

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

Department of Software Engineering

FUNDAMENTAL OF SOFTWARE ENGINEERING PROJECT

TITLE:- LIBRARY MANAGEMENT SYSTEM

SUBMITTED TO Mr.Endris Mohammed

SUBMISSION DATE 16-OCT-2023

Members	Id No.
1. Natan Muleta	UGR/25576/14
2. Binyam Feleke	UGR/25505/14
3. Uzair Abdulalim	UGR/25350/14
4. Amanuel Bantidagn	UGR/25306/14
5. Amir Naser	UGR/25560/14
6. Natnael Chala	UGR/25371/14

Acknowledgment

The team has made all efforts possible to complete the project in this way. During this, different bodies have taken in making this project possible, and we would like to extend our sincere appreciation for them.

We would like to express our gratitude toward ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY for giving us this opportunity by which we can expand our knowledge of the subject.

We would also like to thank our instructor Mr.Endris Mohammed for the guidance, inspiration, kind comments and constructive suggestions that helpful us in the preparation of this project. Although he was always loaded with several other activities, he gave us more than enough time for this work. His comments and guidance helped us in preparing our project report.

We are also thankful to all of our teachers of the department who helped us in a number of ways by providing various resources and moral support.

ABSTRACT

Library management system is a project which aims at developing a computerized system to maintain all the daily work of the library. This protection has many features which are generally not available in normal library management systems like a facility of librarian login. It also has a facility of admin login through which admin can monitor the whole system. Library is a collection of sources of information and similar resources, made accessible to a defined community for reference or borrowing. Thus the process of handling a library manually is very troublesome and clumsy. As regards to this point of view, the computerized system for handling the activities of library management provides a comprehensive way to lessen physical labor, to reduce complexity of the manual system and so on. This project work aims to design and implement a computerized library management system.

APPENDIX

Definitions and Acronyms

- SQL -> Structured query Language
- DFD -> Data Flow Diagram
- CFD -> Context Flow Diagram
- ER -> Entity Relationship
- IDE -> Integrated Development Environment
- SRS -> Software Requirement Specification

Contents

Acknowledgment	3
ABSTRACT	4
APPENDIX	5
Definitions and Acronyms	5
CHAPTER ONE	8
INTRODUCTION	8
1.1 Statement Of The Problem	9
1.2 Objective.....	10
1.2.1 Main objective	10
1.2.2 Specific objective	10
1.3 Purpose Of The Project	11
1.4 Feasibility study	11
1.4.1 Technical feasibility.....	12
1.4.2 Operational Feasibility	14
1.4.3 Economic Feasibility	16
1.5 Scope and Limitation	17
1.5.1 Scope	17
1.5.2 Limitation	18
1.6 Significance of the Project	18
1.7 Methodology	18
1.7.1 Fact-finding Methodology	18
1.7.2 Software development methodology	18
1.7.3 Development tools	19
1.7.3.1 Hardware tools	19
1.8 Testing Procedure.....	20
1.8.1 Unit testing	20
1.8.2 Integration testing	21
1.8.3 System testing	22
1.8.4 Acceptance Testing	22
CHAPTER TWO	25
BACKGROUND OF LIBRARY MANAGEMENT SYSTEM	25
2.1. Description of the existing system.....	25
2.2 Major function of the current system	26
2.3 Users of the Current System	27
2.4 Drawback of The Current System	28
2.5 Business Rule	28
CHAPTER THREE.....	29
3.1 FUNCTIONAL REQUIREMENT	29
3.1.1 USER LOGIN	29
3.1.2 REGISTER NEW USER	29
3.1.3 REGISTER NEW BOOK	29
3.1.4 ISSUE BOOKS AND RETURN BOOKS	30
3.2 NONFUNCTIONAL REQUIREMENT	30
3.3 SYSTEM MODEL	31
3.4 Use case model.....	32
3.4.1 Actor identification and use case identification	32
3.4.2 USE CASE DIAGRAM AND DESCRIPTION	33
3.3 OBJECT MODEL	35
3.3.1 DATE DICTIONARY	35
3.3.2 CLASS DIAGRAM	37
3.4 DYNAMIC MODAL	39
3.4.1 Sequence diagram	39
3.4.2 Activity Diagram.....	40
3.4.3 State Chart Diagram.....	41
CHAPTER FOUR	46

System Design.....	46
4.1. Overview.....	46
4.1.1. Purpose of the System Design	46
4.3. Design Goal	46
4.4 Proposed system architecture.....	48
4.2.1 System Process	48
4.4.3. Hardware and Software mapping.....	51
4.2.4. Persistent Data Management	52
4.2.5 Component diagram	56
4.4.6 Deployment diagram	57
4.2.7.Database Design	59
4.4.8. Access Control	59
4.4.9 User Interface Design	61
Reference.....	62

CHAPTER ONE

INTRODUCTION

The Library Management System is an application designed to assist librarians in efficiently managing small to medium-sized libraries using a computerized system. This system enables librarians to record various transactions, such as book issues, book returns, addition of new books, and addition of new students, in a structured and organized manner. By implementing this computerized system, libraries can eliminate the loss of book records or member information that often occurs with non-computerized systems.

The Library Management System consists of modules for books and student maintenance, which facilitate the tracking of library users and provide detailed descriptions of the library's book collection. This ensures accurate and up-to-date information about the library's resources. The book maintenance module allows librarians to enter book details such as title, author, publisher, and ISBN, enabling easy searching and categorization of books. The student maintenance module allows for the management of student records, including information such as name, contact details, and borrowing history. With this comprehensive system, librarians can efficiently monitor the availability and circulation of books, ensuring a seamless borrowing experience for library users.

Additionally, the system includes a report module that allows administrators to generate various reports, such as lists of registered students, book inventory, and issue and return reports. These reports provide valuable insights into library usage, book popularity, and overdue items. Administrators can analyze these reports to make data-driven decisions, such as purchasing additional copies of popular books or identifying areas for improvement in the library's operations. The report module enhances the overall management of the library by providing access to valuable information and enabling informed decision-making.

By utilizing these modules, librarians can manage the library with greater convenience and efficiency compared to non-computerized systems. The computerized nature of the system ensures the preservation of book records and member information, minimizing errors and data loss. It eliminates the need for manual record-keeping and enables librarians to focus on providing quality services to library users. The system also offers features such as book

reservation management, automated reminders for overdue items, and notifications for book availability, further enhancing the user experience and overall satisfaction.

Library management is a sub-discipline of institutional management that addresses the unique challenges faced by libraries and library professionals. It encompasses traditional management tasks, such as budgeting, staff management, and collection development, along with responsibilities related to intellectual freedom, anti-censorship efforts, and fundraising. The Library Management System serves as an application that caters to the needs of small to medium-sized libraries, offering a computerized solution to enhance the efficiency and effectiveness of library operations. It streamlines routine tasks, improves resource management, and provides a platform for delivering exceptional library services.

In conclusion, the Library Management System is a comprehensive application designed to streamline library operations, improve record-keeping accuracy, and provide efficient access to information. By automating tasks and providing modules for books, student maintenance, and reporting, the system empowers librarians to manage their libraries with convenience and effectiveness. The computerized approach ensures the preservation of records and simplifies the management of library resources, offering a significant advantage over non-computerized systems. With its user-friendly interface, robust features, and data-driven reporting capabilities, the Library Management System revolutionizes library management, enabling librarians to deliver exceptional

1.1 Statement Of The Problem

The existing library management system faces several critical challenges due to the absence of computerization, which significantly impacts its efficiency and functionality. These challenges include the loss of files, as human errors can result in the misplacement or complete loss of important records. Additionally, physical files are susceptible to damage from accidents like spills or natural disasters such as floods or fires, leading to irretrievable loss of information. The lack of a computerized system also makes it difficult to search for specific records, especially when the volume of records is substantial, resulting in time-consuming and inefficient retrieval processes. Furthermore, the physical storage of files becomes increasingly space-consuming as the number of records grows, leading to additional storage requirements. The absence of computerization also contributes to increased costs, as paper-based records require continuous

purchasing and maintenance. These challenges collectively hinder the library's ability to effectively manage and provide access to its resources while incurring unnecessary expenses. Therefore, the implementation of a computerized library management system is urgently needed to address these issues and improve the overall efficiency, accessibility, and cost-effectiveness of the library's operations.

- File lost: When a computerized system is not implemented a file is always lost because of the human environment. Sometimes due to some human error there may be a loss of records.
- File damaged: When a computerized system is not there file is always lost due to some accident like spilling of water by some member on file accidentally. Besides, some natural disasters like floods or fires may also damage the files.
- Difficult to search record: When there is no computerized system there is always a difficulty in searching for records if the records are large in number.
- Space consuming: After the number of records becomes large the space for physical storage of file and records also increases if no computerized system is implemented.
- Cost consuming: As there is no computerized system to add each record paper will be needed which will increase the cost for the management of the library.

1.2 Objective

Our project has 2 types of objectives.

1.2.1 Main objective

To design, investigate, build web based library management system for ASTU.

1.2.2 Specific objective

- Study existing library management system of ASTU.
- Identify functional requirement and non-functional requirement for the library management system of ASTU.
- Identify software design alternatives and choose the best candidate for library management system of ASTU.
- Design the software architecture for library management system of ASTU.
- Build and implement the library management system of ASTU.
- Test and evaluate the proposed library management system of ASTU.

1.3 Purpose Of The Project

The purpose of this project is to develop and implement a computerized library management system to address the existing challenges and improve the efficiency, functionality, and cost-effectiveness of the library's operations. By transitioning from a manual system to a computerized one, the project aims to eliminate the loss of files and records caused by human errors and accidents, ensuring the preservation and accessibility of vital information. The implementation of a computerized system will also facilitate quick and efficient searching of records, even with a large volume of data, enhancing the overall user experience and reducing administrative burden. Moreover, the project aims to optimize space utilization by eliminating the need for physical file storage, thus saving valuable resources. By reducing paper-based processes and implementing a computerized system, the project will contribute to cost savings while improving the library's ability to manage and provide access to its resources effectively. Ultimately, the purpose of this project is to modernize the library management system, streamline operations, and enhance user satisfaction by leveraging technology to overcome the limitations of the existing manual system.

1.4 Feasibility study

A feasibility study assesses the operational, technical and economic merits of the proposed project. The feasibility study is intended to be a preliminary review of the facts to see if it is worthy of proceeding to the analysis phase. From the systems analyst perspective, the feasibility analysis is the primary tool for recommending whether to proceed to the next phase or to discontinue the project.

The feasibility study is a management-oriented activity. The objective of a feasibility study is to find out if an information system project can be done and to suggest possible alternative solutions.

Projects are initiated for two broad reasons:

- Problems that lend themselves to systems solutions
- Opportunities for improving through:
 - (a) upgrading systems
 - (b) altering systems
 - (c) installing new systems

A feasibility study should provide management with enough information to decide:

Whether the project can be done?

Whether the final product will benefit its intended users and organization

What are the alternatives among which a solution will be chosen

-Is there a preferred alternative?

-How beneficial or practical the development of an information system would be to an organization?

And for the System to be worthwhile it should pass through some tests that examine whether it should proceed further or not. This series of tests is commonly known as a feasibility study on the system and it plays a very vital role for every system project. Feasibility studies undergo four major analyses to predict the system to be success and they are as follows:-

1. Technical Feasibility
2. Operational Feasibility
3. Economic Feasibility

1.4.1 Technical feasibility

A large part of determining resources has to do with assessing technical feasibility. It considers the technical requirements of the proposed project. The technical requirements are then compared to the technical capability of the organization. The systems project is considered technically feasible if the internal technical capability is Sufficient to support the project requirements. The analyst must find out whether current technical resources can be upgraded or added to in a manner that fulfills the request under consideration.

This is where the expertise of system analysts is beneficial, since using their own experience and their contact with vendors they will be able to answer the question of technical feasibility.

The essential questions that help in testing the operational feasibility of a system include the following:

. Is the project feasible within the limits of current technology?

- Does the technology exist at all?
- Is it available within given resource constraints?
- Is it a practical proposition?
- Are the current technical resources sufficient for the new system?
- Can they be upgraded to provide the level of technology necessary for the new system?
- Do we possess the necessary technical expertise, and is the schedule reasonable?
- Can the technology be easily applied to current problems?
- Does the technology have the capacity to handle the solution?
- Do we currently possess the necessary technology?

Automated library system deals with the modern technology system that needs a well efficient technical system to run this project. All the resource constraints must be in the favor of the better influence of the system. Keeping all these facts in mind we had selected the favorable hardware and software utilities to make it more feasible.

Recommended Software:-

Microsoft word 2013
 Enterprise architect (Brain Edition)
 HTML, CSS and JavaScript
 GitHub

Web browser
PHP
MySQL server
Node.js

Recommending the Hardware Part:-

Personal computer (PC) or Laptop
Flash
Printer:
Stationeries (pen, paper
Notebook
Server

1.4.2 Operational Feasibility

Operational feasibility is a measure of how well a proposed system solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development .Operational feasibility reviews the willingness of the organization to support the proposed system. This is probably the most difficult of the possibilities to gauge. In order to determine this feasibility, it is important to understand the management commitment to the proposed project. If the request was initiated by management, it is likely that there is management support and the system will be accepted and used. However, it is also important that the employee base will be accepting of the change. The operational feasibility is the one that will be used effectively after it has been developed. If users have difficulty with a new system, it will not produce the expected benefits. It measures the viability of a system in terms of the **PIECES** framework. The PIECES framework can help in identifying operational problems to be solved, and their urgency:

Performance :- Does current mode of operation provide adequate throughput and response time? In comparison to the earlier process of maintaining data in the written mode, in contrast this system plays a very important role in maintaining the book management system and makes the process of data entering so easier and user friendly.

Information:-Does current mode provide end users and managers with timely, pertinent, accurate and usefully formatted information?

System provides end users and managers with timely, pertinent, accurate and usefully formatted information. Since all the user related information is being stored in the database against a unique user ID, it will provide meaningful and accurate data to the librarian. The information handling in the current system is done manually. This results in scribbling of data and loss of validity of data. The information handling in the proposed system will be computerized and will automatically update. The human errors will be minimal. The data can be easily updated, modified when required and will be validated before the data is processed into the system.

Economy Does the current mode of operation provide cost-effective information services to the business? Could there be a reduction in costs and/or an increase in benefits?

