



## ARSI UNIVERSITY

### COLLEGE OF BUSINESS AND ECONOMICS

### DEPARTMENT OF INFORMATION TECHNOLOGY

### WEB-BASED ONLINE BOOK STORE SYSTEM FOR ARSI UNIVERSITY

**Submitted to Information Technology Department**

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## Table content

### Table of Contents

DECLARATION.....	i
APPROVAL FORM.....	ii
ACKNOWLEDGMENT .....	iii
Table content .....	iv
List of Table .....	vii
List of Figure.....	viii
List of Acronyms.....	ix
ABSTRACT .....	x
CHAPTER ONE.....	1
INTRODUCTION.....	1
1.1 BACKGROUND OF THE PROJECT .....	1
1.2 STATEMENT OF THE PROBLEM .....	1
1.3 OBJECTIVES .....	2
1.3.1 General Objective of the project.....	2
1.3.2 Specific Objective of the project. ....	2
1.4 Feasibility Analysis .....	3
1.4.1 Technical feasibility .....	3
1.4.2 Operational feasibility .....	3
1.5 SIGNIFICANCE AND BENEFICIARY OF THE PROJECT .....	3
1.5.1 Significance of the Project.....	3
1.5.2 Beneficiaries of the Project.....	4
1.6 Scope and Limitation of the Project.....	4
1.6.1 Scope of the Project.....	4
1.6.2 Limitation of the Project.....	4
1.7 The Methodology of the Project.....	4

1.7.1 Data Collection Tools and Techniques.....	5
1.7.2 System Analysis and Design .....	5
1.7.3. System Development Models.....	5
1.7.4. System Testing Methodology.....	6
1.8. System Development Tools and Techniques .....	7
CHAPTER TWO.....	8
2. DESCRIPTION OF EXISTING SYSTEM.....	8
2.1 Introduction of existing system .....	8
2.2. Users of Existing System .....	8
2.3 Major Function of Existing Systems.....	9
2.4. Forms and Other Documents of the Existing Systems.....	10
2.5. Drawbacks of the Existing System.....	11
2.6. Business Rules of the Existing System .....	11
CHAPTER THREE .....	13
3. PROPOSED SYSTEM .....	13
3.1. System Description.....	13
3.2. Functional Requirements of Proposed System.....	14
3.3 Non-functional Requirements .....	14
3.3.1. User Interface and Human Factors.....	14
3.3.2. Hardware Consideration.....	14
3.3.3. Security Issues .....	15
3.3.4. Performance Consideration .....	15
3.3.5. Error Handling and Validation.....	15
3.3.6. Quality Issues .....	15
3.3.7. Backup and Recovery.....	15
3.3.8. Physical Environment.....	15

3.3.9. Resource Issues .....	15
3.3.10. Documentation .....	15
CHAPTER FOUR .....	16
4.1.1.3. Use Case Documentation.....	20
4.2. Object Model.....	30
4.2.1. Class Diagram .....	31
4.2.2. Data Dictionary .....	32
4.3. Dynamic Model.....	33
4.3.1. Sequence Diagram.....	34
4.3.2. Activity Diagram.....	44
CHAPTER FIVE .....	56
5. SYSTEM DESIGN.....	56
5.2 Proposed System Architecture .....	56
5.2.1 Subsystem Decomposition and Description.....	58
5.2.2 Hardware/Software Mapping .....	58
5.2.3. Detailed Class Diagram.....	60
5.2.3.1 Class Diagram Description.....	61
5.2.4 Persistent Data Management .....	62
5.2.5 Access Control and Security.....	62
5.3 Packages .....	63
5.4 Algorithm Design.....	64
5.5. User Interface Design.....	64
5.6 user interface .....	65
Reference.....	66

## List of Table

Table 1: Deployment tool .....	7
Table 2: Business Rule 1.....	11
Table 3: Business Rule 2.....	11
Table 4: Business Rule 3.....	12
Table 5: Business Rule 4.....	12
Table 6: use case description for login.....	20
Table 7: use case description for user registration.....	21
Table 8: use case description for user registration.....	22
Table 9: use case description for Store Books Online .....	23
Table 10: use case description for search for book.....	24
Table 11: use case description for read book online.....	25
Table 12: use case description for download book online.....	26
Table 13: use case description for notification .....	27
Table 14: use case description for manage book .....	28
Table 15: use case description for user management.....	29
Table 16: use case description for logout.....	30
Table 17: Data Dictionary for Administrator.....	32
Table 18: Data Dictionary for department head.....	32
Table 19: Data Dictionary for user .....	32
Table 20: Data Dictionary for Librarian .....	33
Table 21: Data Dictionary for Book .....	33
Table 22: Data Dictionary for notification.....	33
Table 23: class diagram detail.....	61
Table 24: for Access Control and Security .....	63



## List of Figure

Figure 1: literative model .....	6
Figure 2: exist book shelves system.....	10
Figure 3:exist book search system .....	10
Figure 4: exist book limitation.....	10
Figure 5: exist book borrow system.....	10
Figure 6: use case diagram.....	19
Figure 7: class diagram .....	31
Figure 8: sequence diagram for login .....	34
Figure 9: sequence diagram for create account.....	35
Figure 10: sequence diagram for user registration.....	36
Figure 11: sequence diagram for store book online.....	37
Figure 12: sequence diagram for search book .....	38
Figure 13: sequence diagram for read book online.....	39
Figure 14: sequence diagram for download book.....	40
Figure 15: sequence diagram for notification .....	41
Figure 16: sequence diagram for manage book .....	42
Figure 17: sequence diagram for manage user.....	43
Figure 18: sequence diagram for logout .....	44
Figure 19: activity diagram.....	45
Figure 20: activity diagram for login.....	46
Figure 21: activity diagram for user registration .....	47
Figure 22: activity diagram for store book.....	48
Figure 23: activity diagram for search book.....	49
Figure 24: activity diagram for read and download book.....	50
Figure 25: activity diagram for book and user management .....	51
Figure 26:state chart diagram for login.....	52
Figure 27: state chart diagram for user registration .....	53
Figure 28: state chart diagram for manage book.....	54
Figure 29:state chart diagram for user management.....	55
Figure 30: propose system architecture .....	57
Figure 31: class diagram detail .....	60
Figure 32: user interface design diagram.....	64
Figure 33: home page.....	65
Figure 34: login page .....	65
Figure 35: user registration form .....	65

