ADDIS ABAB SCIENCE & TECHENOLOGY UNIVERSTY

COLLEGE OF ELECTRICAL AND MECHANICAL ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

COMPUTER ENGINERING STREAM

DATABASE SYSTEM PROJECT

TITLE: AASTU LIBRARY MANAGEMENT SYSTEM REPORT.

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Date: May 13, 2021

Submission date: July 12,2021

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Abstract: 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 soon. This project work aim to design and implement a computerized library management system in Addis Ababa Science and Technology University (AASTU). The library management system was design and implemented using the HTML (Hypertext mark-up language), CSS (Cascading style sheet), PHP (Hypertext pre-processor) and My SQL database. The system was developed using the water fall Model software development approach. An extensive evaluation of the project determines that the project achieved many of its predefined objectives.

Keyword: *library system, book recommendation system, UML diagram, System design and architecture*

Acknowledgment: We take this occasion to thank my God, almighty for blessing us with his grace and taking our endeavor to a successful culmination. The satisfaction that accompanies that the successful completion of any task would be incomplete without the mention of people whose ceaseless cooperation made it possible, whose constant guidance and encouragement crown all efforts with success. Thanks Mir. Nestanet Getnet (Database teacher in AASTU), he gives an inspiration and attentions to do this project. And also thanks AASTU library members to help this project by taking some important needed information's both limitation and delimitations in the library. After all, we are grateful our project guided Dr. Eyob Nigussie for the guidance and inspiration, and constructive suggestion that helpful as in the preparation of this project. We also tanks our colleagues (group member) who have helped in successful completion of this project.

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Chapter 1

Introduction

Library management system is a system that facilitates the easiness in using and tracking the library assets. It provides an instant real picture and process of all the activities that happens in a library commencing from the member joining the library and the same leaving the library with all the utilization and rendering of the library facilities in between

1.1 Objectives of the project:

- To eliminate the paper-work in library Also it will save unnecessary wastage of time.
- To record every transaction in computerized system so that problem such as record file missing won't happen again
- To design a user friendly graphical user interface which suit the users
- To produce technical report that documents the phases, tasks and deliverables in the project

1.2 Scope of the project:

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 the admin, users and members.

1.3 Methodology:

1.3.1 Data gathering techniques:

The library is a major means of data gathering and as well a case study for the proposed system. In line with this the major method of information gathering for the system is the library and observation method via observing the staff and operation of the library.

1.3.2 Design Methodology:

Firstly, we collect the requirement for the library system, and then we analyzed it. After analyzing the requirement, we proceed to design stage. In the design phase, we design

not only the user interface, but also the database design. The next phase in waterfall model after design phase is Construction phase. Construction phase is an important phase in waterfall model and it is a time consuming phase depends on programmer's ability. In Library Management System development, construction phase is using PHP coding to write the program. After done the coding phase, we will proceed to integration phase. In this phase, online web site and library system will share a same database to make integration between two applications. The next phase after integration is the testing and debugging phase. For testing module, it is separated into few types which are module testing, system testing, unit testing and user acceptance test. Once there is a bug founded, it will be solving immediately before the system is launched to ensure the system launched is bug free.

1.3.3 Implementation Methodology:

1.3.3.1 Hard ware:

- Personal computer (PC).

1.3.3.2 Software(for Front end and Back):

The software we have used to design library management systems are:-

- **Operating system**: Windows 10 is used as the operating system as it is stable and supports more features and is more user friendly.

- **Database:** MYSQL-MYSQL is used as database as it easy to maintain and retrieve records by simple queries which are in English language, which are easy to understand and easy to write.

- **Word 2013** is an important office application that can be used by all users. Its features make it a suitable tool for writers and officials to create lengthy documents. You can also record classified information are as your files remain safe under Word's security features.

- **Development tools and Programming language**- HTML is used to write the whole code and develop webpages with cascading style sheet, java script for styling work and hypertext pre-processor (PHP) for sever side scripting.

- **Draw.io**: is a 2D business technical diagramming software which help to create flowchart, organizational charts, mind map, network diagrams, floor plans, workflow diagrams.

1.3.3.3 **Documentation:**

Library management system is all about organizing, managing the library and library-oriented tasks**.** It also involves maintaining the database of entering new books and the record of books that have been retrieved or issued, with their respective dates.

1.3.4 Testing Methodology

Unit testing, Integration testing, System testing (Alpha testing, Beta testing)

Chapter 2

Requirements Analysis and Descriptions:

2.1 Overview of the existing system:

2.1.1 Activities of the system:

Most of library management system are designed in paper based or spread sheet table forms this leads file lost, waste time to querying and retrieving. To reduce this we have automate a software base library management system (computerized library management system).

2.1.2 Problem of Existing System:

- Loss of Data: A lot of paper works are needed for the safe keeping of the details of books borrowed by a registered user.

- Time Wasting: User time are wasted as a result of searching for a book that has been borrowed by a user whose record cannot be traced on the paper records.

- Error Prone: The existing system of operation is prone to error.
- Tedious: It is tedious because it must take a routine
- Processing Speed: The processing speed is very low resulting into low output

2.1.3 Weakness and strength:

Weakness:

- The user interface of this system is suitable for screen resolution 1024 x 768 only.
- The reservation that make by member online unable to update the database immediately.
- System didn’t implement smart card technology.

Strengths:

- ✓ System response is fast after user press a button to perform some actions.
- ✓ User interface is considered user friendly and ease of use.
- ✓ Validation has been done to avoid some functional error in later time.
- ✓ Some list-view control has been included to allow user view the history or some important data without print out the report.
- ✓ Search features are included in several modules to ease user so that they can filter the data easily.
- ✓ Allow user to keep track member renting history.
- ✓ No additional/unnecessary steps required to perform the task.
- ✓ Allow user to keep track the lost book.
- ✓ System is able to check the book whether is under reservation or not.