Determines whether the system offers adequate service level and capacity to reduce the cost of the business or increase the profit of the business. The deployment of the proposed system, manual work will be reduced and will be replaced by an IT savvy approach. Moreover, it has also been shown in the economic feasibility report that the recommended solution is definitely going to benefit the organization economically in the long run. In the existing system the data are stored in ledgers and filing cabinets which require a lot of space and maintenance. Access to certain data can be restricted by creating different levels of user accessibility.

Control:- Does current mode of operation offer effective controls to protect against fraud and to guarantee accuracy and security of data and information?

As its database does not contain any confidential information which can be misused so on that contrast there should be no use of any security corner for this system.

Efficiency:-Does current mode of operation make maximum use of available resources, including people, time, and flow of forms?

Efficiency work is to ensure a proper workflow structure to store patient data; we can ensure the proper utilization of all the resources. It determines whether the system makes maximum use of available resources including time, people, flow of forms, and minimum processing delay. In the current system a lot of time is wasted on paper work like making new records, updating records. The proposed system will be a lot efficient in maintaining the record and easily fetching out the required data.

Services:-Does current mode of operation provide reliable service? Is it flexible and expandable?

The system provides desirable and reliable services to those who need it and also whether the system is flexible and expandable or not. The proposed system is very much flexible for better efficiency and performance of the organization. The existing system can provide service only to a limited number of users. There is very little room for change and hardly any scope for expansion. The scalability of the proposed system will be inexhaustible as the storage capacity of the system can be increased as per requirement. This will provide a strong base for expansion. The new system will provide a high level of flexibility.

1.4.3 Economic Feasibility

Economic analysis could also be referred to as cost/benefit analysis. It is the most frequently used method for evaluating the effectiveness of a new system. In economic analysis the procedure is to determine the benefits and savings that are expected from a candidate system and compare them with costs. If benefits outweigh costs, then the decision is made to design and implement the system. An entrepreneur must accurately weigh the cost versus benefits before taking an action.

Possible questions raised in economic analysis are:

- Is the system cost effective?
- Do benefits outweigh costs?

- The cost of doing full system study?
- The cost of business employee time?
- Estimated cost of hardware?
- Estimated cost of software/software development?
- Is the project possible, given the resource constraints?
- What are the savings that will result from the system?
- Cost of employees' time for study?
- Cost of packaged software/software development?
- Selection among alternative financing arrangements (rent/lease/purchase)?

The concerned business must be able to see the value of the investment it is pondering before committing to an entire system study. If short-term costs are not overshadowed by long-term gains or produce no immediate reduction in operating costs, then the system is not economically feasible, and the project should not proceed any further. If the expected benefits equal or exceed costs, the system can be judged to be economically feasible. Economic analysis is used for evaluating the effectiveness of the Proposed System. The economical feasibility will review the expected costs to see if they are in-line with the projected budget or if the project has an acceptable return on investment. At this point, the projected costs will only be a rough estimate. The exact costs are not required to determine economic feasibility. It is only required to determine if it is feasible that the project costs will fall within the target budget or return on investment. A rough estimate of the project schedule is required to determine if it would be feasible to complete the systems project within a required timeframe. The required timeframe would need to be set by the organization.

1.5 Scope and Limitation

1.5.1 Scope

The project product to be produced is a Library Management System which will automate the major library operations. The first subsystem is the registration of the users to the system to keep track of authorized users to the system. The second subsystem is the registration of new books into the library management system to know when new books are brought into the library. The third subsystem is a borrower and return of books which is the major area needed by the user.

There are three end users for the Library Management System. The end users are;-

Admin,
Users and
Librarian.

1.5.2 Limitation

We can go on and on listing what limits this project but essentially Due to time and basic factors like unstable electricity, poor networks, unavailability of concrete government infrastructure and many more this research has been limited to certain areas in the library management system.

The users must have internet access to get services.

1.6 Significance of the Project

The Library Management System Project is a significant project because it provides a comprehensive and integrated system to manage all library operations, including cataloging, circulation, and acquisitions. It also provides an efficient way to track and monitor library usage, and to ensure that library resources are being used effectively and efficiently. The Library Management System Project also helps to reduce costs associated with library operations, such as staff time, materials, and other resources.

1.7 Methodology

1.7.1 Fact-finding Methodology

We have used the following methods to gather requirements for our proposed system.

User Observation- We have observed some customers of the current systems

Brainstorming-We discussed with each other and jotted down possible problems the existing system is facing.

Document Analysis- It describes the act of reviewing the existing documentation of comparable business processes or systems in order to extract pieces of information that are relevant to the current project, and therefore should be considered project requirements.

Use cases-From use cases we observed some required functionalities that existing systems are not meeting unfortunately.

1.7.2 Software development methodology

For our project we will be using a waterfall process model for the system development. The reason why we choose Waterfall is because it relies on teams following a sequence of steps and never moving forward until the previous phase has been completed. Since we are working

in a team of six sharing tasks, sometimes in order to move forward some tasks are need to be completed, and waterfall allows us to go in that manner.

1.7.3 Development tools

1.7.3.1 Hardware tools

Personal computer (PC) or laptop: almost all tasks of our project are performed on a computer.

Flash: required for data transfer.

Printer: to print documentations.

Stationeries (pen, paper): for writing all necessary documentations associated with the project.

Notebook: to take notes during data collection and for other documentations.

Server: integrated to the website to hold data.

1.7.3.2 Software Tools

Tools	Purpose
Microsoft word 2013	Documentation for the project
Enterprise architect (Brain Edition)	Designing the system
HTML, CSS and JavaScript	For designing websites for clients.
Adobe photoshop	Editor software used to edit some picture and web interface
GitHub	It allows the group members to access the

	source code remotely that will help the development to be quick
PHP	For backend implementation of the project
MySQL server	We Use to manage and Store our Data
Node.js	Back-end implementation
Web browser	Test the execution and For display web application via internet.

Table. 1.1 Software Tools

1.8 Testing Procedure

Testing is intended to show what a program does what it is intended to do and to cover is intended to show that a program does what it is intended to do and to discover program defects before it is put into use, or testing is the process of executing a program with the intention of finding errors. In order to know whether there is an error or not in our system, we will perform the following testing strategies; these strategies are used to test the functionalities and the working style of the system.

1.8.1 Unit testing

In these strategies, we will concentrate on each component/function of the software as implemented in the source code. To perform these, we will use two approaches/techniques of unit testing.

i.Black box testing

In this technique, we will test to see if the function of the system is fully operational or error free. This includes testing the interface of the system rather than the logical structure of the system.

We used this testing technique for the following reasons

- More effective on larger units of code.
- Tester needs no knowledge of implementation, including specific programming language.
- Testers and programmers are independent of each other.
- Tests are done from a user's point of view.
- Will help to expose any ambiguities or inconsistencies in the specifications.

ii. White box testing

We will use this approach to know the internal working style of the system, test that all internal operations are performed according to specifications and all internal components have been exercised and the logical path of the system is correct.

We use this testing technique for the following reasons:

- It is easy to find out which type of input/data can help in testing the application effectively.
- To optimize the code.
- It helps in removing the extra lines of code, which can bring in hidden defects.
- Early detection of errors during software development.

1.8.2 Integration testing

In these strategies the group members will focus on testing the design and construction of the software architecture. To do the two techniques of integration testing will be considered.

i. Top –Down integration testing

This will perform starting from the top module up to the last or bottom module individually (tests were run as each individual module is integrated).

ii. Bottom-up integration

We will begin with the lowest –level modules which are combined to cluster, or build that perform a specific software sub-function (top-level).

1.8.3 System testing

After all of the above testing is checked we will test our system by other peoples and we will conduct some comments on how they get our system.

1.8.4 Acceptance Testing

This testing is done by the customer to ensure that the delivered product meets the requirements and works as the customer expected. It includes:-

Alpha- Conducted by users to ensure they accept the system.

Beta- Users use real data, not test data.

Name	Responsibility	Main Activity	Other
Binyam Feleke	Lead	Coordinate and lead the Members, Design, implementation and Documentation	Participate Activity
Amir Naser	Organize ideas	Requirement Analysis, Design, and Documentation	Participate Activity

Natnael Chala	Edition	Requirement Analysis, Design, and Documentation	Participate Activity
Uzair Abdulalim	Edition	Requirement Analysis, Design, and Documentation	Participate Activity
Amanuel Bantidagn	Edition,Evaluati on	Requirement Analysis, Design, and Documentation	Participate all Activities
Natan Muleta	Evaluation	Requirement Analysis, Design, and Documentation	Participate all Activities

Table.1.2 Team Composition

1.11 Task and Schedule

Roll No.	Task Name	Start Date	Finish Date
1	Data collection and gathering	11/09/2023	13/09/2023
2	Documentation chapter one	14/09/2023	16/09/2023

3	Documentation chapter two	17/09/2023	20/09/2023
4	Documentation chapter three	21/09/2023	22/09/2023
5	Documentation chapter four	23/09/2023	24/09/2023
6	Testing	25/09/2023	29/09/2023

Table.1.3 Task and Schedule

1.12 Overview of Project phase

The Library Management System (LMS) Phase Project is an effort to develop a comprehensive system to manage library resources. This project will provide an interface for library staff to manage library resources, including books, journals, articles, and other materials. It will also provide a platform for library patrons to access library resources, search for materials, and place holds. The project will include a web-based interface for library staff to manage library resources, such as cataloging, ordering, and tracking library materials. It will also provide a web-based interface for patrons to access library resources, search for materials, and place holds. Additionally, the project will include a mobile app for library patrons to access library resources, search for materials, and place holds.

CHAPTER TWO

BACKGROUND OF LIBRARY MANAGEMENT SYSTEM

2.1. Description of the existing system

Existing system does not have any facility of admin login or librarian login whereas the proposed system will have a facility of admin login as well as librarian login.

- Existing system does not have a facility of online reservation of books whereas proposed system has a facility of online reservation of books
- Existing system does not have any facility of online notice boards where description of workshops happening in our college as well as nearby colleges is being provided.
- Existing system does not have any facility to generate student reports as well book issue reports whereas proposed system provides librarian with a tool to generate reports
- Existing system does not have any facility for book request and suggestions where as in proposed system after logging in to their accounts student can request books as well as provide suggestions to improve library

Description of proposed system

The library management system is a desktop based application system used by an administrator (Librarian) as an alternative means of record keeping of the books stored in the library.

It has the following features.

The administrator registers the applicant(librarian) with their name as the first and last name, phone number and etc. and a username is being suggested by the user alongside a login password which is to be used for log in by the registered user

An applicant is allowed to log into the system with his email and generated password which is given at the point of registration.

The administrator goes into the report to view the details of a librarian.

Advantages of Proposed system

Certain merits have been associated with the proposed system which enhances the design of the system. Some of which are stated below:

- It eliminates the presence of the audience or fellow colleague who can whisper the result to their friends.
- It is free from biasness (all users are served equally).
- It provides an immediate form of response to every user.
- It facilitates easy learning.

2.2 Major function of the current system

Major function of current system is:-

- Admin Login
- Librarian Login
- Add new Librarian
- Add new Book
- Update Book
- Issue Book and Return Book

Admin Login

Admin can login into the system by using his Username and password provided in the program. In our program Admin User name is admin and his password is admin.

Librarian Login

This feature is used by the librarian to login into the system. They are required to enter user id and password before they are allowed to enter the system. The librarian id and password will be verified and if invalid id is there user is allowed to not enter the system.

Functional requirements

- User id is provided when they register
- The system must only allow user with valid id and password to enter the system
- The system performs an authorization process which decides what user level can be accessed.
- The user must be able to logout after they finish using the system.

Add New Librarian

This feature can be performed by the admin to register a new librarian to create an account.

Functional requirements

- System must be able to verify information .
- System must be able to delete information if information is wrong .

Add New Book

This feature allows to add new books to the library

Functional requirements

- System must be able to verify information.
- System must be able to enter number of copies into table.
- System must be able to not allow two books having the same book id.

Edit/Update Book

Description of Feature

This feature is found in the book maintenance part. We can edit a book based on book id, book name, publication or by author name.

Functional requirements

- System must be able to search the database based on the selected search type.
- System must be able to filter books based on keywords entered.
- System must be able to show the filtered book in the table view.

Issue Books and Return Books

Description of Feature:-

This feature allows users to issue and return books and also view reports of book issues.

Functional requirements

- System must be able to enter issue information in the database.
- System must be able to update the number of books.
- System must be able to search if book is available or not before issuing books
- System should be able to enter issue and return date information
-

2.3 Users of the Current System

1. **Admin:-** Admin is the administrator of the library. Responsible for the setting up of the library system and managing the library staff/librarian.
2. **Librarian:-** Responsible for adding, editing ,borrowing and returning books in a library. And also they can view the return status of the borrowing book.

3. **Student** : Students are the users of the book. Students can borrow the book and also return the book.

2.4 Drawback of The Current System

The main drawback of the library management system is that they can be expensive to implement and maintain. Additionally, they can require a significant amount of time and effort to properly set up and configure. Additionally, Library management systems can be difficult to use and require a certain level of expertise to use effectively. Finally library management systems can be vulnerable to cyber attacks, which can lead to data loss or theft.

2.5 Business Rule

- A customer who has not entered the system cannot perform any kind of activity on the system.
- A User who wants to use the system must have a smartphone, laptop or a desktop computer that is connected to the internet.
- Borrowers must present a valid library card or other form of identification to borrow materials.
- Borrowers must return borrowed materials (book) on or before the due date.
- Borrowers are responsible for any lost or damaged materials.
- The user of the system should be able to have reading and writing skills in the English language.
- Borrowers may be charged overdue fines for materials not returned on time.
- Borrowers must pay any fees or fine associated with their account before borrowing additional materials.
- Books must be registered before they are presented to the student to borrow.
- Borrowers must abide by all library policies regarding the use of library materials.
- Borrowers may not loan their library cards to others.
- Borrowers must abide by copyright laws when using library materials. Only the administrator can register librarian

CHAPTER THREE

3.1 FUNCTIONAL REQUIREMENT

3.1.1 USER LOGIN

Description of feature

The user logs in to the system using this feature. Before they can access the system, users must provide their user id and password. The user id and password will be checked, and if either is found to be invalid, the user is to be excluded from the system.