## List of Acronyms

<b>Admin:</b>	Administrator
<b>ARU:</b>	Arsi university
<b>BR:</b>	Business Rules
<b>CSS:</b>	Cascading Style Sheets
<b>DB:</b>	Database
<b>GUI:</b>	Graphical user interface
<b>HTML:</b>	Hypertext Markup Language
<b>JS:</b>	JavaScript
<b>MS:</b>	Microsoft
<b>MySQL:</b>	My Structured Query Language
<b>PHP:</b>	Hypertext Preprocessor
<b>VS:</b>	Visual Studio
<b>XAMPP:</b>	Cross-Platform Apache MySQL PHP Perl
<b>UAT:</b>	User Acceptance Testing
<b>UC:</b>	use case
<b>UML:</b>	Unified Modeling Language

## ABSTRACT

The intention of this project is to develop a supplemental web-based online bookstore system for ARU University. The current ARU bookstore system in library is physical bookstore system manages educational resources manually but this physical bookstore system it has lacks electronic books and digital access. This creates delays in providing timely book availability and burdens students with slow searches. The Web-Based Online Book Store System is an online portal to coordinate book supply and student demand. Its purpose is to bring an online advantage for students, allowing them to search by title, author, and department, read books and download books based on availability introducing e-books to ARU. Rules require user authentication, ban redistribution, and uphold copyright. The system offers details on books, publishers, and authors to improve access for ARU University students.

## CHAPTER ONE

### INTRODUCTION

In today's digital time, the way we find and use reading materials has changed dramatically. The Web-Based Online Book Store System is an important step forward in making books and academic resources more accessible for students (Haleem et al., 2022). Traditional bookstores and simple online platforms have been around for a long time, but they often don't fully meet the needs of students. For example, at ARU University, students face problems like limited book choices, outdated textbooks, and bookstores that are not open when they need them. These challenges make it harder for students to get the materials they need for their studies.

To address these issues, we are developing a Web-Based Online Book Store System designed specifically for ARU University students. This platform will act as a digital bookstore system, offering free access to a wide range of reading materials without requiring purchases. Students will be able to easily browse, search, and read books, download including textbooks, literature, and reference, guide materials, anytime they want. With a simple, user-friendly design and powerful search features, this system will help students quickly find the resources they need.

### 1.1 BACKGROUND OF THE PROJECT

ARU University, a public university in Ethiopia's Oromia region, was established in 2006 to advance higher education and contribute to national development. Located in Asella City, it operates three campuses and offers a variety of undergraduate and postgraduate programs in natural and social sciences, focusing on advanced knowledge and research. The university also provides a physical bookstore system to support student access to academic resources. However, this system faces challenges such as outdated textbooks, inefficient search processes, and high operational costs.

### 1.2 STATEMENT OF THE PROBLEM

The current bookstore system at ARU University operates as a traditional physical store, which creates several challenges for students and staff. While the bookstore provides access to textbooks and reference materials, it lacks the efficiency and convenience of a modern digital system. The existing system does not support online searching, read and downloading of books, making it difficult for students to access resources quickly and efficiently.

So, we have identified the following problems in the existing system:

- **Outdated Textbooks:** The bookstore often stocks older editions of books, which may not meet the current academic requirements of students.
- **Inefficient Search Process:** Finding books in a physical store is time-consuming and lacks the convenience of quick online searches. Students often spend significant time locating the books they need, which could be better spent on their studies.
- **Limited Accessibility:** Students can only access the bookstore during specific operating hours, which may not align with their schedules. This limitation restricts their ability to obtain necessary materials at their convenience.
- **High Operational Cost:** Running a physical bookstore requires significant manpower for tasks such as stocking shelves, managing inventory, and assisting customers. Additionally, the system generates a large volume of paperwork, which is both resource-intensive and environmentally unfriendly.
- **Difficulty in Tracking Demand:** The bookstore cannot easily track which books are in high demand and which are rarely requested. This makes it challenging to manage inventory effectively and ensure that students have access to the most needed materials.
- **No Real-Time Inventory Updates:** The inventory system cannot show the total number of books categorized by department or subject in real-time. This makes it difficult for students to know which books are available before visiting the bookstore.

These issues highlight the need for a more efficient and modern solution to improve access to academic resources for ARU University students. The proposed Web-Based Online Book Store System aims to address these challenges by providing a digital platform for students to easily browse, borrow, and access books anytime and from anywhere.

## 1.3 OBJECTIVES

### 1.3.1 General Objective of the project

The general objective of this project is to develop an online bookstore system.

### 1.3.2 Specific Objective of the project.

- Gathering requirements for the online bookstore system.
- Identifying and defining problems in the existing bookstore system.
- Analyzing the current physical bookstore system.
- Identifying functional and non-functional requirements.

- Designing an interactive web-based bookstore interface for users.
- Creating a database to store book records and user profiles.
- Coding and testing the new system.
- Implementing the online bookstore system.
- Deploying the system for ARU University.

## 1.4 Feasibility Analysis

To bring the successful completion of this project's goals and objectives, the feasibility issues listed below have determined the project's viability through the discipline of planning, organizing, and managing resources.