2.1.4 Business Rule:

- Once the library system is developed, it will be applicable for the library. So the paying process for the developers will go with the business policies and practices.
- Neither the School Administration nor the developers should cross the rules and regulations.
- If failures are occurred related to the requirements, the developers have an obligation to fix that failures. But if the failures are out of the requirement boundary or other update ideas are arises, the developers have the right to deal again for that failures and updates.

2.2 Overview of proposed system:

2.1.5 Functional Requirement:

This refers to the specification of the system that should be satisfy both completeness and consistency of the library management system.
These requirement s are:

1. **User (Admin) login:** This feature used by the user (librarian / library admin) to login into the system. They are required to key in the user id and password before they are allows entering the system. The user id and password will be verified and invalid id is not allowed to enter the system. So its functional requirements are:
    - User id is provided when they register as staff.
    - The system must only allow the user with valid id and password to enter the system.

- The system must be able to perform authorization process which decides what the user's level can access to.
- The user must able to logout after they finished using the system.

2. **Password recovery:** This feature used by the user (librarian / library admin) whenever they forget their login password. When the user lost his password and forgot their passwords then the system must be able to send the correct password to the user's mailbox.

3. **Register New Book:** System will validate the information entered such as ISBN length, price entered whether in correct format. If all the information was entered correctly, system will add the book into Book table and other requirement table. After enter into database, system will prompts a message box stated that the book was enter successfully.so its functional requirements are:
    - System must be able to verify the information.
    - System must enter the correct copies quantity into book copies table.
    - The repeated ISBN number should not be allowed to enter into database

4. **Search Books:** This feature is found at book maintenance part. User can search the book based on ISBN, book title, category or publisher. Once user key in a character into the Search textbox, system will filter and show out the books which fulfil the search criteria. Its main functional requirements are:
    - System must be able to search the database based on selected search type (ISBN, book title , etc)
    - System must able to filter the book based on the keyword entered.
    - System must able to show out the filtered book in list view.

5. **Rental Report:** This feature allows the admin to view the rental transaction info on particular day. Its main functional requirements are:
    - System must able to show out the correct information about the transaction happens on particular date.
    - System must show the information correctly whether it is rental report or return report

6. **Activity log:** This feature records every process done by user in the system. System will record down every process such as add record, update record as well as login information. When system crash, admin can check back which action happens lastly and maybe the action is the cause for system crash. Its main functional requirements are:
    - System must able to show out all the activity log information.
    - System must store all the critical process into activity log.

2.1.6 Non-Functional Requirement:

These requirements that are not directly concerned specific function delivered by the system, but rather it relate to emerge system properties. Such product requirement (safety, security, efficiency, reliability), organizational requirements (implementation, delivery) and external requirements.

1. **Safety Requirement:** The software may get crashed due to virus or the operating system failure. So it is mandatory to take a database recovery so that it will not lost.

2. **Security Requirement:**
    - The system will secure the database.
    - Users can search books and get using the shelf number information and simply comment their feeling about the library. But they cannot edit or delete any information about the books, the members…etc.
    - There is different account for the Librarians and users; only the librarians can update the database.
    - No one should hack the Librarians password.

3. **Reliability Requirement :**
    - The system must perform accurately towards member request. For example, when the librarian saves the edited profile detail, after they review their detail, the details must be change according to the latest details that they have updated. When member return the book after the expired date, the fine should be calculate accurately. Besides that, in the registration form, it will have validity check to check the input to prevent wrong data type

4. **Efficiency Requirement:**
    - With the library management system, librarian should be able to process faster when they process book transaction.

5. **Implementation Requirements:**

    - In implementing the system, it uses the PHP as the main programming language and tools. Besides that, the SQL language will be used to maintain the information in the database. On the other hand, SQL Server 2008 needs to be

installed.

6. **Users and Librarians Requirements:**
   - The users of the software are specified by the organization administration. They are assumed to know basic computer skill and spelling.
   - The librarians are assumed to have more knowledge about the software. They are assumed to know adding and deleting information from database, access the users' comments and the like.
   - The developers provide certain facilities for the Librarians.
     - Recovery and backups
     - Forgot password
     - Updates for better uses.

2.1.7 Systems Requirement (Hardware and Software requirement):

1. **Hardware Requirement**:
   - Intel core i3 4nd generation is used as a processor because it is less costy than other processors and it is very reliable and we can as well run our pc for long time with the Intel core i3. By using this processor we can keep on developing our project without any worries.
   - Ram 4 GB is used as it will provide fast reading and writing capabilities and will in turn support in processing.

2. **Software Requirements:**

The whole Project is divided in two parts the front end and the back end.

1. **FRONT END:** The front end is designed by using HTML, PHP, CSS, Java script

   ✓ **Hyper Text Mark-up Language** (HTML): html is the main mark-up language for creating web pages and other information that can be displayed in a web browser. HTML is written in the form of HTML elements consisting of tags enclosed in angle brackets (like <html>), within the web page content. The purpose of a web browser is to read HTML documents and compose them into visible or audible web pages. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts written in languages such as JavaScript which affect the behavior of HTML web pages.

   ✓ **Cascading Style Sheets** (CSS): CSS is a style-sheet language used to describe the presentation of a document written in HTML or XML (including

XML dialects such as SVG or XHTML). CSS describes how elements should be rendered on screen, on paper, in speech, or on other media. CSS is one of the core languages of the open web and is standardized across browsers according to the W3C (World Wide Web Consortium) specification.