Functional requirement

- When a user registers, they supply a user id.
- The system must only permit users with legitimate user ids and passwords to access the system
- The system then goes through an authorization procedure to determine what user levels are allowed access.
- After utilizing the system, the user must be able to log out.

3.1.2 REGISTER NEW USER

Description of feature

All users have access to this function, which allows them to create accounts for new users.

Functional requirement

- System must have the ability to validate data.
- System must be able to erase data if it is incorrect.

3.1.3 REGISTER NEW BOOK

Description of feature

This function enables the addition of new books to the library.

Functional requirement

- The system must be able to check information and put the quantity of copies into a table.

-Two books with the same book id must not be permitted by the system.

SEARCH BOOK

Description of feature

The book maintenance section contains this function. We can conduct a book search using the book's ID, title, publication, or author.

Functional requirement

- System must be capable of selecting a search type to use while searching the database.
- The system must be able to filter books using the given keywords and display the filtered books in table view.

3.1.4 ISSUE BOOKS AND RETURN BOOKS

Description of feature

This function enables for the issuing, returning, and reading of reports of books issued. Functional requirement

- System must be capable of adding issue data to databases.
- The number of books must be updated by the system.
- Before issuing books, the system must be able to check to see if the book is already in stock.
- The system should be able to enter information about the issue and return dates.

3.2 *NONFUNCTIONAL REQUIREMENT*

Performance

After a fair amount of time, the Server would be able to complete the specified tasks.

Reliability

The Server would carry out required duties as desired. The system completes tasks including user registration, user validation, and authorization, book search and issue functionality, return status, and database updating by syncing between database and application with greater precision.

Security

Only authorized users would have access to the system. On the network, it will be secure and only authorized users will be able to use it.

Scalability

The suggested system would be expandable to accommodate more users.

Ease of Use

The suggested system would offer Graphical User Interface and be user-friendly (GUI).

Accessibility

The suggested system would consist of a desktop GUI application placed on a server that serves as the program's compute root node.

Maintainability

It would be simple to expand and maintain the suggested system. The operating application wouldn't be harmed by a little system adjustment.

3.3 SYSTEM MODEL

Used to highlight key characteristics of a system while omitting minor ones to build an abstraction of the system. Our system consists of three various system models.

1. Functional model, first (use case model, scenario) 2.The object model (class diagram)
3. Dynamic model (state diagrams, sequence diagrams, and activity diagrams) 3.3.1 Scenario

-The Scenario is an actual use of the system. The scenario's name, event sequence, potential issues, and remedies must all be mentioned. Based on the following, the scenarios for our project are presented below.

-A user who originally registers as a new user is considered a staff member or a student by the library system.

-There are registration forms that must be completed in order for the user to register as a new user.

- The librarian issues the user a library card upon registration. A user's or cardholder's ID is listed on the library card

2. The user requests a new book based on their needs after receiving a library card.

3. Following a request, the user reserves the desired or requested book, making it unavailable for further requests from other users.

4. Now that a book can be renewed, a new due date will be assigned to the user whether the user has renewed them, for the chosen book.

5. The user is responsible for paying a fine if they accidentally forget to return the book before the deadline. The book will be considered overdue and the user will be fined if they forget to renew it before

6. If a user so chooses, they may complete the available feedback form.
7. Under this system, the librarian plays a crucial role. Every time a student or user borrows a book, returns a book, or pays a fine, the librarian adds records about that user or student to the library's database.
8. If a student quits or graduates from a college, the librarian also removes their record from the system. If the book has been removed from the subsequently, the record of the specific book is also removed from the library.
9. The vital job of the librarian is to update databases.

3.4 Use case model

Use case models are sometimes known as behavior models or diagrams. It only outlines and illustrates the relationship or interaction between application service or system users or clients and their providers.

3.4.1 Actor identification and use case identification

A.STUDENT

1. Authenticate
2. reserve a book
3. renew a book
4. pays fine
5. register new user
6. feedback includes filling up feedback form
7. update my profile
8. change account password

B.LIBRARIAN

1. Add record
2. delete book record
3. update book record
4. search book
5. change account password
6. update profile

C.LIBRARY DATABASE

1. Prepare library database

D.SUPER ADIM

- 1.manager library
- 2.manager issue
- 3.manager member
4. manager student
5. manager book
6. manager user and full application
- 7.change account password

3.4.2 USE CASE DIAGRAM AND DESCRIPTION

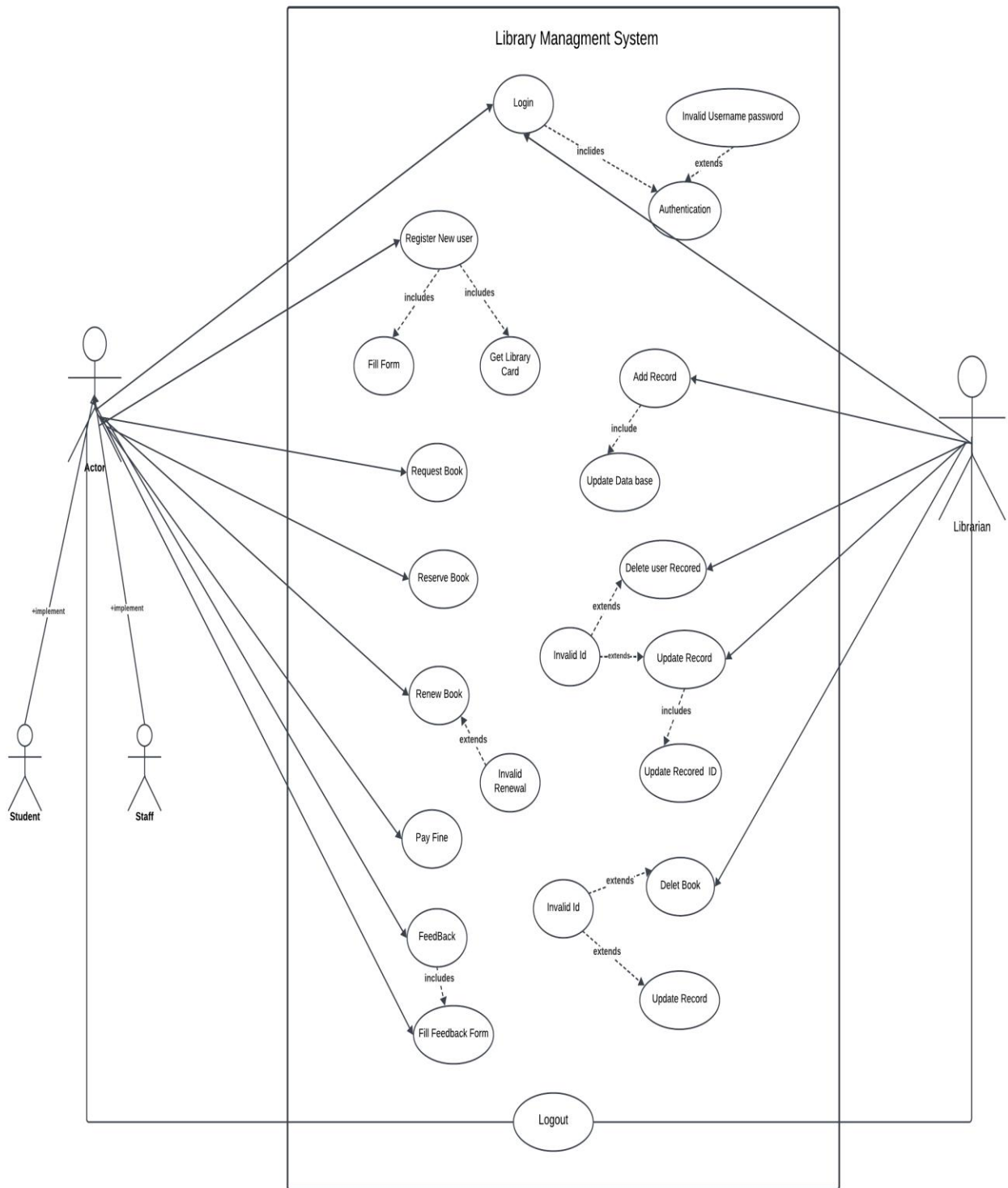


Figure. 3.1 Use Case diagram

3.3 OBJECT MODEL

3.3.1 DATE DICTIONARY

-Each class that is present in the system, as well as its members such as attributes, operations, and descriptions, are defined using the data dictionary.

Classes	attributes	methods	description
---------	------------	---------	-------------

Library management System	UserType username, password	Login() Register() Logout()	It central part of organization
User class	NAME id	Verify() Check account() Get book info()	Manages all operation of user
Librarian class	Name Id Password Search string	Verify librarian() Search()	Manages all operation of librarian
Book class	Title Author ISBN publication	Show data () Reservation status() Feedback() Book request() Renew info()	Manages all operation about book.it building block of system
Account class	No _borrowed book No _reserved book No _returned book No _lost- <u>books</u> Fine _book_ amount	Calculate fine()	Manages al operation about account

Library database class	List of books	Add() Delete() Update() Display() Search()	Manages all operation of database
Student class	Class	Name()	It manages all operation about student

Table. 3.1 Date Dictionary

3.3.2 CLASS DIAGRAM

Class diagrams are frequently used to conceptually represent the static appearance of a software application and to model the precise conversion of models into programming code. An extensive use of class diagrams occurs during the development or design of software systems. They are employed in data modeling as well. It is employed to display classes, their connections, interfaces, associations, etc. A class in a class diagram is merely an object's blueprint. It merely defines and explains the many kinds of system objects and the various kinds of interactions that exist between them.

Class Diagram for Library Management System :

Aggregation and multiplicity are two crucial factors to take into account while building a class diagram for a library management system. Let's get more specific.

Aggregation - Aggregation only depicts a relationship in which two things can coexist without being dependent on one another. To define a class, it is to create or combine many abstractions. In a class diagram, aggregation is shown as a relationship component. As seen in the picture below, aggregation is symbolized by an edge with a diamond-shaped end pointing in the direction of the superclass. Many classes make up the superclass "Library Management System."

Multiplicity - Multiplicity refers to the number of a class's elements that are linked to another class. One-to-one, many-to-many, one-to-many, and many-to-many relations are all possible. One element is denoted by 1, zero elements by 0, and numerous elements by *. As shown in the diagram, a many-to-many relationship between users and books is indicated by the asterisk (*). One person has only one account, which is indicated by the number 1, signifying a one-to-one relationship.

One librarian is connected to many books, indicating a one-to-many or many-to-one relationship. An illustration depicts each of these relationships.

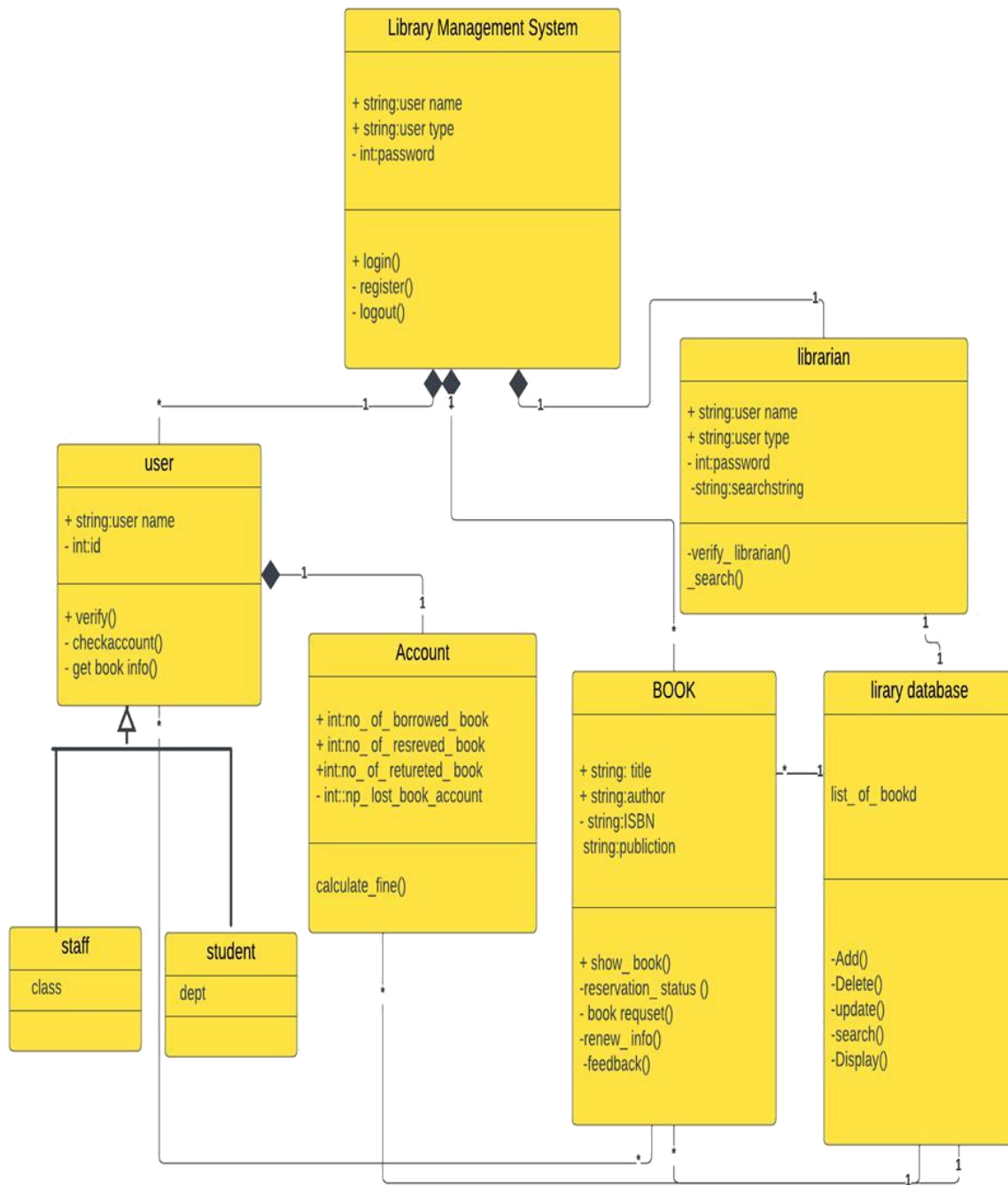


Figure. 3.2 Class Diagram

3.4 DYNAMIC MODAL

3.4.1 Sequence diagram

One type of diagram in the Universal Modeling Language (UML) are sequence diagrams. They are employed to demonstrate how elements of a system interact over time. The order in which these interactions take place can be seen and understood by the system designer using a sequence diagram.

