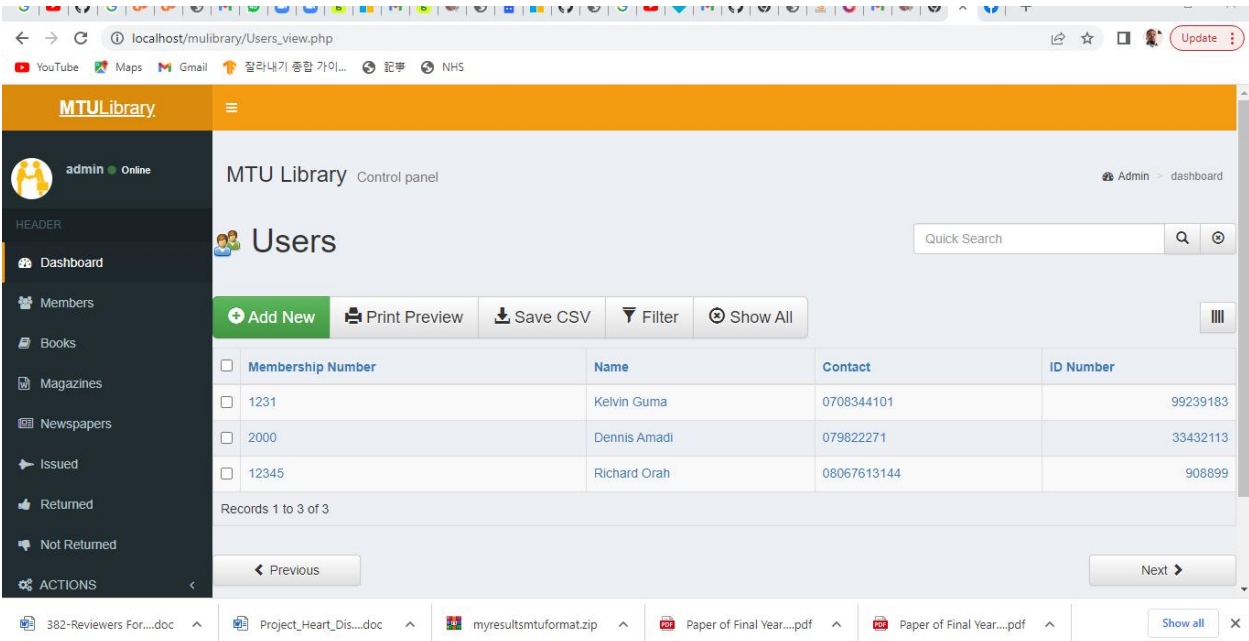


Figure 4.3:Member Page

MTU Library Control panel

Admin > dashboard

Books

Quick Search

+ Add New Print Preview Save CSV Filter Show All

<input type="checkbox"/>	ISBN NO	Book Title	Book Type	Author Name	Quantity	Purchase Date	Edition	Price	Pages	Publisher
<input type="checkbox"/>	62781733	River Between	Physics	Ngugi wa Thiongo	33	02/24/2018	1	300.00	120	Longhorn
<input type="checkbox"/>	978-9966-111-32-6	Who is Jesus	short stories	Greg Gilbert	1	02/24/2018		800.00	138	ekkleisia afrika
<input type="checkbox"/>	978-0-8308-5810-1	Pauls Prison Letters	Physics	Smith	23	02/24/2018		450.00	133	IVP cONNECT

Records 1 to 3 of 3

Previous Next

Figure 4.4: Book Registration

The screenshot displays the 'Issued' module of the MTU Library system. The interface includes a sidebar with navigation options such as Dashboard, Members, Books, Magazines, Newspapers, Issued, Returned, and Not Returned. The main content area shows a table of issued books with the following data:

Issue id	Member	Number	Book Number	Book Title	Issue Date	Return Date	Status
1	Kelvin Guma	1231	62781733	River Between	02/24/2018	02/24/2018	returned
2	Dennis Amadi	2000	978-9966-111-32-6	Who is Jesus	02/24/2018	03/01/2018	issued
3	Richard Orah	12345	62781733	River Between	07/16/2022	07/20/2022	issued

The interface also features a 'Quick Search' bar, a 'Records 1 to 3 of 3' indicator, and navigation buttons for 'Previous' and 'Next'. The top navigation bar includes buttons for 'Add New', 'Print Preview', 'Save CSV', 'Filter', and 'Show All'.