- ✓ **JAVA SCRIPT (JS):** JavaScript is a high-level, dynamic, weakly typed, prototype-based, multi-paradigm, and interpreted programming language. JavaScript is a full-fledged dynamic programming language that, when applied to an HTML document, can provide dynamic interactivity on websites

- ✓ **PHP:** it is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. The best things in using PHP are that it is extremely simple for a newcomer, but offers many advanced features for a professional programmer. Don't be afraid reading the long list of PHP's features. You can jump in, in a short time, and start writing simple scripts in a few hours. What distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script, but would not know what the underlying code was. You can even configure your web server to process all your HTML files with PHP, and then there's really no way that users can tell what you have up your sleeve.

2. **BACK END:** The back end is designed using MySQL which is used to design the databases.

   - ✓ **MySQL** is a database management system that allows you to manage relational databases. It is open source software backed by Oracle. It means you can use MySQL without paying a dime. Also, if you want, you can change its source code to suit your needs. Even though MySQL is open source software, you can buy a commercial license version from Oracle to get premium support services. MySQL is pretty easy to master in comparison with other database software like Oracle Database, or Microsoft SQL Server. MySQL can run on various platforms UNIX, Linux, Windows, etc. You can install it on a server or even in a desktop. Besides, MySQL is reliable, scalable, and fast.

Chapter 3
Constraints and Assumptions:

3.1 Assumption:

- ✓ All the users have ID, email address
- ✓ All entity's , tuples and its attribute are typed in English
- ✓ All library users including admins are assumed to type words, numbers and in English.
- ✓ All Books have ID, Author's name and title.
- ✓ The library is assumed to be huge. It is not expected to be small; if it is small (private library), it is not as such important to use Digital library System

3.2 Constraints:

- Resources – the weak connection of WIFI and Broadband connection ruins us from searching and then finding desired references. so to accesses the library elements the library system automated in better quality broad band connection.

Chapter 4
System Modeling

System modeling is the interdisciplinary study of the use of models to conceptualize and construct systems in business and software development. In this chapter we will covers use case model, sequence diagram, class diagram and activity diagrams.

4.1 Use case Model:

4.1.1 Actor Specification:

The implementation of our library management systems uses one tier architectures because. It is suitable to our project since it is a website form and the architecture is simple and the client, server, and database all reside on a single computer at any time, it is easy to access in a single computer without affecting the other.

1. Students (users or members) are a customer registered members that entered in to the privileges. Or it refers to the reader that entered into the library system.
   ➔ This is known as primary actors because they initiate the use of the system
2. Librarian (staffs or admins): is a person who works professionally in a library, providing access to information, updating, deleting maintaining books and sometimes social or technical programming, or instruction on information literacy to users.
   ➔ This is called secondary actor because it is being act as a reactionary.