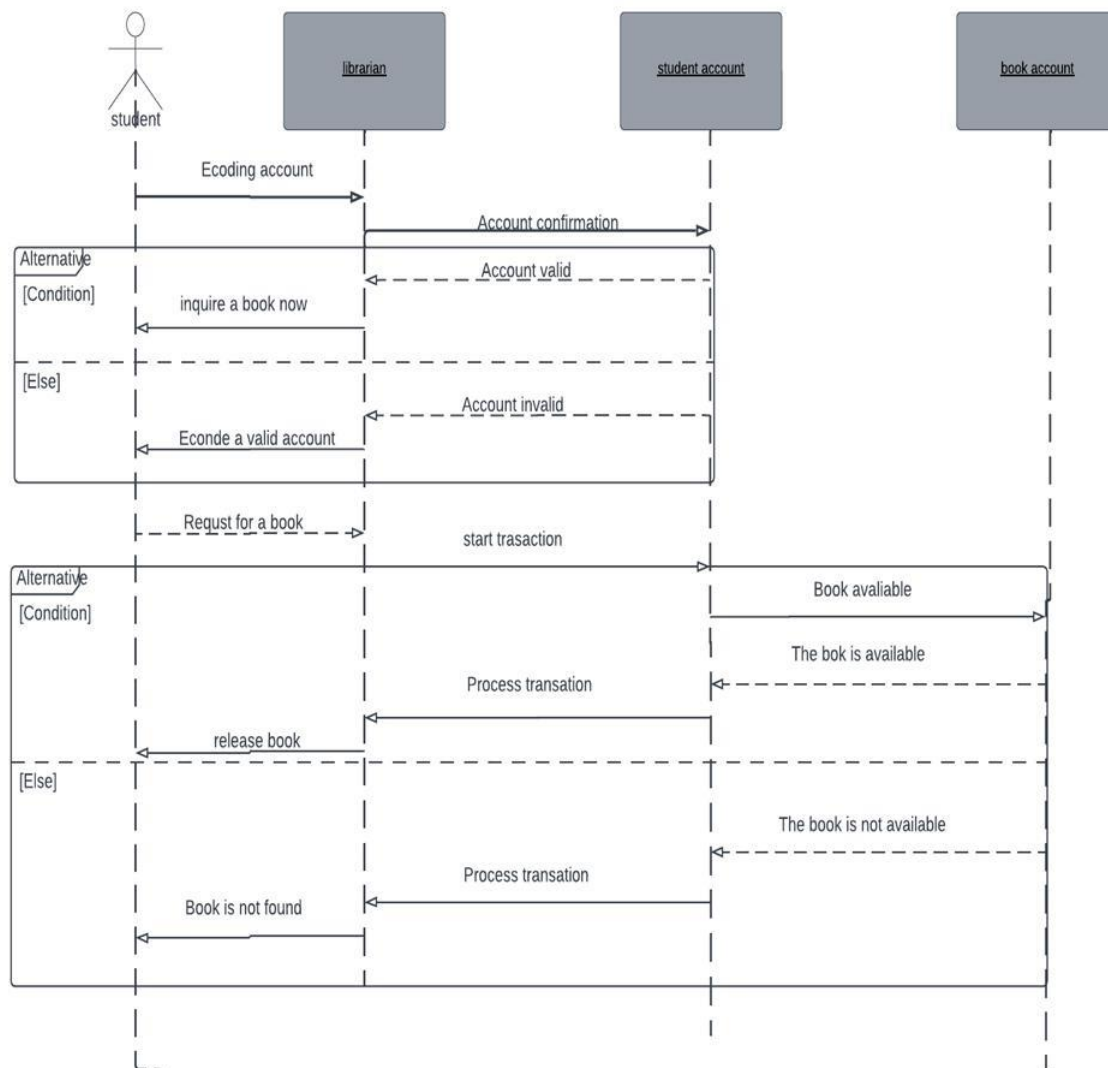


Figure. 3.3 Sequence Diagram

3.4.2 Activity Diagram

It illustrates the behavior of the system by showing how activities flow from one to the next. Activities may go sequentially, in segments, or continuously. The table displays the project

information for the library management system. It includes all the project's specific figures.

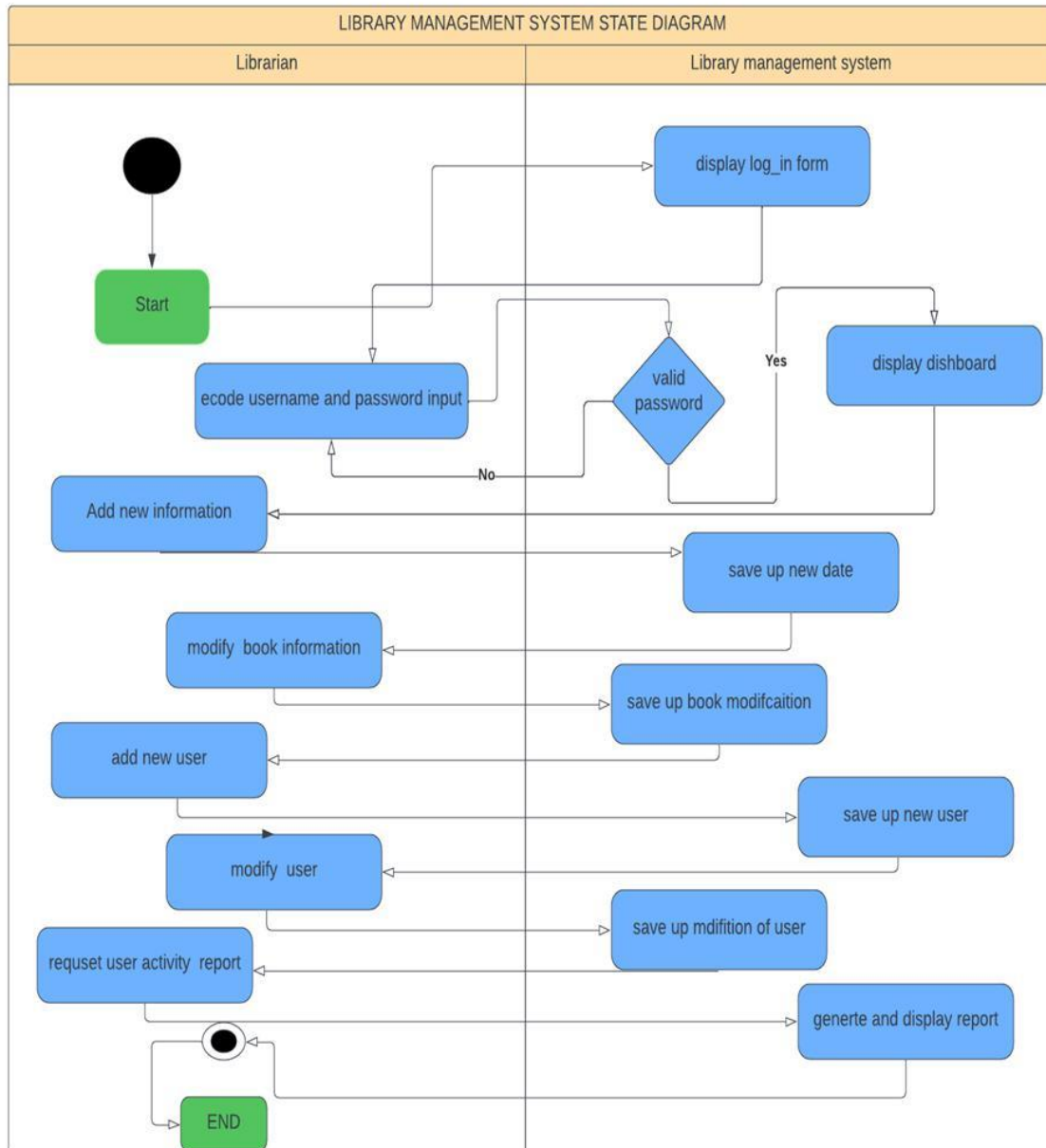


Figure. 3.4 Activity Diagram

3.4.3 State Chart Diagram

The state chart diagram illustrates how the system behaves. The eight stages of the state chart diagram include logging in, entering information, requesting a book, viewing the book's details,

searching for a book, issuing a book, returning a book, and logging out. Collaboration diagrams are sometimes known as interaction diagrams, much like sequence diagrams