### 1.4.1 Technical feasibility

Technical feasibility considers both the hardware and software requirements. We must determine whether the required technology and proposed equipment have the capacity to store the data used in the project. The system will be developed using web development techniques, as the group members are familiar with the tools and methodologies (e.g., HTML, CSS, JS, PHP, MySQL, and XAMPP server) required to build this system for data collection, coding, and implementation. The team possesses the necessary skills to complete the project, making it technically feasible.

### 1.4.2 Operational feasibility

The system will provide adequate throughput at the desired time to the users and deliver needed information in a timely and usefully formatted way. It will include security features to grant access privileges by providing accounts for authorized users, such as students and administrators. The system will offer help descriptions to guide users on how to navigate and utilize its features. Any technical modifications or updates to the system will be managed by the developers, ensuring smooth operation and adaptability to user needs.

## 1.5 SIGNIFICANCE AND BENEFICIARY OF THE PROJECT

### 1.5.1 Significance of the Project

The current bookstore system at ARU University relies heavily on physical operations, which limits accessibility and efficiency. Developing an online bookstore system will bring significant benefits from multiple perspectives. For students, it provides instant access to a wide range of up-to-date books and resources, eliminating the need for physical visits and saving time. The system offers a user-friendly interface with powerful search capabilities, allowing users to find books by title, author, or department effortlessly. For the university, it reduces operational costs associated

with manpower and paperwork, while improving inventory management through real-time updates. This digital platform enhances resource availability, supports academic success, and promotes environmental sustainability by reducing paper usage.

### 1.5.2 Beneficiaries of the Project

Several groups will benefit from this system. The primary beneficiaries are ARU University students, who will gain easy and convenient access to educational materials anytime and anywhere, enhancing their learning experience. The university itself will benefit from a modernized resource management system that improves efficiency and supports its academic mission. Additionally, the developers will enhance their technical skills, communication abilities, and problem-solving capabilities through the process of designing and implementing this system.

## 1.6 Scope and Limitation of the Project

### 1.6.1 Scope of the Project

- ✚ storing books online.
- ✚ Managing books (edit, delete, update).
- ✚ Registering users.
- ✚ Managing user info (edit, delete, update).
- ✚ Reading and downloading books.
- ✚ Granting administrator privileges.
- ✚ Generate notification.

### 1.6.2 Limitation of the Project

- ✚ Excluding book reviews and ratings.

## 1.7 The Methodology of the Project

This project involves building a dynamic web-based online bookstore system. To achieve our objectives, an appropriate software design methodology, the agile methodology, has been chosen. Agile allows for iterative development, breaking the project into smaller phases that build upon each other. We selected this approach because it enables flexibility, continuous user feedback, and early testing of ideas, reducing time spent on documentation and focusing more on design and implementation.

### 1.7.1 Data Collection Tools and Techniques

To fulfill the project's purpose, we gathered extensive information using various methods to understand the current bookstore system and its challenges. Primary data sources include interviews with students and library staff to capture their needs and experiences, and observation of the existing bookstore workflow to identify inefficiencies. Secondary data sources, such as online resources and tutorials from the internet, provide additional insights into available samples and development techniques, supporting the system's design and implementation.

### 1.7.2 System Analysis and Design

For system analysis and design, we employed specific tools and techniques. The Unified Modeling Language (UML) is used as the object-oriented modeling language to create diagrams such as use cases, class diagrams, and sequence diagrams, facilitating analysis and design phases. Tools like Draw.io and Microsoft Visio assist in visualizing these models.

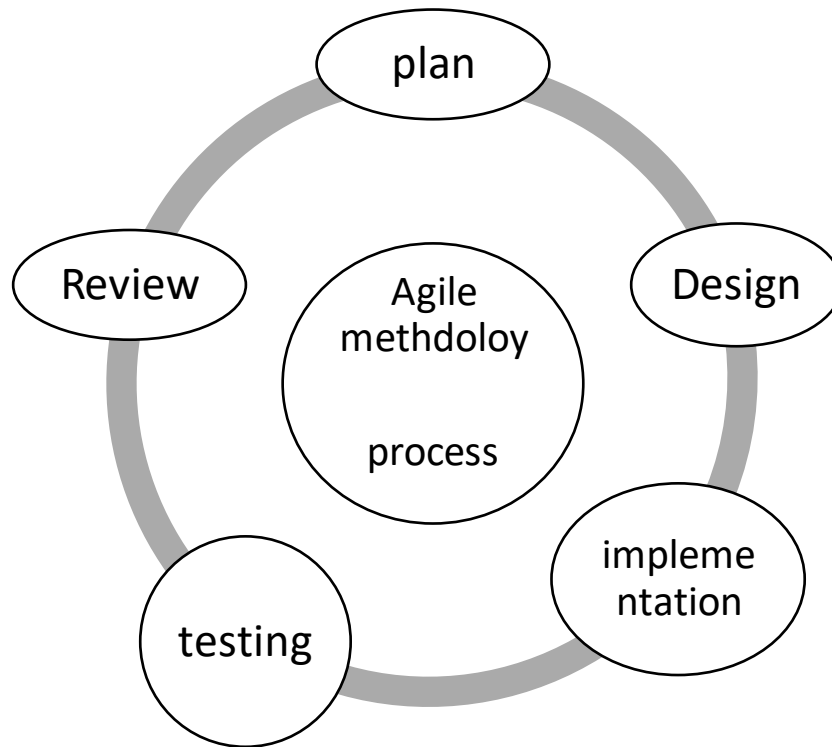
For interface design, we utilize VS Code editor to craft a responsive and user-friendly layout with HTML, CSS, and JS, ensuring the system meets user expectations and technical requirements effectively.

### 1.7.3. System Development Models

The development method chosen for this Online Book Store System is the agile methodology. Agile is an iterative and incremental approach that emphasizes flexibility, collaboration, and continuous improvement throughout the development process. This model is ideal for our project as it allows us to break the development cycle into smaller, manageable phases, enabling us to adapt to changing requirements and incorporate user feedback effectively

The Agile process involves repeated cycles of.