4.1.2 Use case Diagram:

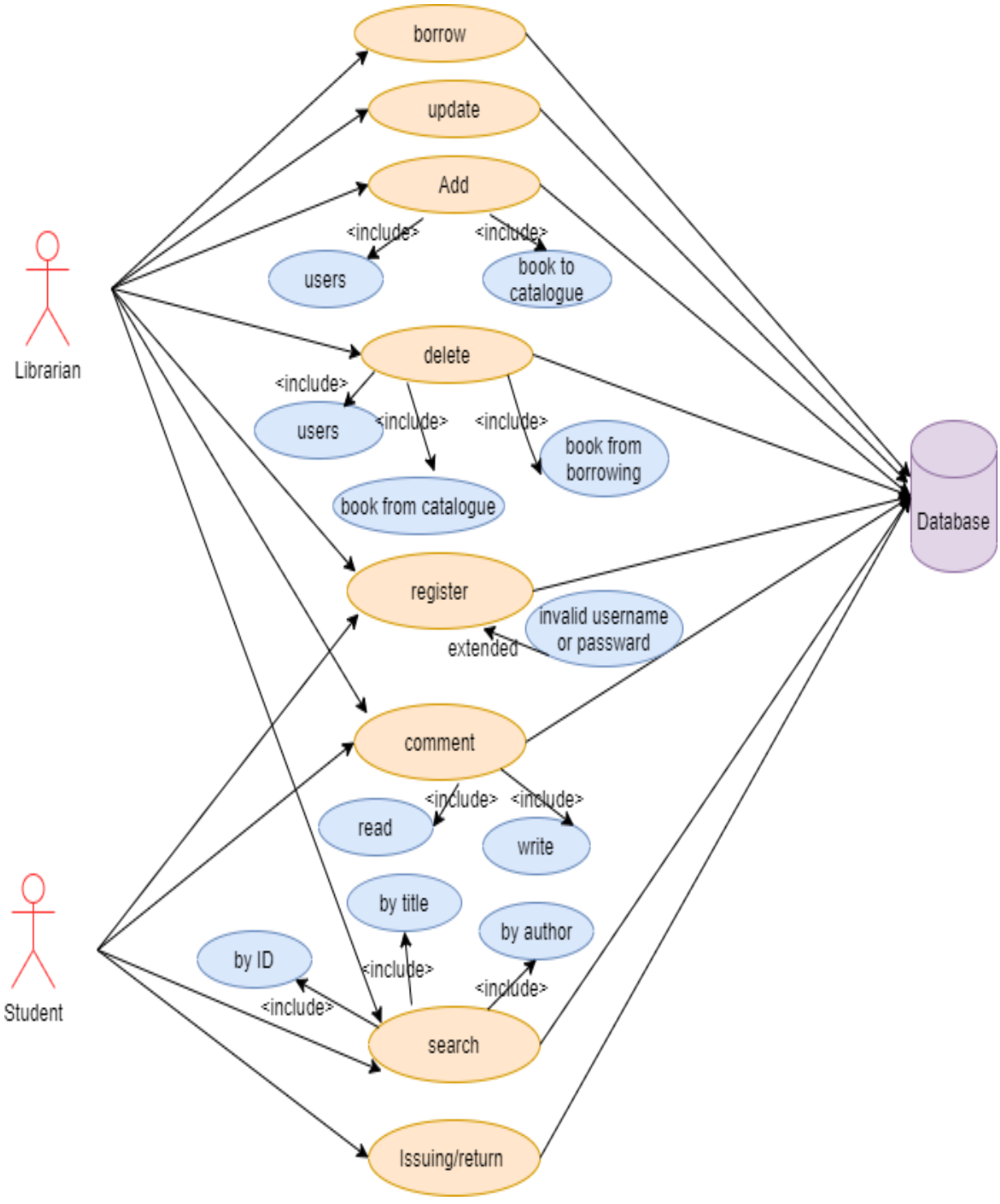


Fig. Use case diagram

4.1.3 Use case Description:

- ✓ User who registers himself as a new user initially is regarded as student or a reader. For the user to get registered as anew user, registration form are available that is needed to be full filed by the user. After registered new book is requested by the user as per there requirements.

- ✓ After requesting, the desired book or the requested book is reserved by the user that means no other user can request for that book.

- ✓ The user can take his suggestion or feedbacks to the librarian.

- ✓ If the user somehow forgets to return the book before the due date, then the user pays fine. Or if the user forgets to renew the book till the due date, then the book will be overdue and the user pays fine.

- ✓ The librarian must be registered himself before accessing any information's by filling the registration form.
- ✓ The librarian has a key role in the system. Librarian add the records in the library database about each student user every time issuing the book or returning the book, or paying fine.
- ✓ Librarian also delete records of particular student if student leaves the college or university, book records from catalogue.
- ✓ The librarian also able to can update users (members), book details