<<LOGIN

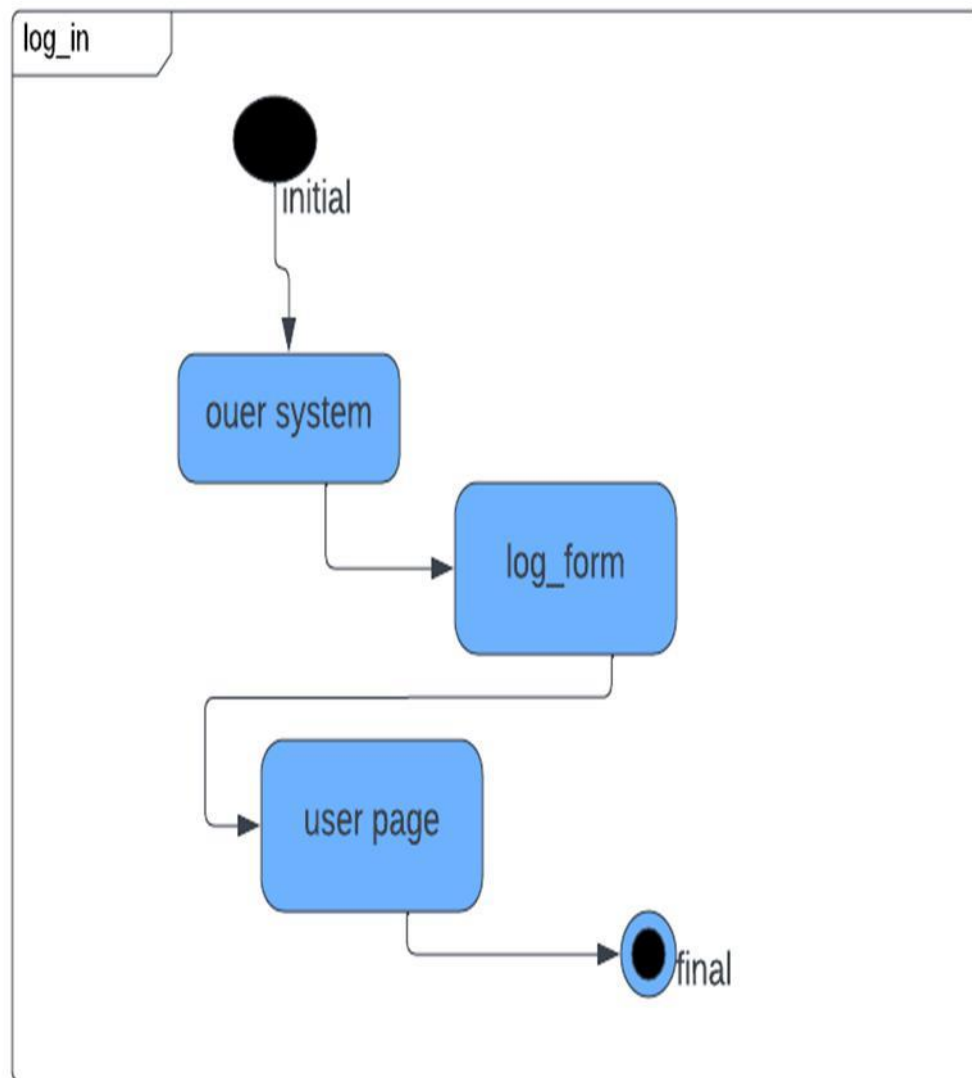


Figure. 3.5 State Chart Login

<<SEARCH BOOK

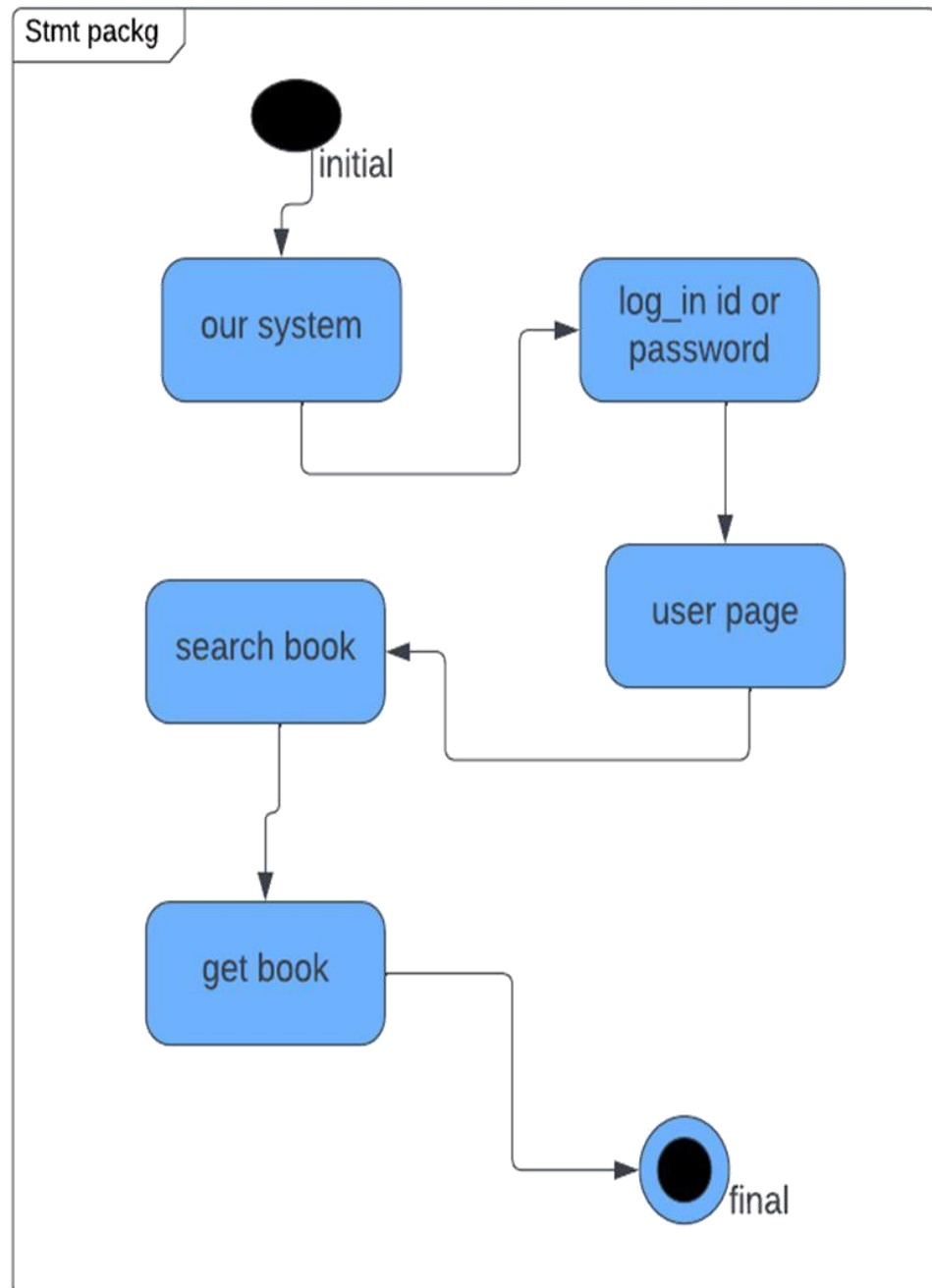


Figure.3.6 State Chart Search book

<< RECIEVE BOOK

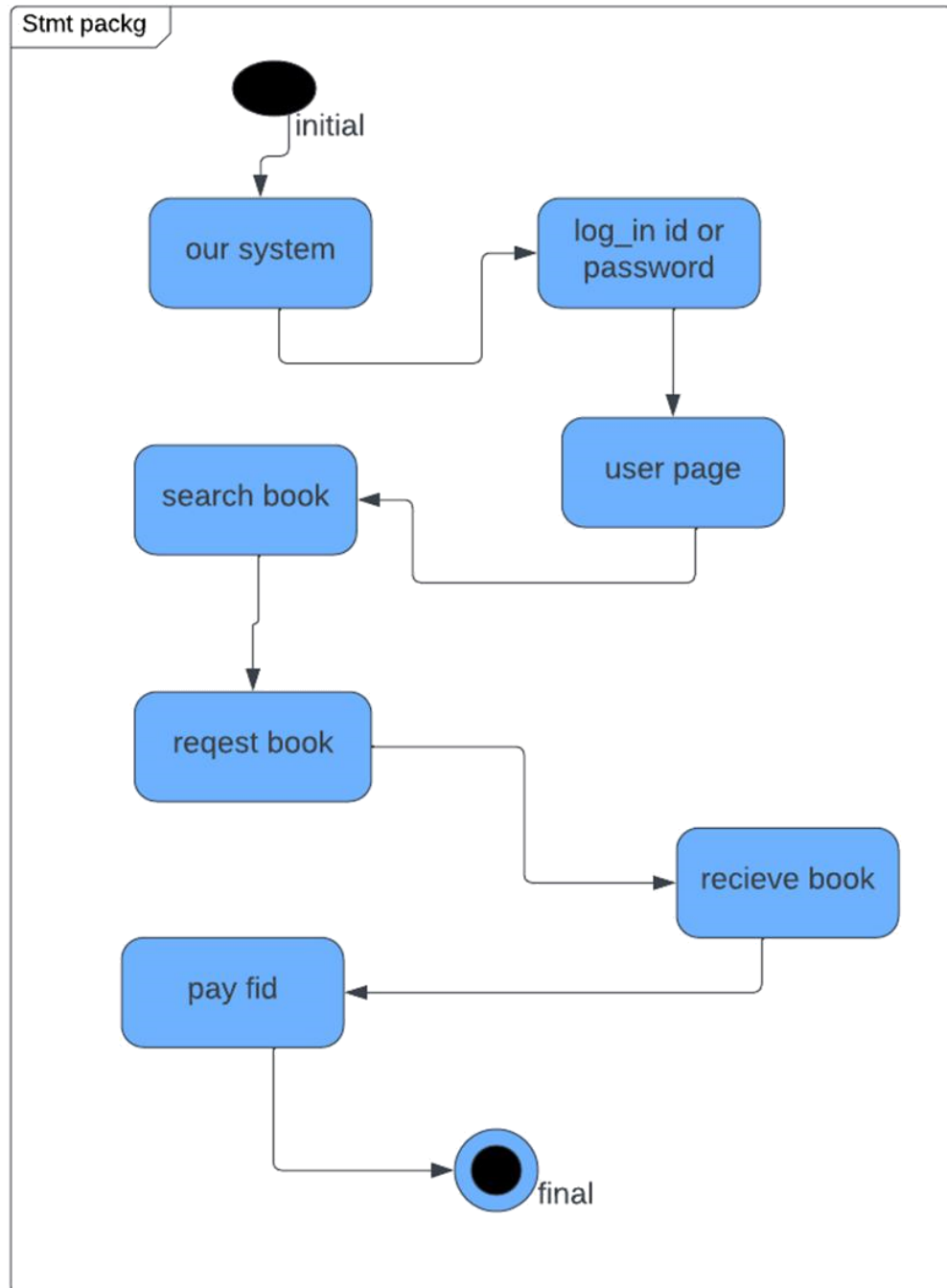


Figure.3.7 State chart Receive book

<< RETURN BOOK

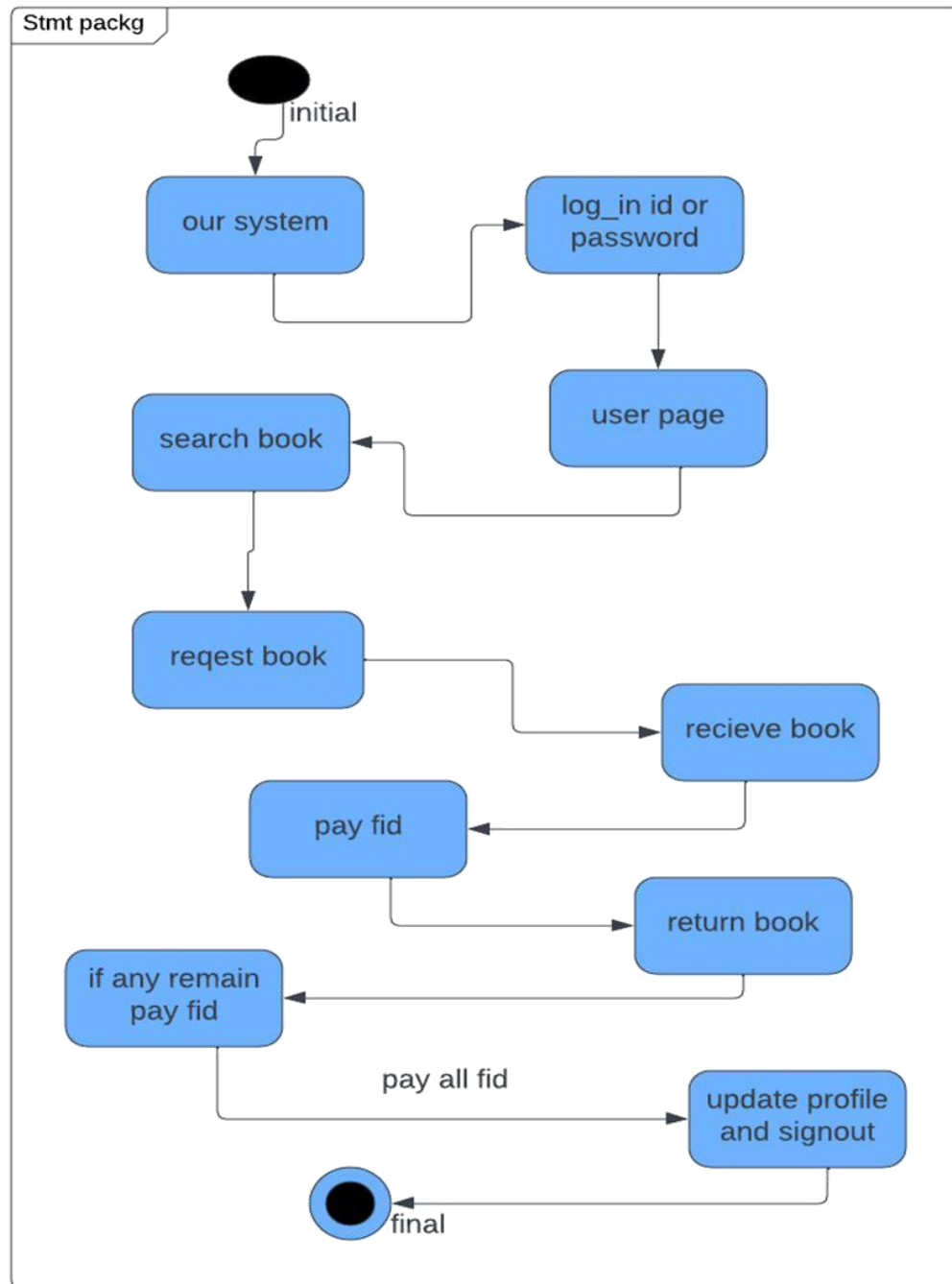


Figure .3.8 State Chart Return book

CHAPTER FOUR

System Design

4.1. Overview

The conversion of the analytical model into a system design model is the system design, until now we were operating in the problem domain. The first phase of software development to enter the solution domain is system design. This chapter is concerned with converting the analysis model into the design model, which incorporates the constraints and non-functional needs mentioned in the problem description and requirement analysis sections previously covered.

The design challenges of the entire system are discussed in this section, including the design objective, subsystem decomposition, hardware/software mapping, and persistent data management. It offers a thorough architectural summary of the suggested system. Its goal is to document and clearly communicate the system's main architectural choices.

4.1.1. Purpose of the System Design

The purpose of the system design is to supplement the system architecture by providing information and data useful and necessary for implementation of the system element. The purpose of the system design is to show the direction how the system is built and to obtain clear and enough information needed to drive the actual implementation of the system. It is based on understanding of the model the software built on.

The objectives of design are to model the system with high quality. Implementing a high quality system depends on the nature of design created by the designer. If one wants to change to the system after it has been put into operation depends on the quality of the system design.

This document describes the design issues of the overall of the proposed system. It is intended to capture and express the significant architectural decisions which have been made on the system.

4.3. Design Goal

The objective of the design is to model the system with high quality. The design goals are derived from nonfunctional requirements that means the nonfunctional requirements are used to show the attribute and characteristics of the system.

The design goal specifies the qualities of the system that should be achieved and addressed during the design of the system. Those are;

- Performance
- Dependability
- Maintenance
- End User

Performance

The system should respond fast with high throughput. The system performs its task within a user acceptable time and space.

In order for a system to give good service it should meet the following performance criteria: -

- Scalability
- Responsiveness

Responsiveness: is the ability of a system to meet its objectives for response time or throughput.

Scalability: is the ability of a system to continue to meet its response time or throughput objectives as the demand for the software functions increases.

Dependability

Our system includes the following dependability criteria: -

- **Reliability:** the system should be reliable.
- **Fault Tolerance:** - the system should be fault tolerant to loss of connectivity with the Service.
- **Security:** the system i.e., not allow other users or unauthorized users to access data that has no right to access it.
- **Availability:** - as long as there is an internet connection the system will be available 7 days a week and 24 hours a day

Maintainability

To be maintainable the system should meet the following maintenance criteria: -

- **Extensibility:** - if it is needed to add new functionality to the system, this must be achieved by only making a separate page and integrating this page with the existing system.
- **Modifiability:** - augmented reality system should be modifiable for further modification and enhancement of the system.
- **Portability:** - the system is developed to be viewed and retrieved from any web browser regardless of the version and platform it resides in.

End User Criteria

The system should have a simple and understandable graphical user interface such as forms and buttons, which have descriptive names. It should give a reliable response for each user request.

4.4 Proposed system architecture

The proposed system architecture is mainly based on the SRS document that's already developed and submitted. It mainly deals with subsystem decomposition- dividing the system into manageable components. Another major task in system design deals with hardware/software mapping which deals with which components would be part of which hardware. Another aspect of system design deals with persistent data management, which illustrates how persistent data (file, database, etc) are stored and managed and at last access control will be presented.

4.2.1 System Process

The overall system of the service is shown below.