*Figure 1: Iterative model*

#### 1.7.4. System Testing Methodology

To ensure the "Web-Based Online Book Store System for ARU University" meets its functional and non-functional requirements, we will adopt a comprehensive testing methodology across multiple levels

- **Unit Testing:** Tests individual parts (e.g., login, search) alone using PHP Unit to ensure they work right, like checking if search finds the correct book.
- **Integration Testing:** Checks if parts work together smoothly by testing user actions, catching connection issues early.
- **System Testing:** Tests the whole system with real scenarios.
- **UAT:** Real users (students, Library staff) test the system to see if it's easy and useful.

### 1.8. System Development Tools and Techniques

The team plan to use the following software Development tools for the development of the system among different available tools.

Activities	Tools
Documentation	Microsoft Word 2010
Code Editing	Visual Studio
Database Server	MySQL (via XAMPP)
Web Server	Apache (via XAMPP)
Client-Side scripting	JavaScript
Back-end Implementation	PHP
Interface Design	HTML, CSS
Diagramming	Draw.io, MS Visio
Presentations	Microsoft PowerPoint

*Table 1: Deployment tool*

## CHAPTER TWO

### 2. DESCRIPTION OF EXISTING SYSTEM

#### 2.1 Introduction of existing system

The current bookstore system at ARSI University operates as a traditional physical bookstore located on campus, managed by university library staff to provide students and college with access to academic resources such as textbooks, reference books, and supplementary materials. This system relies heavily on manual processes for inventory management, book lending, and record-keeping, with no digital platform for online access or transactions. While it serves the basic purpose of distributing educational materials, it lacks modern features like online browsing real-time inventory updates, which limits its efficiency and convenience for users.

#### 2.2. Users of Existing System

The existing bookstore system at ARU University involves several key users who perform distinct activities to manage and access resources.

1. **Library Director:** The Director oversees the entire library operation, ensuring that all services run smoothly and efficiently. They set policies, manage budgets, and make high-level decisions to maintain the system's effectiveness.
2. **Group Leader:** The Group Leader manages a specific team within the library. They coordinate activities, ensure that tasks are completed efficiently, and serve as a liaison between the library staff and the Director, keeping workflows aligned with university goals.
3. **Catalog Arranger:** Catalog Arrangers are responsible for organizing and maintaining the library's collection. They categorize books by subject or department, update the catalog system, and ensure that materials are easily accessible to users on the shelves.
4. **Book Borrower:** Book Borrowers manage the lending process. They check books in and out, track borrowing records using manual logs or basic systems, and ensure that all materials are returned on time, issuing reminders for overdue items.
5. **Acquisition Officer:** The Acquisition Officer handles the procurement of new books and resources. They work with publishers, review faculty requests, and ensure the library's collection stays current and relevant to academic needs.

6. **Reference Librarian:** Reference Librarians assist students and faculty with research. They guide users to specific books or journals, provide expertise on academic resources, and help navigate the library's limited catalog for complex inquiries.
7. **Maintenance Staff:** Maintenance Staff keep the physical space functional. They shelve returned books, repair damaged materials, and ensure the library remains clean and organized for users to access resources comfortably.
8. **Users:**
  - Visiting the bookstore during operating hours.
  - Browsing available titles on shelves.
  - Selecting required textbooks for studies.

## 2.3 Major Function of Existing Systems

The existing bookstore system at ARSI University is a physical operation designed to provide students and collage with access to academic books for educational purposes. It relies on manual processes managed by Library staff to support borrowing and resource availability. The major functions of the current system are:

- **Book Acquisition:** Library Staff obtain books from university suppliers or publishers based on course requirements provided by collage, ensuring relevant materials are available for the reader and borrower.
- **Inventory Management:** The system tracks the number of books in stock using paper records or basic digital tools like spreadsheets.
- **Book Lending:** Students and collage members (instructor, other collage users) read, borrow books by visiting the bookstore, where staff record borrower details and due dates manually on forms.
- **User Support:** Library Staff assist users in finding books by answering inquiries and directing them to available resources.

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Figure 2: exist book shelves system

Figure 3: exist book search system

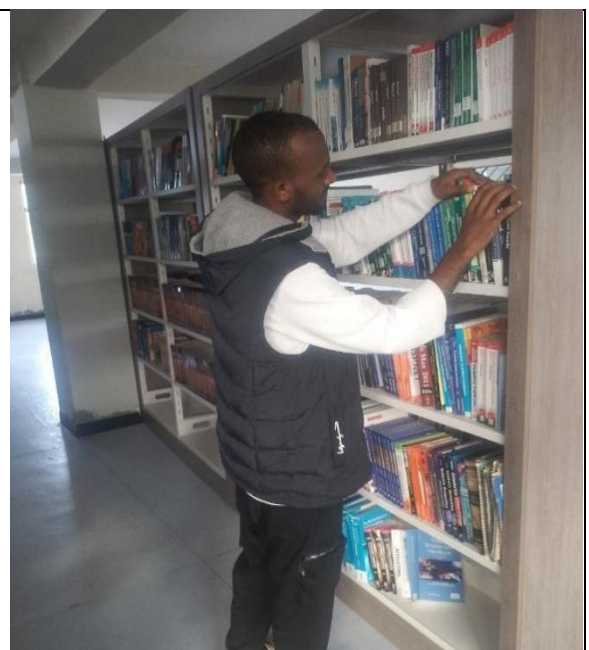


Figure 3:exist book search system



Figure 5: exist book borrow system

## 2.5. Drawbacks of the Existing System

The current physical bookstore system at ARU University has several issues that make it less helpful for students. Many books on the shelves are old and don't match what students need for their current classes. Finding a book is slow because students have to search through shelves by hand, and it's frustrating when the book they want isn't there. Even though the bookstore is open 24 hours, it's still hard to use because there is no online way to check what's available, so students must visit in person every time. Library Staff have to manage everything manually, like keeping track of books and recording who borrows them, which takes a lot of work and can lead to mistakes.