Figure 4.5: Issued Book Module

The screenshot shows the MTU Library Control Panel interface. The main content area is titled 'Returned' and contains a table of returned books. The table has the following data:

<input type="checkbox"/>	Book Number	Book Title	Issue Date	Due Date	Return Date	Member	Number	Fine	Status
<input type="checkbox"/>	62781733	River Between	02/24/2018	02/24/2018	03/04/2018	Kelvin Guma	1231	50.00	cleared
<input type="checkbox"/>	62781733	River Between	07/16/2022	07/20/2022	07/16/2022	Richard Orah	12345	500.00	pending

Records 1 to 2 of 2

Navigation buttons: Previous, Next

Actions: Add New, Print Preview, Save CSV, Filter, Show All

Search: Quick Search

Header: MTU Library Control panel, Admin -> dashboard

Left sidebar menu: Dashboard, Members, Books, Magazines, Newspapers, Issued, Returned, Not Returned, ACTIONS

Browser tabs: 382-Reviewers For..., Project_Heart_Dis..., myresultsmtuformatzip, Paper of Final Year..., Paper of Final Year...

Figure 4.6:Returned Page Module

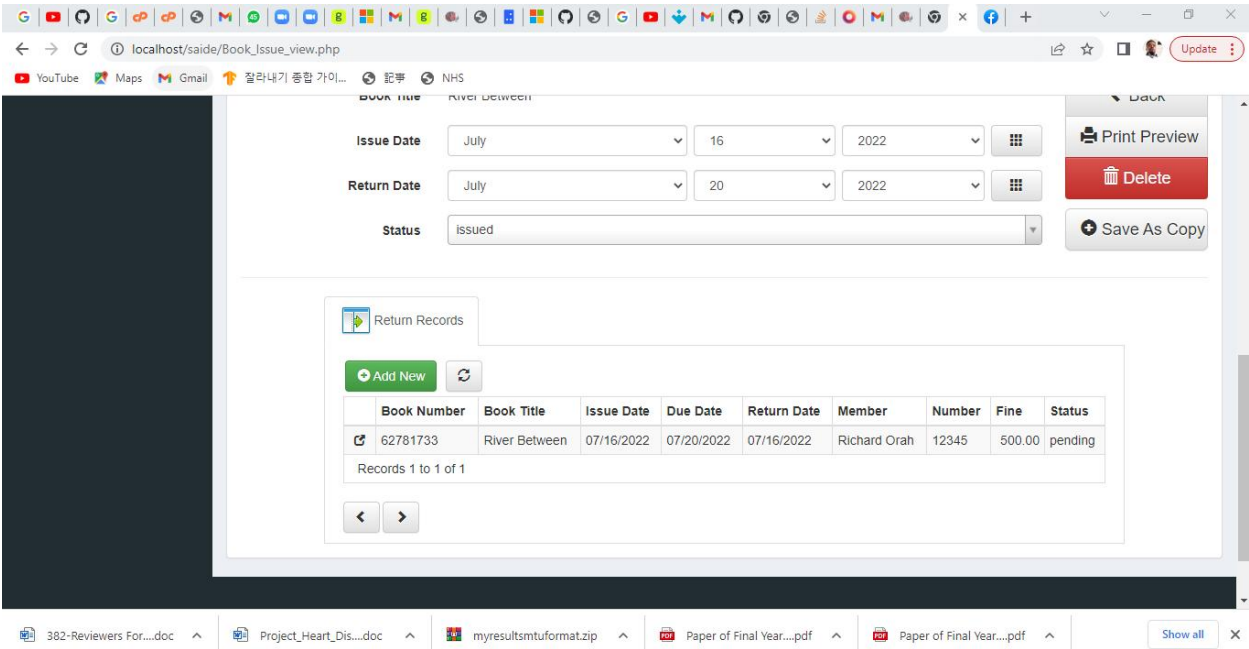


Figure 4.7: Fine Module

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

It has been a great pleasure for me to work on this exciting and challenging project. This project has been a rewarding experience in more than one way. The entire project work has enlightened me in the following areas;

- a. I have gained an insight into the working of the system. This represents a typical real-world situation.
- b. My understanding of database design has been strengthened; because in order to generate the final reports, database designing has to be properly followed.
- c. Scheduling a project and adhering to that schedule creates a strong sense of time management.
- d. It provided practical knowledge of programming in PHP and MySQL web-based application. This will provide better opportunities and guidance in the future in developing projects independently.

5.2 Achievements of the Project

Almost all the primary objectives of this project as stated in chapter one of this report have been completed with a positive result.

5.3 Recommendations

It can be implemented to upload files with a huge amount of size with the support of various file formats; This System being web-based and an undertaking of Cyber Security Division, needs to be thoroughly tested to find out any security gaps.

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