System Activity Diagram

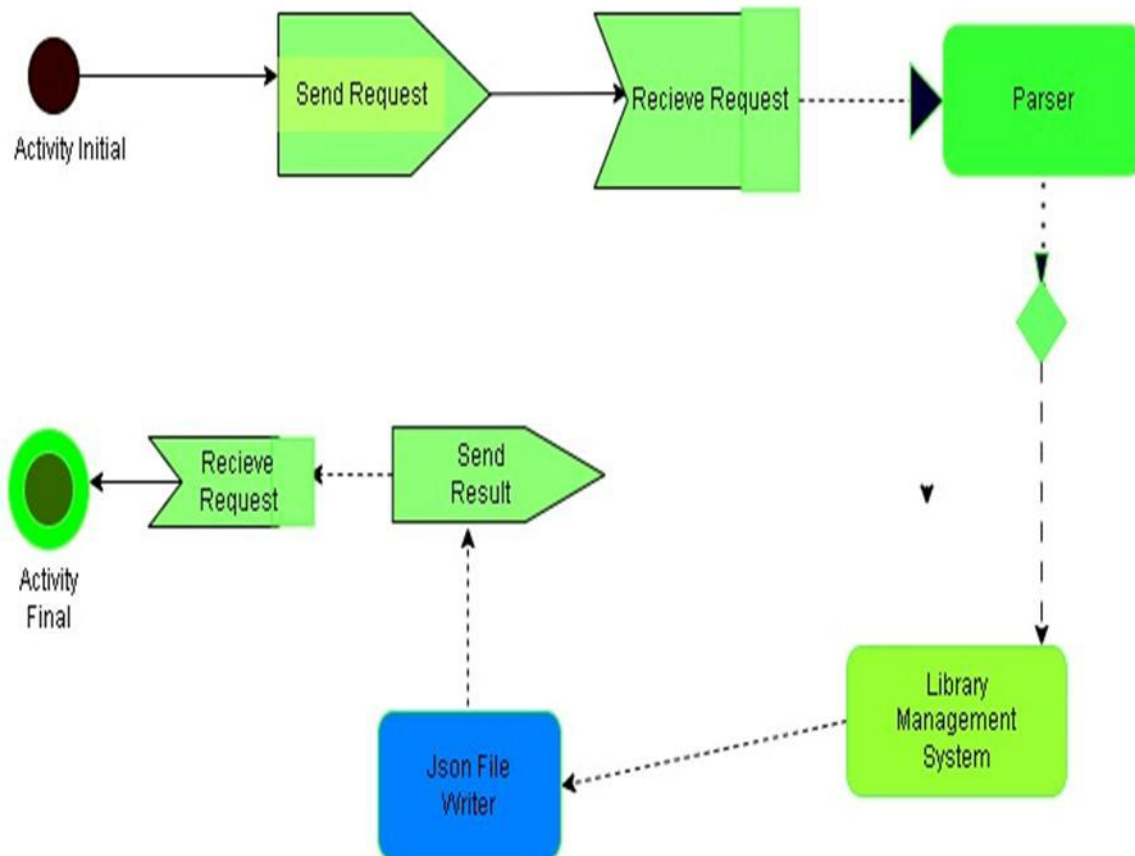


Figure 4.1: System Activity Diagram



Figure 4.2: Over All process

Over All System Process

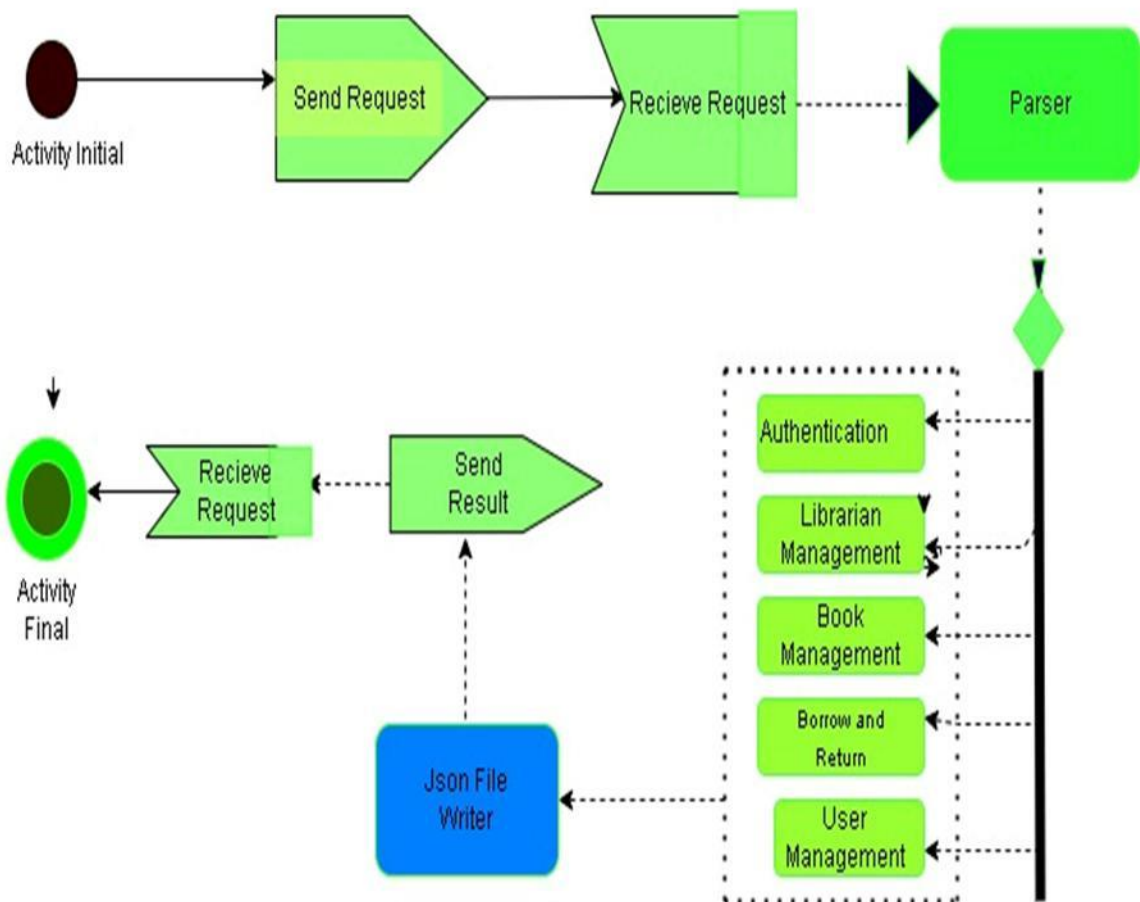


Figure 4.3: System Process diagram

4.4.2. Subsystem decomposition

We break down the system into simpler sections called subsystems to lessen the complexity of the solution domain.

Here we have decomposed the system into four subsystems.

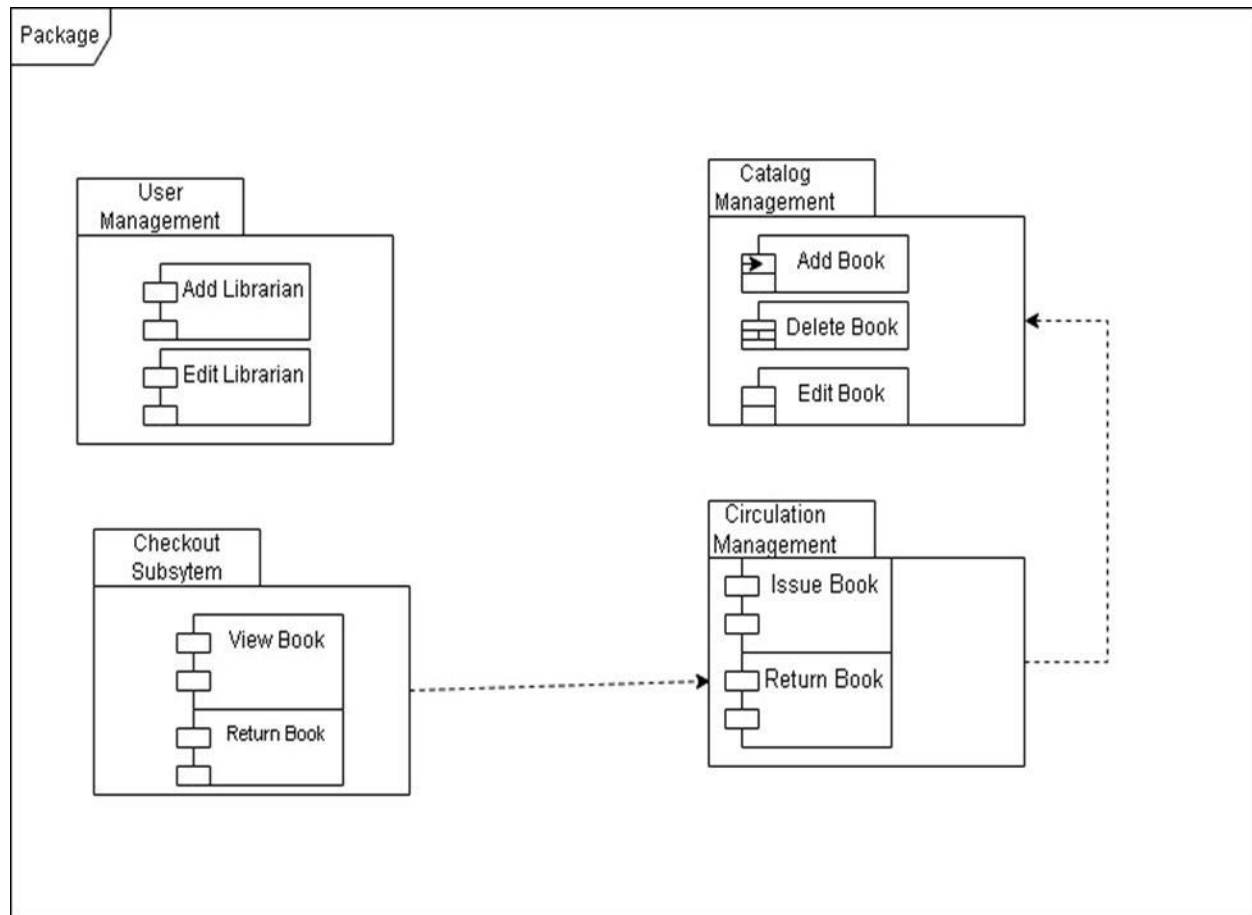


Figure 4.4 : Decomposed Subsystem

4.4.3. Hardware and Software mapping

When we are talking about hardware or software mapping, we are talking about how systems are allocated to hardware components. It also describes the problems caused by many nodes and software reuse.

There are 3 hardware components in this system design. The client, server and database sides when the team uses the system, the appropriate software are installed onto each side's hardware components. Each party must have its own network. The software for each subsystem will then

be distributed and installed to the mapped hardware. The local area network will then be linked to the internet, and the system will be operational. However, it is presently in the design phase. The system's hardware software mapping is depicted in the diagram below.

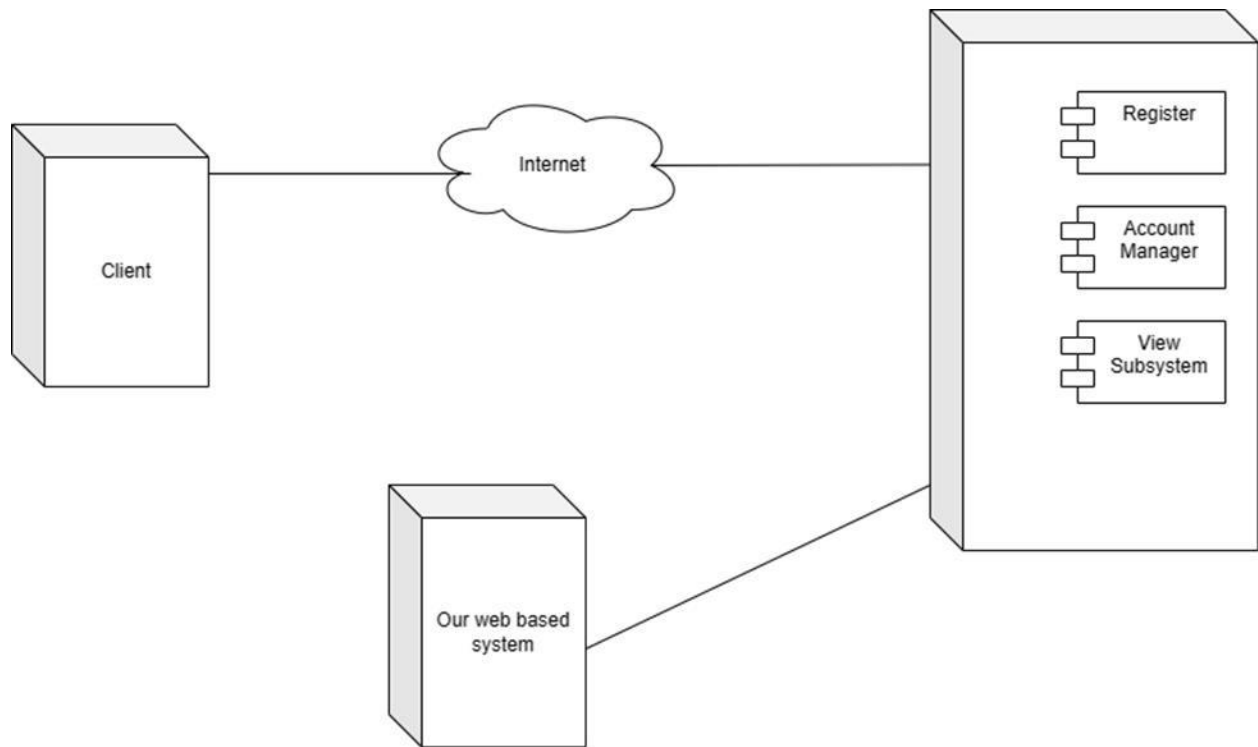


Figure 4.5: Hardware/Software mapping

4.2.4. Persistent Data Management

Persistent data management for library management systems is the process of storing and managing data in a way that ensures it is available for use in the future. This includes organizing and maintaining data in a secure and reliable manner, as well as making sure that the data is backed up regularly in case of system failure or other data loss incidents. Persistent data management also includes data migration, archiving, and data recovery services.

The goal of this part is to illustrate the mapping of the system's objects/classes discovered during the analysis stage to the associated relational database. The goal of this part is to illustrate the mapping of the system's objects/classes discovered during the analysis stage to the associated relational database.