## 2.6. Business Rules of the Existing System

Business rules define the policies and procedures that govern the current physical bookstore system at ARSI University, ensuring students and college users can access academic materials for reading and borrowing. These rules maintain an organized approach to resource sharing within the university community. Below are the key business rules:

Name	Access Eligibility
ID	BR1
Description	Only registered ARSI University students and collage Employer can read or borrow books from the bookstore.

Table 2: Business Rule 1

Name	Borrowing Limit
ID	BR 2
Description	Each user can borrow up to 5 books based on the book availability books at a time to ensure fair access to borrowing while allowing others to read in-store.

Table 3: Business Rule 2

<b>Name</b>	Return Deadline
<b>ID</b>	BR 3
<b>Description</b>	Borrowed books must be returned within a given days (1week - 1 semester), while reading in the bookstore has time limit.

*Table 4: Business Rule 3*

<b>Name</b>	Inventory Update
<b>ID</b>	BR 4
<b>Description</b>	Library Staff must manually update the inventory record after every borrowing or return, and note books reserved for in-store reading

*Table 5: Business Rule 4*

These rules ensure that the bookstore supports both borrowing books to take away and reading them on-site, balancing availability and access.

## CHAPTER THREE

### 3. PROPOSED SYSTEM

#### 3.1. System Description

The Web-Based Online Book Store System for ARU University is a web-based platform designed to modernize the current physical bookstore by enabling students and college to access academic books digitally copies from anywhere with an internet connection. This system allows users to search for books, read them online digital copies, and download them to their devices, offering a flexible and convenient alternative to the traditional setup. It aims to streamline how the university community interacts with educational resources like textbooks, reference books, and study materials.

#### System Features

- ❖ **User Management:** Students and Collage user register and log in with secure accounts to use the system.
- ❖ **Book Browsing and Reading:** Users can search books by title, author, or department and read them directly on the platform.
- ❖ **Downloading:** Users can download books to their devices for offline access with no limitation on the number, making resources fully available anytime.
- ❖ **Notifications:** Automated announce new books add on the system.

#### Benefits

- ❖ **Anytime Access:** Users can read or download books 24/7, not limited by physical bookstore hours.
- ❖ **Convenience:** Fast searches and the option to download books save time and effort for studying.
- ❖ **Wider Reach:** Digital copies mean more users can access books at once, whether reading online or downloading.
- ❖ **Simplified Management:** Staff can update the digital collection easily, reducing manual record-keeping.



### 3.2. Functional Requirements of Proposed System

Functional requirements define what the System must do to meet the needs of its users. The following are the key functionalities:

- User Registration and Login: The system must allow students and college employer to create accounts with unique usernames and passwords, and log in to access features like reading and downloading books.
- Search for Books: Users can search the database for books by title, author, or department, retrieving a list of matching results to read or download.
- Read Books Online: The system must enable users to view and read book content directly on the platform without needing to download them.
- Download Books: The system must allow users to download books as digital files (e.g., PDFs) to their devices for offline access, ensuring flexibility in studying.
- Manage Book Inventory: administrator and librarian can add new books, update existing records and
- Generate Notifications: The system sends automated notification when the system adds new books.
- View Book Details: Users can access information about each book, such as author, department, and availability status, to decide whether to read or download it.

### 3.3 Non-functional Requirements

The non-functional requirements of the "Web-Based Online Book Store System for Arsi University" describe how well the system delivers its services to users, ensuring it is efficient, secure, and easy to use for students, college, and staff accessing academic books.

#### 3.3.1. User Interface and Human Factors

The system will feature a clean and simple web interface, allowing users to quickly search, read or download books without confusion. It must be easy to navigate, with clear buttons and labels, so even users with little computer experience can use it comfortably.

#### 3.3.2. Hardware Consideration

The system requires a strong server with high memory and fast processing to support many users reading or downloading books at once. On the user side, it will work on common devices like laptops, tablets, or phones with a stable internet connection.

### 3.3.3. Security Issues

The system must protect user data, like login details, with secure encryption and limit access based on roles: staff can manage books, while students and college users can only read or download. This keeps the system safe from unauthorized changes or data leaks.

### 3.3.4. Performance Consideration

The system should load book searches and pages fast, within a few seconds, even when many users are online during busy times like exams. It must handle downloading and reading smoothly to keep users from waiting too long.

### 3.3.5. Error Handling and Validation

If a user makes a mistake, like typing a wrong password the system will show a clear error message and let them try again. It will check inputs to stop errors, ensuring actions like downloading work correctly.

### 3.3.6. Quality Issues

The system must stay online and work well almost all the time, so users can rely on it for reading or download books whenever they need. It should also adjust to different screen sizes and browsers for a consistent experience.

### 3.3.7. Backup and Recovery

All book files and user data will be backed up every day to a safe place, so if something goes wrong, like a server crash, the system can be fixed quickly with no data lost. Administrator can restore everything within a short time.

### 3.3.8. Physical Environment

The server will be kept in a locked, cool room at the university to protect it from damage or theft. Users can access the system from anywhere classrooms, dorms, or home as long as they have internet.

### 3.3.9. Resource Issues

The system must support many users at once, like 500 students downloading or reading during peak times, without slowing down. It should also work well on the university's network, even if the internet isn't super-fast.

### 3.3.10. Documentation

The system will come with easy guides for users on how to read or download books, and for staff on how to add or update books. This helps everyone use it properly and supports future improvements by developers.