4.2 Sequence Diagram:

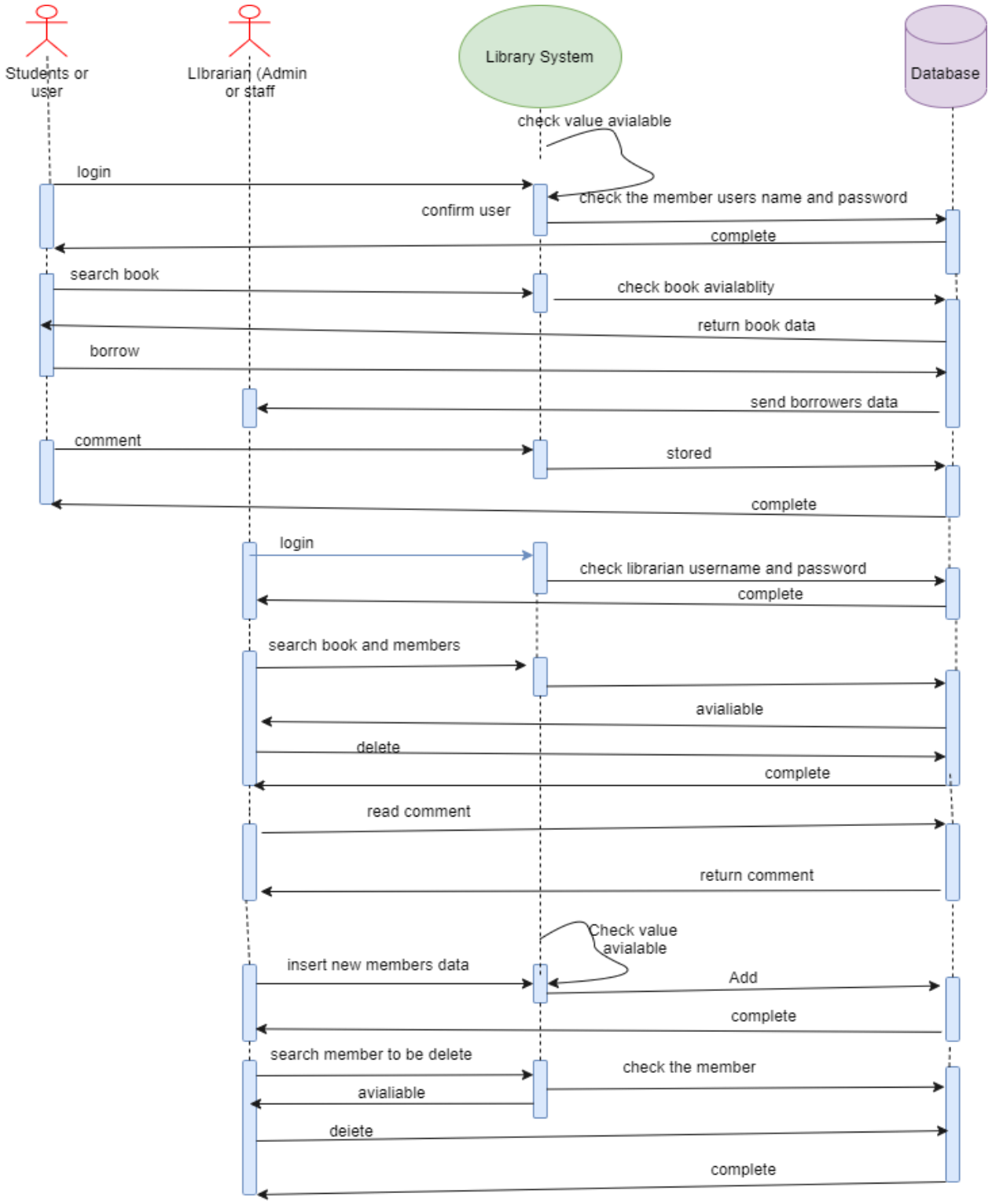
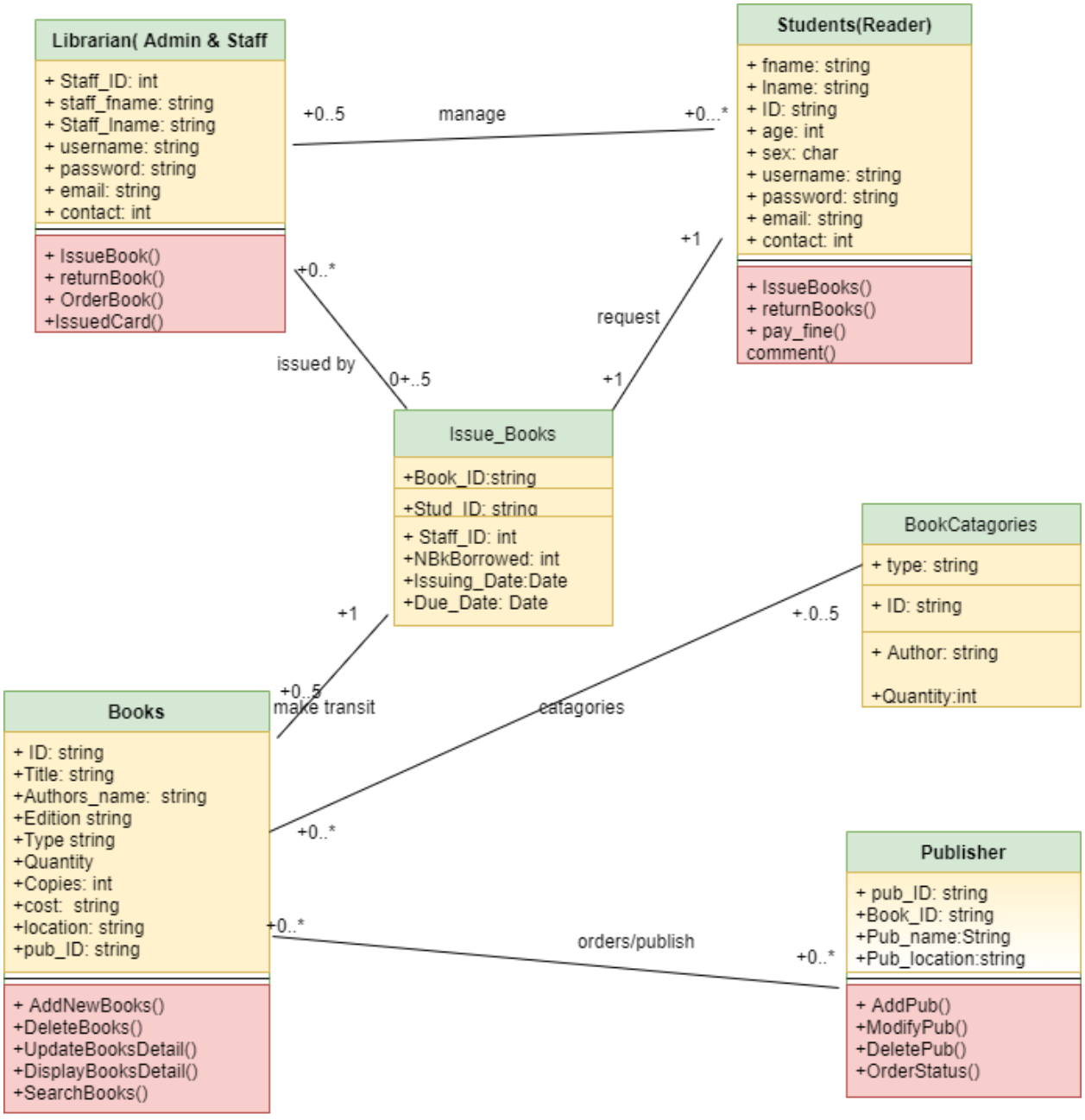


Fig. sequence diagram

4.3 Class Diagram:



4.4 **Activity Diagram:** this indicate the sequence of steps of retrieving and transactions of a library system by considering how can users (students or members) search, borrow a book in the library.