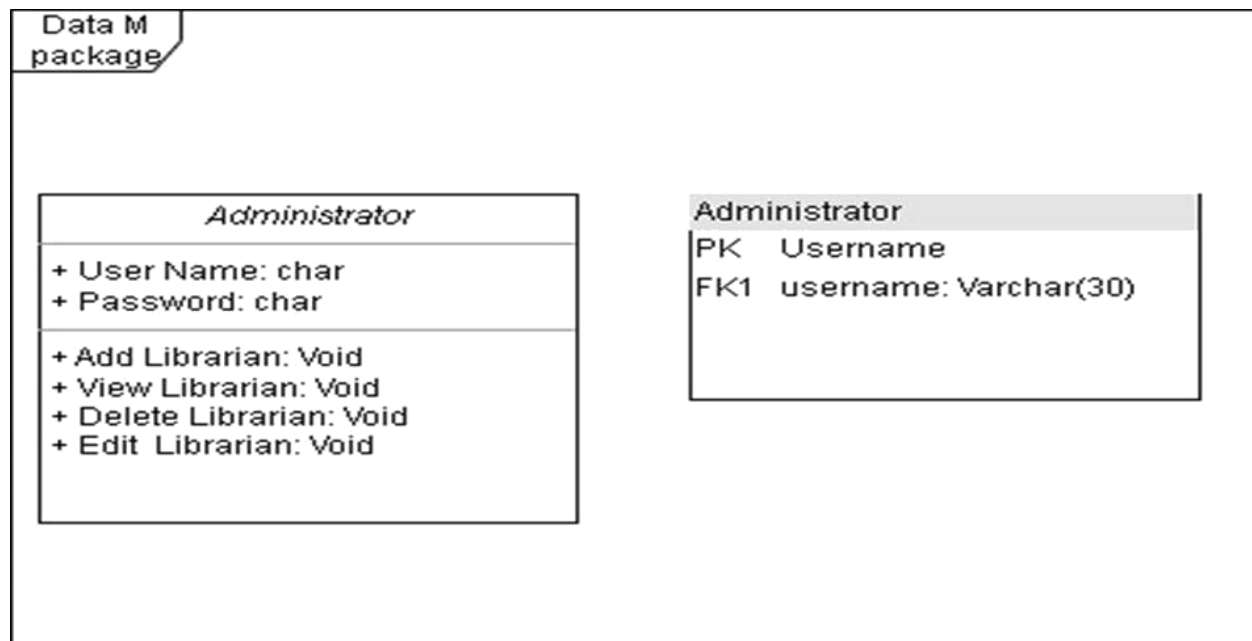


Figure 4.6 Administrator Mapping

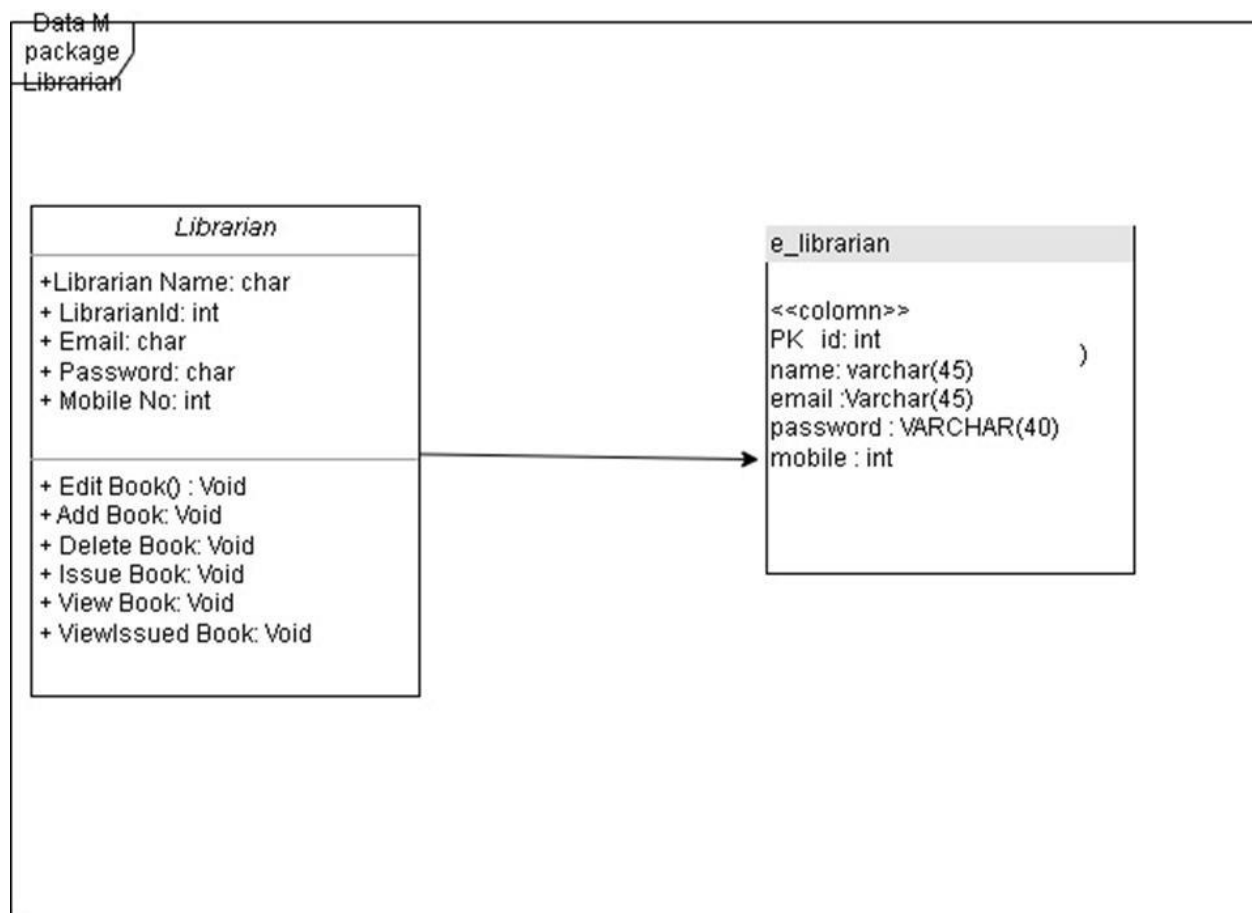


Figure 4.7. Librarian Mapping

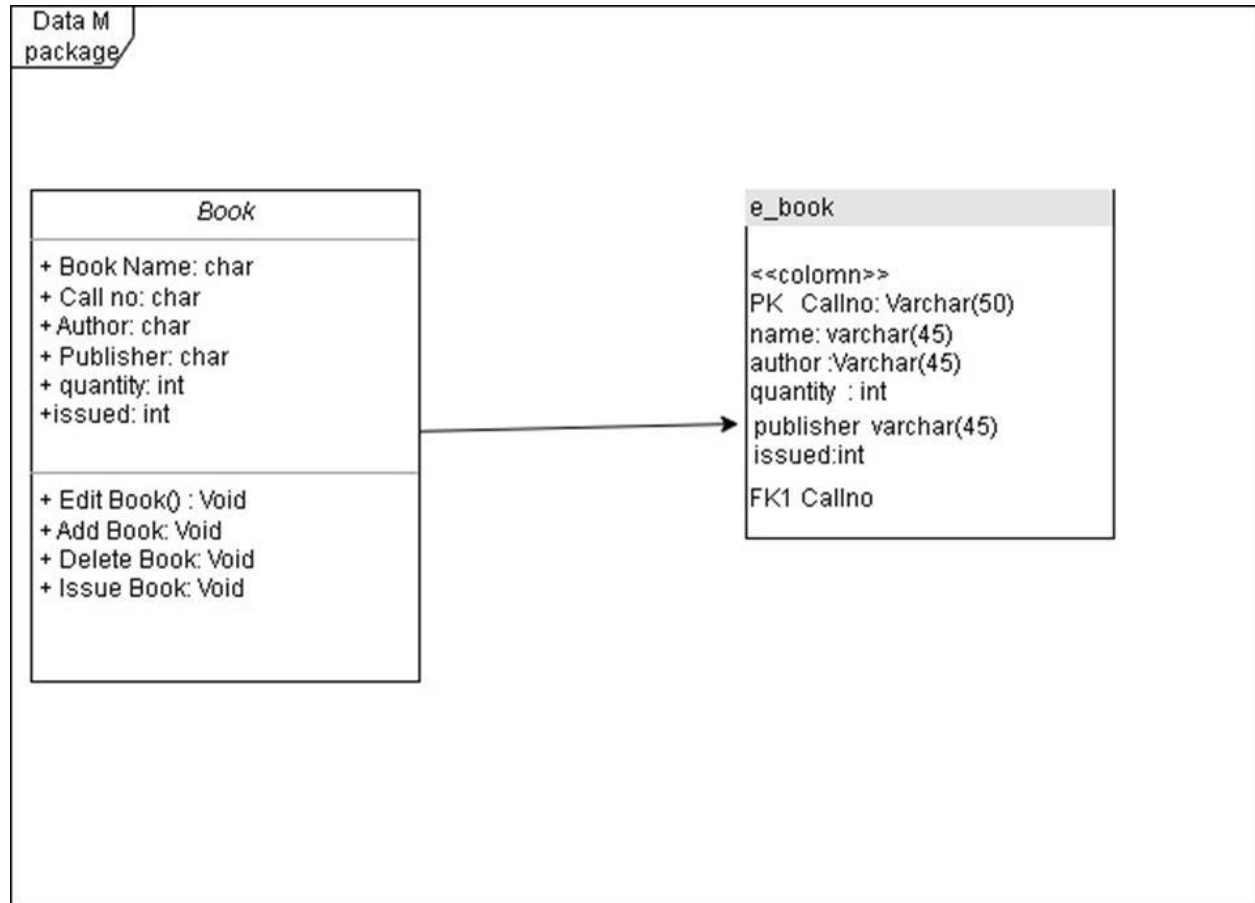


Figure 4.8. Book Mapping

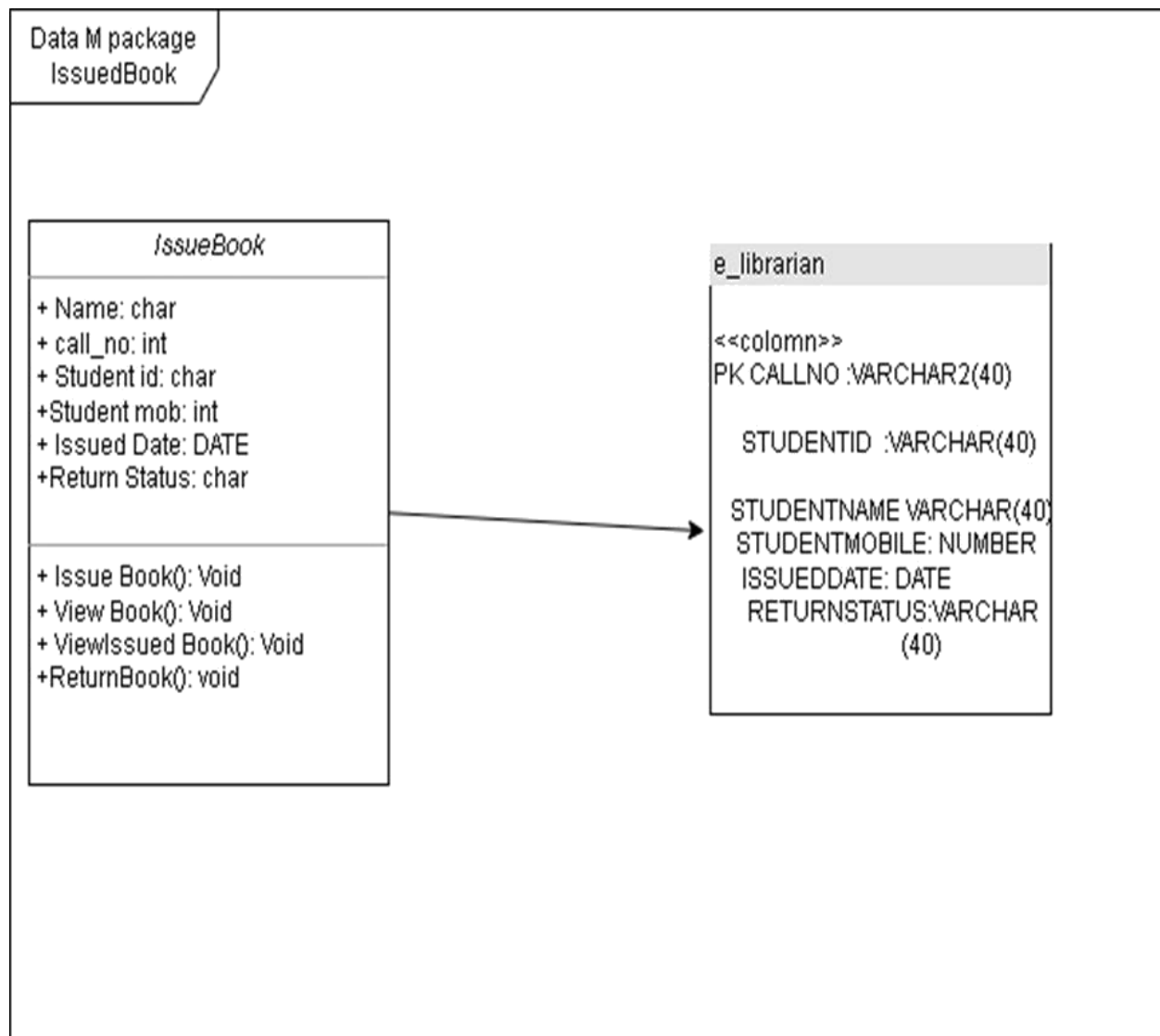


Figure 4.9. Issued Book mapping

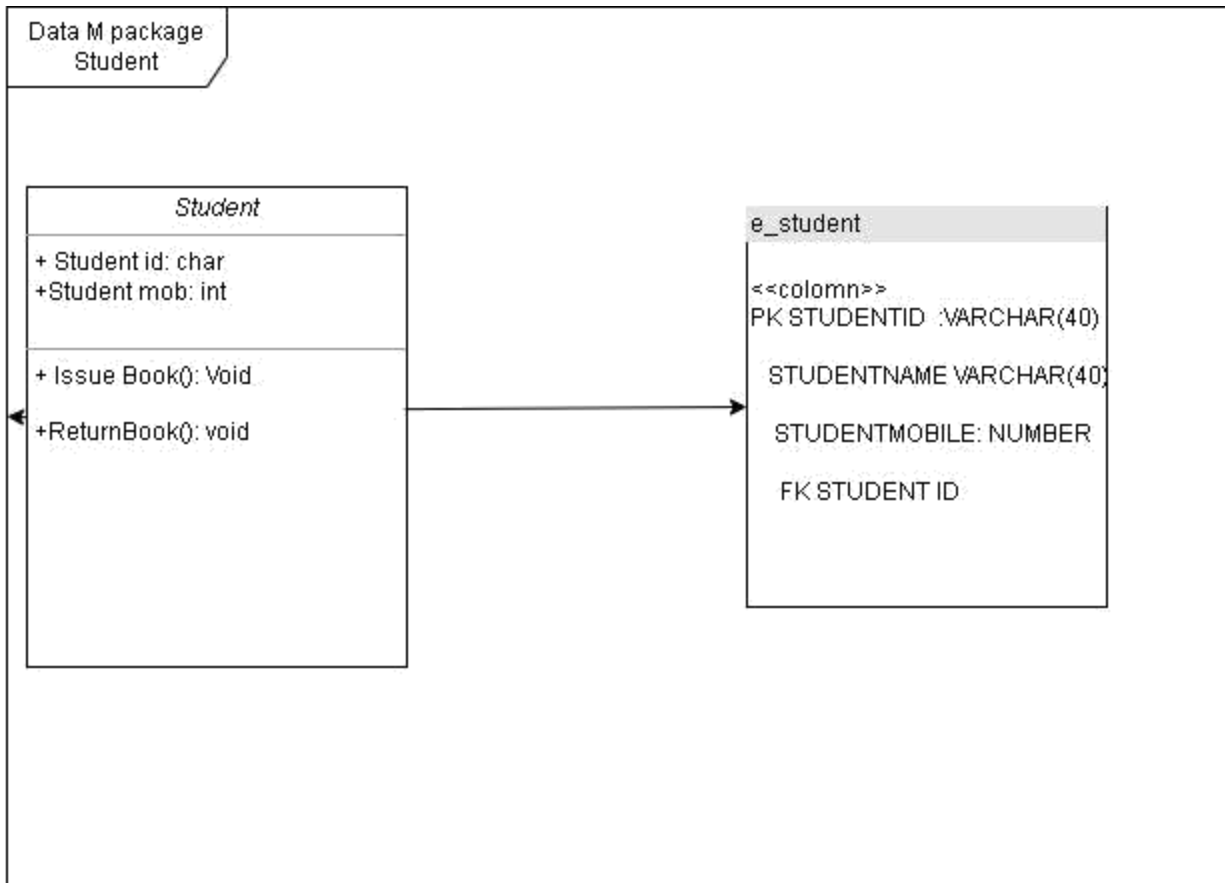


Figure 4.10. Student Mapping

4.2.5 Component diagram

It Describes all components in a system, their interrelationships, interactions, and the interface of the system. It is an outline of the composition structure of components or modules. When we summarize the purpose of component diagram: -

- To represent the components of any system at runtime.
- It helps during testing of a system.
- It visualizes the connection between various components.