## CHAPTER FOUR

### 4. SYSTEM ANALYSIS

#### 4.1 system Model

This section presents key scenarios for the Web-Based Online Book Store System at Arsi University detailing interactions between actors Admin, Department Head, Librarian, and User (students and college employers) and the system. Each scenario outlines the actor's steps and the system's responses, turning the outdated physical bookstore into a vibrant digital platform for book access and management.

#### **Main actor on the system.**

1. Admin
2. Department head
3. Librarian
4. student

#### **scenario name: login**

First, the actor (Admin, Department Head, Librarian, or User) visits the system's login page. The actor enters their username and password in the fields. Upon clicking "Login," the system checks the credentials. If valid for a User, it opens the user dashboard. If valid for a Librarian, it loads the librarian dashboard. If valid for a Department Head, it shows the department head dashboard. If valid for an Admin, it directs to the admin dashboard. If invalid, an error message appears, urging re-entry.

#### **Scenario Name: Create Account**

First, the Admin logs into the system and heads to the "Create Account" section on the admin dashboard. The admin selects "Add Account." The system presents a form, and the Admin enters details like name, email, username, password, and role (Department Head or Librarian). After clicking "Submit," the system verifies the data. If correct, it creates the new account and shows a confirmation message stating the account is active.

**Scenario Name: User Registration**

First, the Department Head logs into the system. Once logged in, the Department Head clicks the "Register User" link on the department head dashboard. The system displays a form. The Department Head fills in User details name, email, and password and submits it. The system validates the input. If accurate, it registers the User and displays a success message.

**Scenario Name: Store Books Online**

First, the Librarian logs into the system and moves to the "Add Book" section. The Librarian picks "Add Book." The system shows a form for book details title, author, and department. After entering the info and clicking "Submit," the system checks the data. If valid, it adds the book to the inventory, confirms the addition with a message, and triggers a notification to all Users about the new book.

**Scenario Name: Manage Books**

First, the Librarian logs into the system and accesses the "Manage Books" section on the librarian dashboard. The Librarian chooses to edit or delete a book from the list. The system allows updates or removal. After submitting changes, the system applies them to the inventory and confirms the action with a message.

**Scenario Name: Search for Books**

First, the User logs into the system and finds the search bar on the user dashboard. The User types in criteria like title or author. Upon clicking "Search," the system fetches matching books. If found, it lists them for further action. If not, an error message prompts a new search.

**Scenario Name: Read Books Online**

First, the User logs into the system and chooses a book from the list. The User clicks "Read Online." The system loads the book in the browser. The User navigates its pages. If unavailable, an error message suggests another choice.

**Scenario Name: Download Book**

First, the User logs into the system and selects a book. The User clicks "Download." The system readies the file and prompts a save. After confirmation, it completes the download and confirms success.

**Scenario Name: Notification**

First, the Librarian adds a new book through the "Store Books Online" process. The system automatically generates a notification about the new book. The system sends this notification to all Users, displaying it on their main page.

**Scenario Name: Logout**

First, the actor (Admin, Department Head, Librarian, or User) logs into the system and finds the "Logout" button on their dashboard. The actor clicks it. The system ends the session, clears data, and redirects to the login page with a success message.

**4.1.1 Use Case Model**

The second step in system analysis is to build the use case model, which visually depicts the Web-Based Online Book Store System's interactions with its external environment. The main actors are Admin, Department Head, Librarian, and User (students and college employers), each with unique roles. Users log in, search for books, view books, read online, and download, while Admins create accounts for Department Heads and Librarians, manage books, users, and notifications. Department Heads register and manage Users, and Librarian's store and manage books. Key use cases include Login, where actors authenticate and access dashboards; Create Account, where Admin registers Department Heads and Librarians; User Registration, for Department Heads to add Users; Store Books Online, allowing Librarians to add books; Manage Books, for Admin and Librarians to edit/delete books; Manage Users, for Admin and Department Heads to update/delete Users; Search for Books, where Users query by title or author; View Books, for Users to browse the catalog; Read Books Online, letting Users read in-browser; Download a Book, enabling Users to save books; Notification, where Admin sends updates; and Logout, ending sessions. These use cases ensure smooth system interactions for an effective online bookstore.

**4.1.1.2 Proposed System Use Case Diagram**

The proposed system use case diagram provides a detailed representation of the Web-Based Online Book Store System, incorporating all major functionalities and interactions between actors and the system.