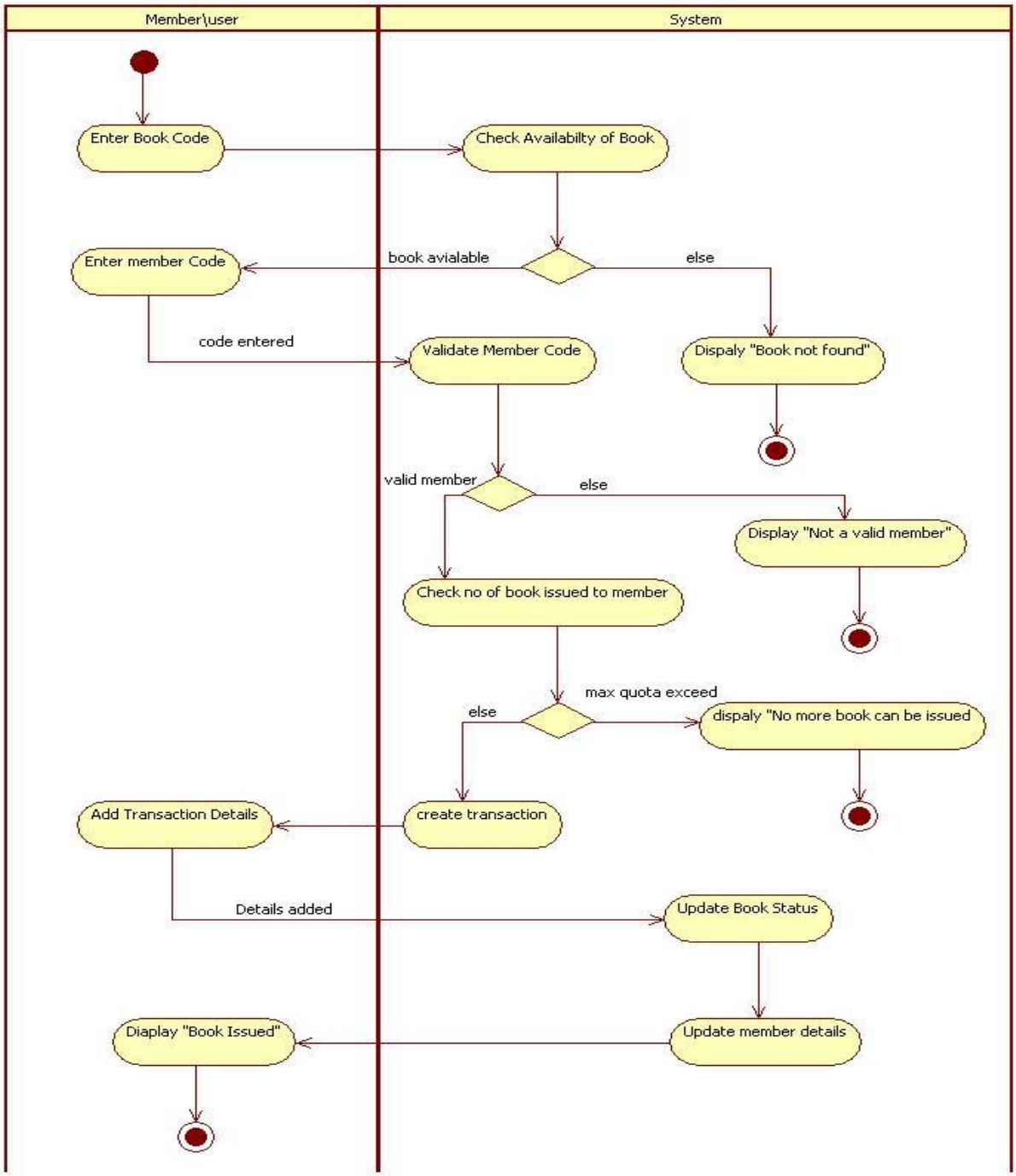


Fig activity diagram

Chapter 5
System Design

System design is the process of defining the element of the system such as the architecture, modules and components, the different interface of those components and the data that goes through the system.

5.1Design Goal:

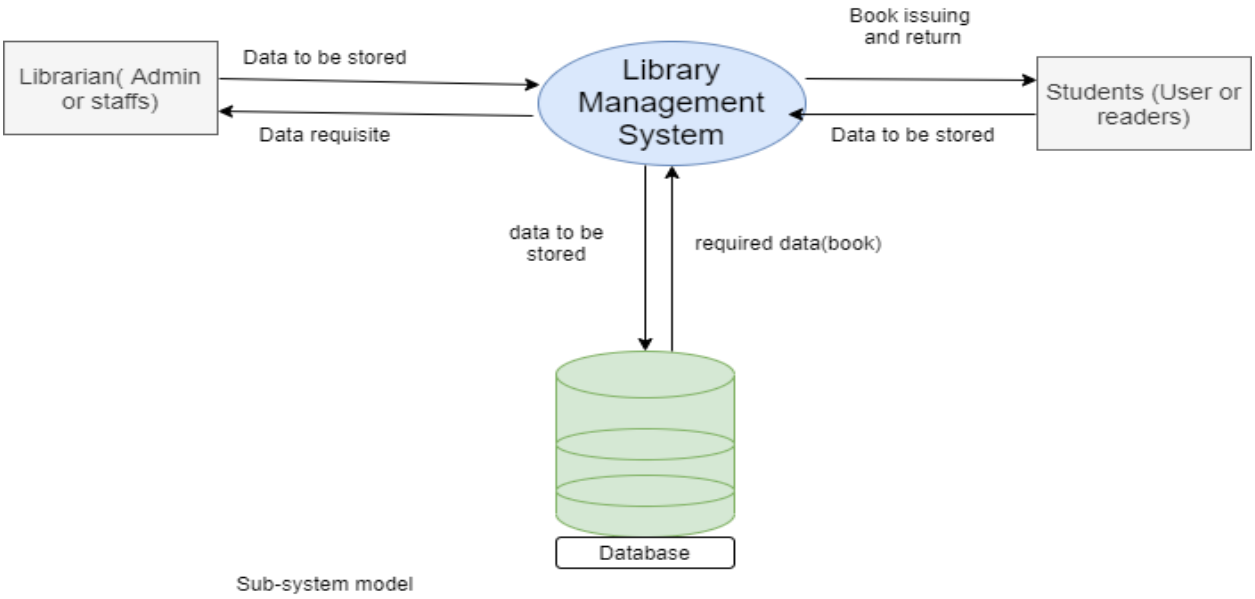
- It main goal is to allocate the full requirements for both software and hardware components by modeling its architectural view.
- The purpose of this project is to decrease the human labor in Library work place. This will make the Librarians from wasting time by searching books and the workers from tiring the works inside the library.
- The goal of *System Design* is to design whole software, which fulfils all the requirements of customer**.** This leads to improve organizational systems, by applying software, which helps employees to perform business, tasks more effectively.

5.2 System Decomposition:

The system is decomposed into:-

1. Students (Users) – this sub-system concerns about the library users and members. The users can access books in the library and can give any suggestions or comments. The library members have the right to borrow books from the library.
2. Librarians (Admin or staffs) – this sub-system controls the database; add or remove. New members (users) and new books are added by librarians.
3. Database – this sub-system stores each data of the books, members, users and librarians. When members borrow books, the data of borrowers will be registered to Librarian account automatically.