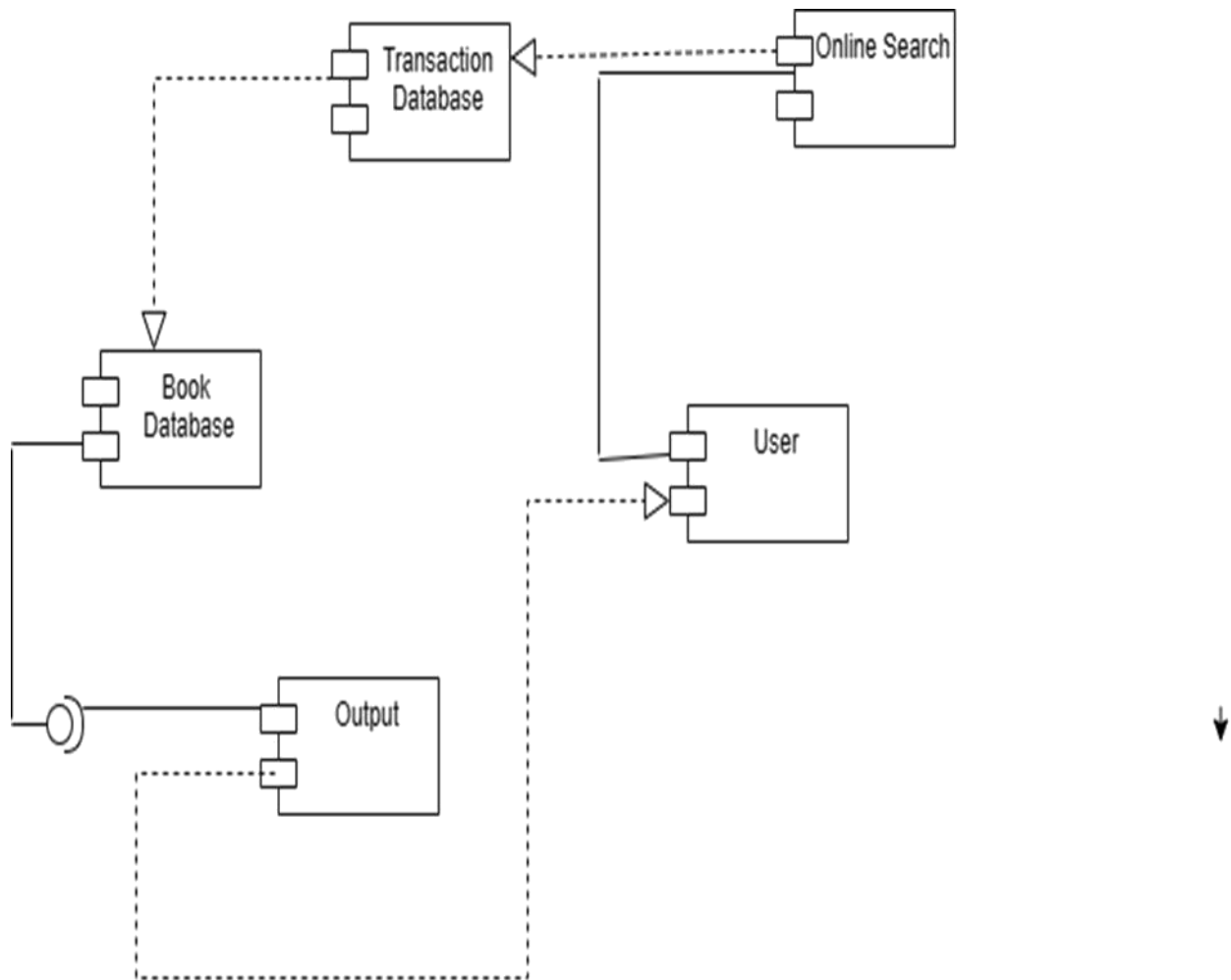


Figure 4.11.Component diagram

4.4.6 Deployment diagram

The Deployment model describes how and where the system will be deployed. Deployment diagrams are used to visualize the topology of the physical components of a system, where the software components are deployed and used to describe the static deployment view of a system. Deployment diagrams consist of nodes and their relationships. Also, system hardware, software, and network connections for distributed computing. It covers server configuration and network connections between server nodes in a real world setting.

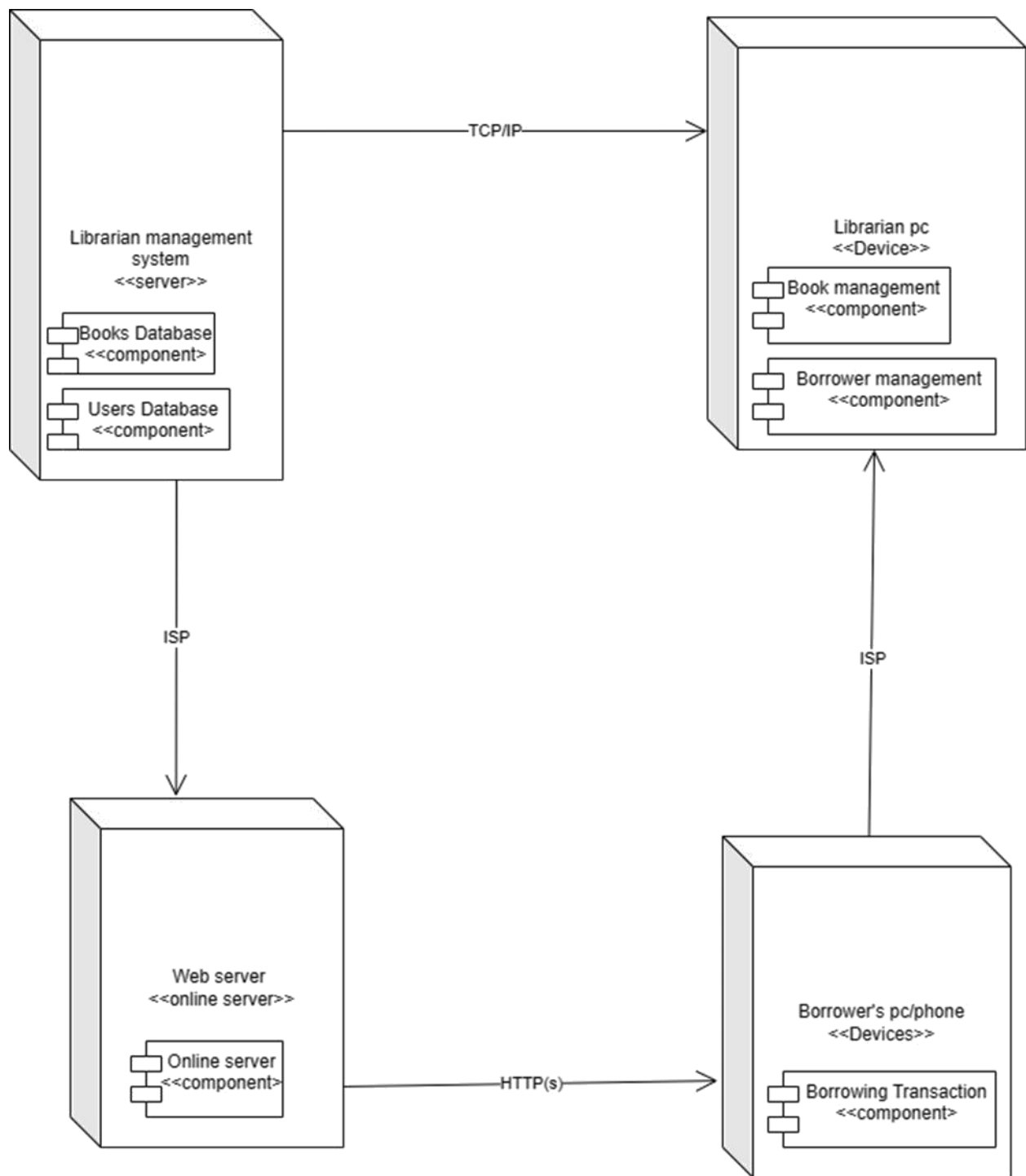


Figure 4.12. Deployment Diagram

4.2.7.Database Design

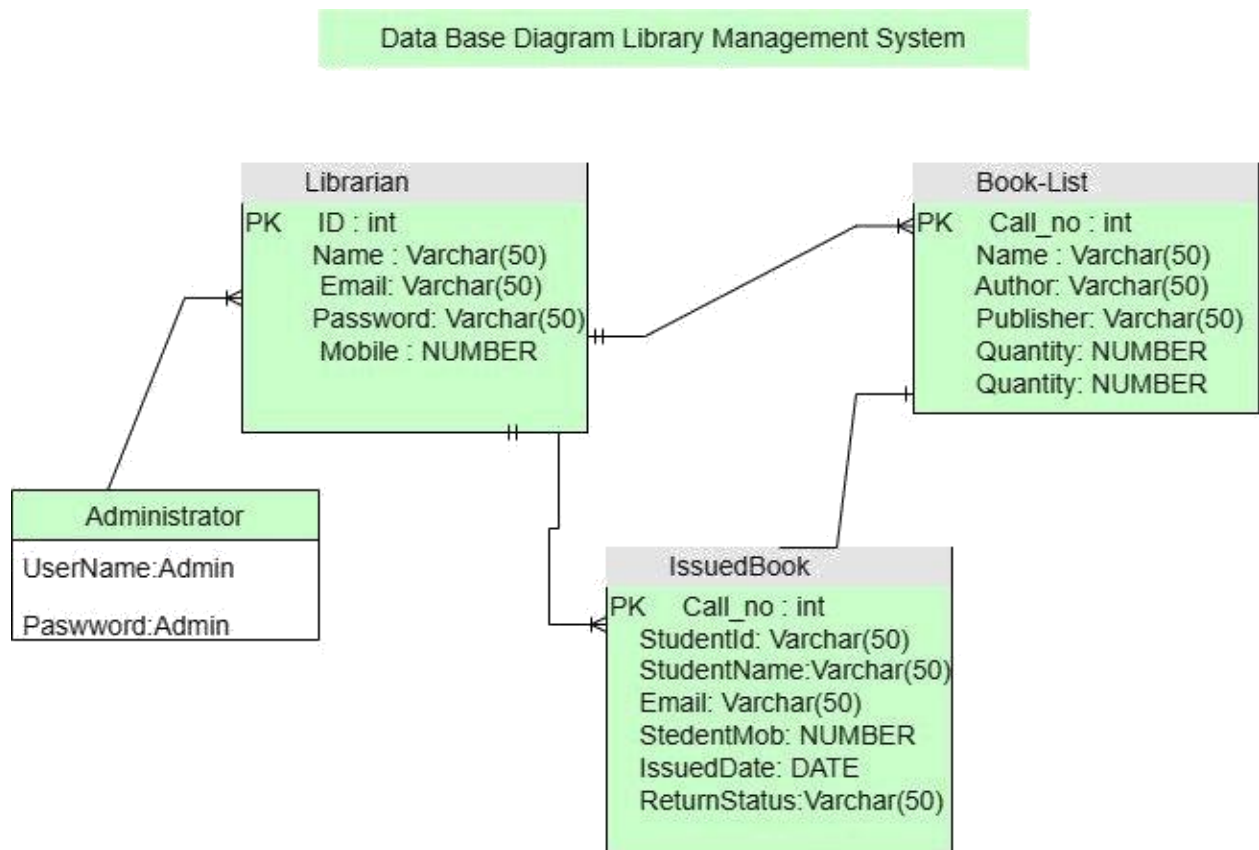


Figure. 4.13 Database design

4.4.8. Access Control

Distinct actors in multiuser systems have access to different functions and data. We modeled these distinctions by correlating various use cases with various actors. The information which is registered in the system we built has to be secure. In our system, different actors have access to different functionality and data. Therefore these privileges stop unauthorized users from accessing data which they don't have privilege to access.

The table below shows the global access table, describing the access relation between the actors, objects and operations in the system:

Actors	Authenticate	User Management	Boo
Admin	Admin login()	AddLibrarian() EditLibrarian() DeleteLibrarian()	
Librarian	LibrarianRegister() Login() Logout()	Returnstatus()	AddBook() EditBook() Deletebook() IssueBook() ViewBook() ViewIssuedBook()
student	Register()		ReturnBook()

Table 4.2 access control

4.4.9 User Interface Design

With websites, the job of a UI designer is to create a web page which not only looks attractive, but where all of the content is well aligned and clearly relates to everything else on the page. This includes all of the site page's visual elements like icons, links, buttons and any other interactive features. In order to build successful, well-designed user interfaces, the layout of the pages need to be stylish, intuitive and clearly laid out. By creating an intuitive user interface, schools can ensure that visitors gain a positive impression of the company.

Reference

1. www.google.com
2. <https://www.academia.edu/>
3. https://t.me/chatBot_GPT3.5bot
4. https://en.wikipedia.org/wiki/Deployment_diagram
5. <https://itsourcecode.com>
6. <https://draw.io>
7. <http://lucidchart>