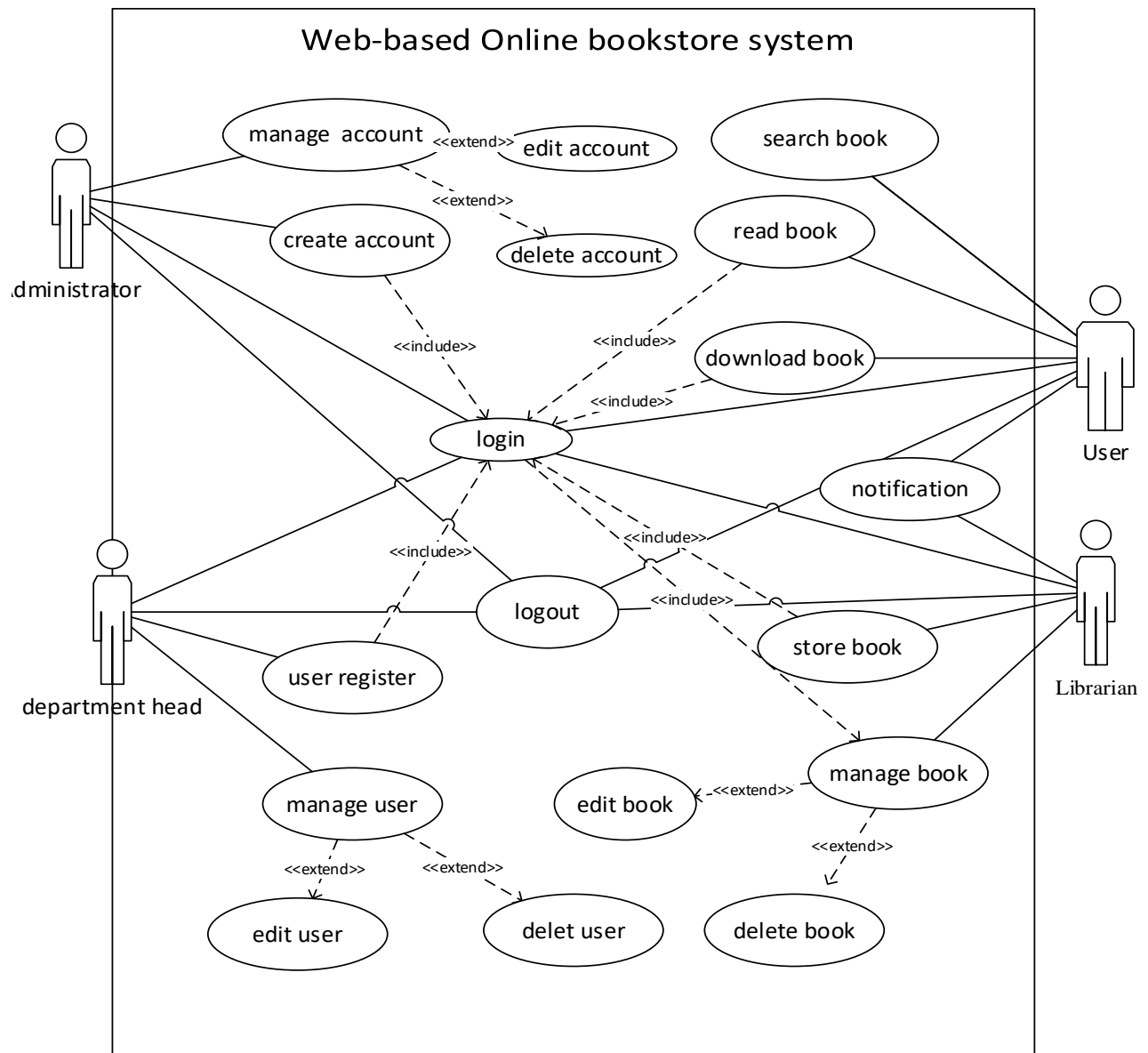


Figure 6: use case diagram

#### 4.1.1.3. Use Case Documentation

<b>Use Case ID</b>	<b>UC#1</b>	
<b>Use Case Name</b>	<b>Login</b>	
<b>Actors</b>	student, Administrator, department head, librarian	
<b>Description</b>	This use case describes the process for users to authenticate and access the online bookstore system.	
<b>Goal</b>	To ensure that only authorized users can interact with the system.	
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• The user must have valid login credentials.</li> <li>• The user must navigate to the login page.</li> </ul>	
<b>Basic Flow of Actions</b>	<b>Actor</b>	<b>System Responses</b>
	<b>Step1:</b> User navigates to the login page. <b>Step3:</b> User enters their username and password. <b>Step5:</b> User clicks the "Login" button <b>Step7:</b> User is redirected to their respective dashboard based on their role (Student or Administrator).	<b>Step2:</b> Displays the login interface. <b>Step4:</b> Captures the input data. <b>Step6:</b> Verifies the credentials.  1. If valid, proceeds to the next step. 2. If invalid, displays an error message and prompts for re-entry.  <b>Step8:</b> Displays the appropriate dashboard.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• User gains access to their main screen.</li> <li>• User is logged into the system.</li> </ul>	
<b>Alternative Actions</b>	If the username or password is invalid, the system prompts the user to re-enter their credentials.	

Table 6: use case description for login

<b>Use Case ID</b>	<b>UC#2</b>	
<b>Use Case Name</b>	<b>Create Account</b>	
<b>Actors</b>	Admin	
<b>Description</b>	This use case describes the process for the admin to create new accounts for Department Heads and Librarians in the online bookstore system.	
<b>Goal</b>	To enable the admin to register new Department Heads and Librarians, granting them access to the system based on their roles.	
<b>Preconditions</b>	Admin must be logged into the system. Admin must have the necessary details (name, email, username, password, and role) for the new account.	
	<p>Step 1: Admin navigates to the "Create Account" section on the admin dashboard.</p> <p>Step 3: Admin selects the "Add Account" option.</p> <p>Step 5: Admin fills in the required fields.</p> <p>Step 7: Admin clicks the "Submit" button.</p>	<p>Step 2: Displays the "Create Account" interface.</p> <p>Step 4: Presents a form for entering account details.</p> <p>Step 6: Captures the input data and validates it. If valid, proceeds to the next step. If invalid, displays an error message indicating the issue.</p> <p>Step 8: Creates the new account and confirms success with a message stating the account is active.</p>
<b>Post Conditions</b>	A new account for the Department Head or Librarian is created and available for login. Admin receives confirmation of the successful account creation.	
<b>Alternative Actions</b>	If the input data is invalid (e.g., duplicate username or missing fields), the system displays an error message and prompts the admin to correct the information.	