The main purpose of this decomposition is to list out the main relations of each element in the system and to use the appropriate design architecture for the system. In addition to this decomposing the system helps in getting a clear understanding on sharing of data between the sub-systems. When the librarians and users need data, the database delivers the required data. When Librarian sub-system needs a data about the books, the database sends to it. When Users sub-system wants to search books the database sends required books to it. This sharing of data and collaboration makes the system to work as the requirement.



Sub-system model

5.3 System Architecture:

Our library management system is decomposed in to three sub-systems and it has six modules. Functions of the sub-systems are independent of each other. But they share a common database. Some of the modules are allowed for all the sub-systems. In addition to this, there are modules allowed only for a single sub-system.

The modules are:-

1. Add - This module has two attributes; member and Book to catalogue. This module performs either adding new member or books. It is directly linked to the database. It is allowed for librarians only.
2. Remove – This module has three attributes; member, Book from catalogue, book from borrowing. To remove the element of one of the attributes, it uses the search button module. After searched and selected, remove action will be executed. It is allowed for librarians only.
3. Update – This module works updating of books data; author, title, edition, location book type. It is allowed for librarians only.
4. Borrow – This module is allowed for members only. Members can search books and then borrow. Search module helps this module to perform as its requirement.
5. Comments – This module is available for users or readers to give their suggestions or comments and for the librarians to read the comments.
6. Searching – This module has three attributes; by id, by author, by title. It gives required data that match with the inputted value. This module supports most of the modules.

As the figure shown below, the modules have this kind of relation to work properly. The User asks data from the database. Then the database provides as it asked. When someone wants to borrow books, he can login on his account, search and select the book. Then the borrowed book will be registered to the librarians.

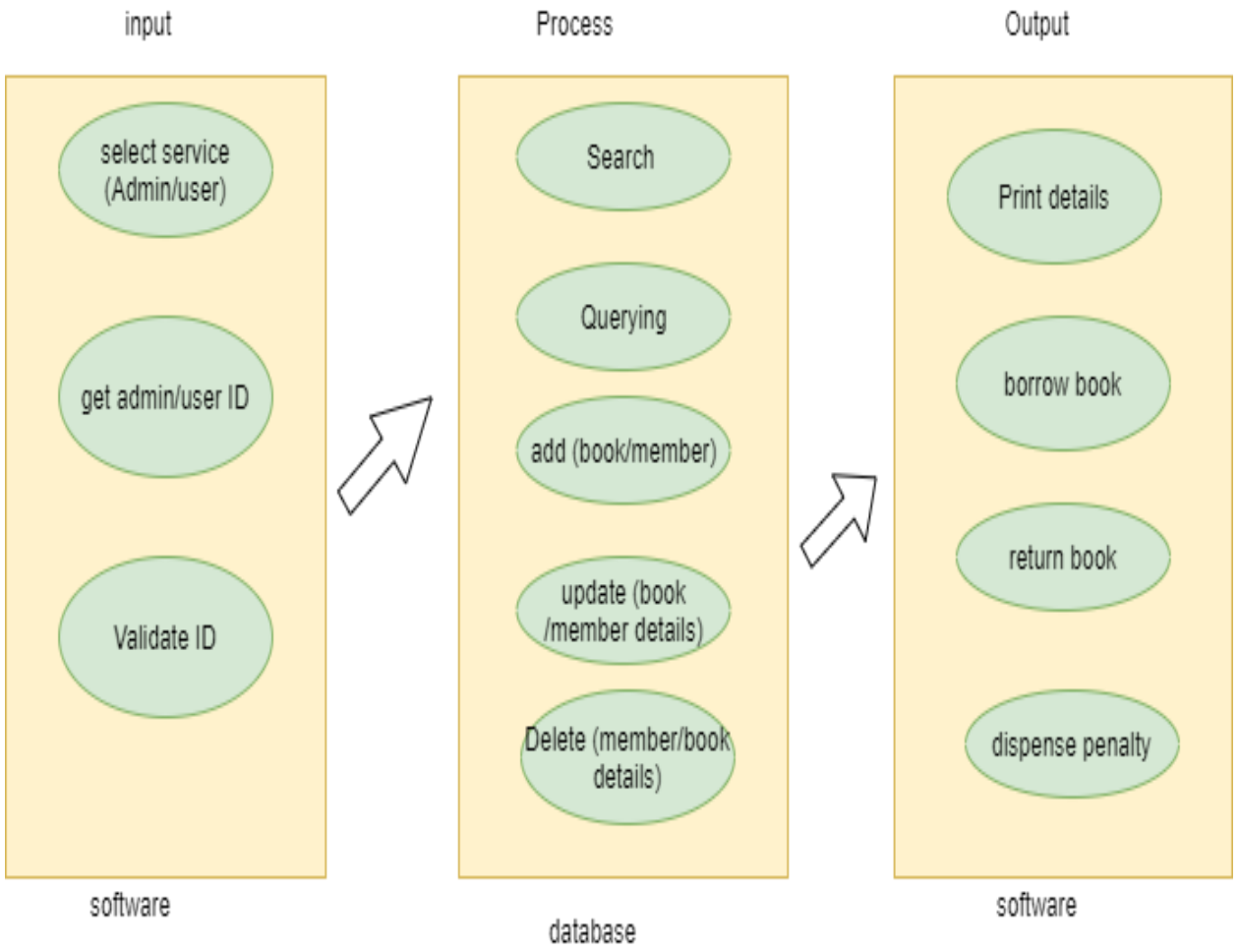


Fig System architecture

5.3 Deployment Diagram:

Deployment diagram is a structure diagram which shows architecture of the system as deployment (distribution) of software artifacts to deployment targets.

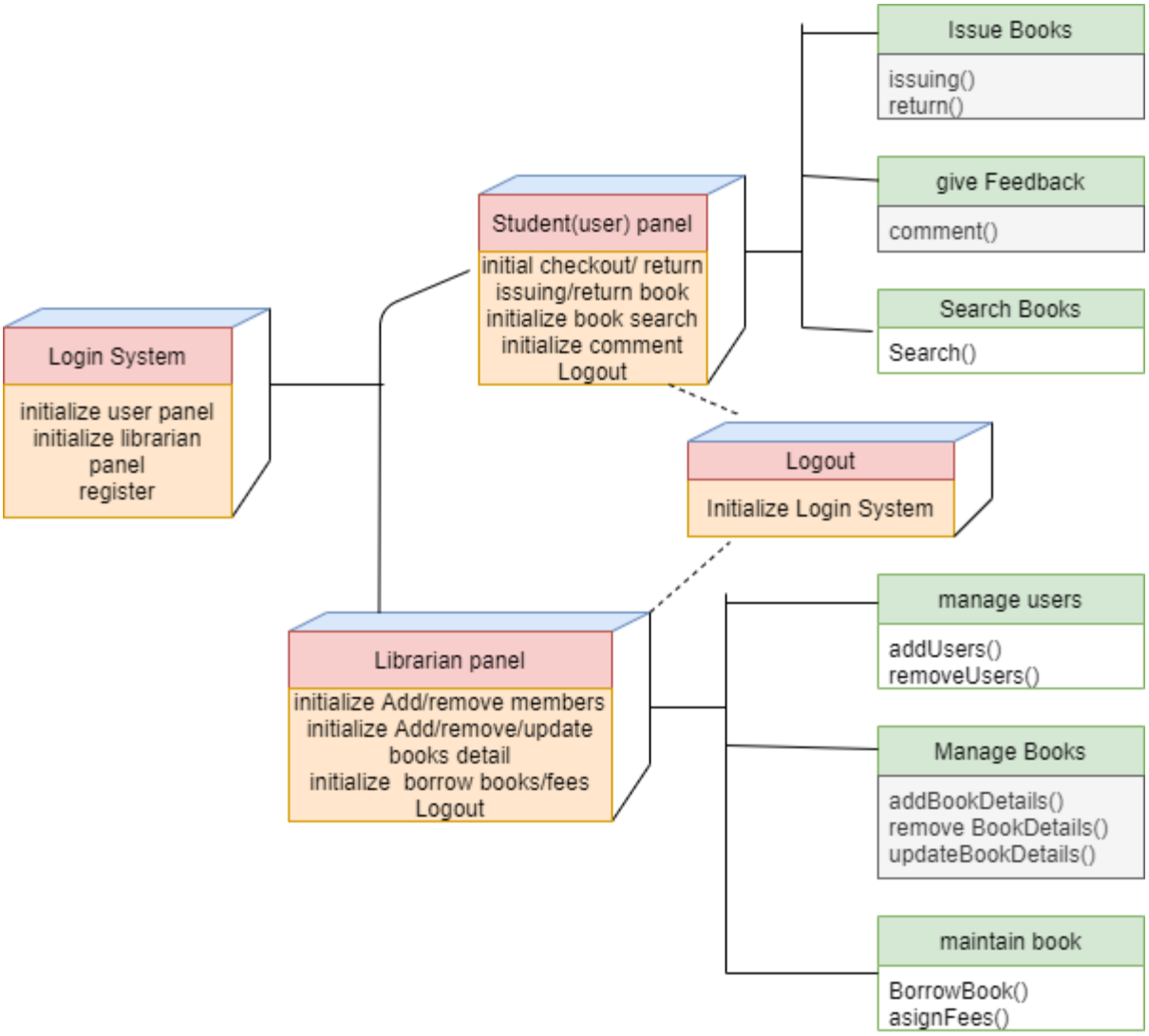


fig. Deployment diagram

5.5 Accesses control and security:

- The authentication controls who enter into the system. This means when the user including staff, students, and other readers enter into the system first it must be registered by filling the given requirements correctly
- And also the admin page is secured for the users to accesses not allowed information's, updating, deleting books.

Chapter 6
Implementation:

6.1 Tools:

The tools or software's that are we used to design library management system are:

- ✓ **Draw.io:** used for drawing architectural design, deployment diagram, class diagram, use case diagram, activity diagram and sequence diagram
- ✓ **Word 2013:** for documentation written purpose.
- ✓ **PHP XAMPP server:** for connecting database to our designed software (website)
- ✓ **MySQL:** for database part (back end).
- ✓ **CSS and Html:** code part (front end)
- ✓ **Windows 10 operating System**

Chapter 7

Conclusions and Recommendations:

7.1 Conclusion:

This was an effort to develop library management system which may be useful in library to insert, update, store, handle, retrieve and deletes information's about books, member's, publisher's.

The user can be able to ask the librarians some information like whether the book is found or not, rules and regulation of the library system, interpreting some confused information's when they registered the system or accessing any data. The users can simply search a book and know whether the book is at that library or not.

The user can easily access the book or any data with searching mechanism, search with Author Name, Book Title or The Books ID. If the Book is at the library, the software will give them the location of the book; locations with shelf number, Code of the book (ID), Authors name, book categories (fiction, art, engineering, medical, science etc..) and book title. This results decrease wasting time and human labor force. And also if the user have any comments or suggestions they will gave to the library workers.
The software notifies the librarians when the members didn't return the borrowed books within the dead line date. If time is passed from the returning dead line date the software will calculate the fee and shows to the librarian.

Reference:

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8.