*Table 7: use case description for user registration*



<b>Use Case ID</b>	<b>UC#3</b>	
<b>Use Case Name</b>	<b>User Registration</b>	
<b>Actors</b>	Department head	
<b>Description</b>	This use case allows an department head to register a new user in the system.	
<b>Goal</b>	To enable new users to create accounts for accessing the online bookstore.	
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• Department head must be logged into the system.</li> <li>• Department must have user details ready for registration.</li> </ul>	
<b>Basic Flow of Actions</b>	<b>Actor</b>	<b>System Responses</b>
	<b>Step1:</b> department head selects the "Register User" option from the dashboard. <b>Step3:</b> department fills in the required fields (name, email, and password). <b>Step5:</b> department head clicks the "Submit" button. <b>Step7:</b> System creates a new user account with a unique username and password.	<b>Step2:</b> Displays the registration form. <b>Step4:</b> Captures the input data. <b>Step6:</b> Validates the input data. <ol style="list-style-type: none"> <li>1. If valid, proceeds to the next step.</li> <li>2. If invalid, displays an error message indicating the issue.</li> </ol> <b>Step8:</b> Confirms successful registration to the administrator.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• A new user registration is created and available for login.</li> <li>• User receives confirmation of registration.</li> </ul>	
<b>Alternative Actions</b>	If registration fails due to invalid input, the system displays an error message indicating the issue.	

Table 8: use case description for user registration

<b>Use Case ID</b>	<b>UC#4</b>	
<b>Use Case Name</b>	<b>Store Books Online</b>	
<b>Actors</b>	librarian	
<b>Description</b>	This use case allows an librarian to add new books to the online bookstore inventory.	
<b>Goal</b>	To maintain an updated collection of books in the system.	
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>librarian must be logged into the system.</li> <li>librarian must have book details prepared (title, author, department).</li> </ul>	
<b>Basic Flow of Actions</b>	Actor	System Responses
	<b>Step1</b> librarian selects the "Add Book" option. <b>Step3:</b> librarian enters the required book information (title, author, and department). <b>Step5:</b> librarian clicks the "Save" button. <b>Step7:</b> System saves the book information to the database	<b>Step2:</b> Displays the form for entering book details. <b>Step4:</b> Captures the input data. <b>Step6:</b> Validates the input data. <ol style="list-style-type: none"> <li>If valid, proceeds to the next step.</li> <li>If invalid, displays an error message indicating missing or incorrect information.</li> </ol> <b>Step8:</b> Confirms the addition of the book to the inventory.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>The new book is available for users to search and borrow.</li> <li>The inventory is updated accordingly.</li> </ul>	
<b>Alternative Actions</b>	If any required information is missing, the system prompts the administrator to complete it.	

Table 9: use case description for Store Books Online

<b>Use Case ID</b>	<b>UC#5</b>	
<b>Use Case Name</b>	<b>Search for Books</b>	
<b>Actors</b>	User	
<b>Description</b>	This use case enables users to search for books within the online bookstore based on various criteria.	
<b>Goal</b>	To facilitate easy access to book information for users.	
<b>Preconditions</b>	<ul style="list-style-type: none"> <li>• User must be logged into the system.</li> <li>• User must navigate to the search feature.</li> </ul>	
<b>Basic Flow of Actions</b>	<b>Actor</b>	<b>System Responses</b>
	<p><b>Step1:</b> User navigates to the search bar on the dashboard.</p> <p><b>Step3:</b> User enters search criteria (title, author, or keyword).</p> <p><b>Step5:</b> User clicks the "Search" button.</p> <p><b>Step7:</b> System displays a list of matching books with options to read online or download.</p>	<p><b>Step2:</b> Displays the search interface.</p> <p><b>Step4:</b> Captures the input data.</p> <p><b>Step6:</b> Processes the search query, retrieving matching books from the database</p> <p><b>Step8:</b> Lists available options based on search results.</p>
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• User can view a list of available books based on the search criteria.</li> <li>• User has options to either read or download the books.</li> </ul>	

Table 10: use case description for search for book

<b>Use Case ID</b>	<b>UC#6</b>	
<b>Use Case Name</b>	<b>Read Books Online</b>	
<b>Actors</b>	User	
<b>Description</b>	This use case allows users to read a selected book online through the system.	
<b>Goal</b>	To provide instant access to book content for users.	
<b>Preconditions</b>	User must be logged in and have selected a book from the search results	
<b>Basic Flow of Actions</b>	Actor	System Responses
	<b>Step1:</b> User selects a book from the search results. <b>Step3:</b> System displays the book in a readable format in the browser. <b>Step5:</b> User reads the book online.	<b>Step2:</b> Loads the book content for online reading. <b>Step4:</b> Provides an interface for reading the book. <b>Step6:</b> Session may be tracked for history.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• User is able to read the book without needing to download it.</li> <li>• Reading session is tracked for user history.</li> </ul>	
<b>Alternative Actions</b>	If the book is unavailable for reading, the system displays an error message.	

Table 11: use case description for read book online

<b>Use Case ID</b>	<b>UC#7</b>	
<b>Use Case Name</b>	<b>Download a Book</b>	
<b>Actors</b>	User	
<b>Description</b>	This use case enables users to download a digital copy of a book for offline access.	
<b>Goal</b>	To allow users to access books without needing an internet connection.	
<b>Preconditions</b>	User must be logged in and have selected a book to download.	
<b>Basic Flow of Actions</b>	Actor	System Responses
	<b>Step1:</b> User selects the download option for a book. <b>Step3:</b> User clicks the "Download" button. <b>Step5:</b> User saves the file.	<b>Step2:</b> Prepares the digital file for download. <b>Step4:</b> Prompts the user to save the file to their device. <b>Step6:</b> Confirms the successful download.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• User has the book file downloaded and accessible offline.</li> <li>• Download history may be recorded.</li> </ul>	
<b>Alternative Actions</b>	If the download fails, the system notifies the user and suggests troubleshooting steps.	

Table 12: use case description for download book online

<b>Use Case ID</b>	<b>UC#8</b>	
<b>Use Case Name</b>	Notification	
<b>Actors</b>	librarian, User	
<b>Description</b>	This use case describes the process of automatically generating and displaying a notification to users when a new book is added or delete to the online bookstore system.	
<b>Goal</b>	To inform users about the addition of new books or delete book in the system, enhancing their awareness of available resources.	
<b>Preconditions</b>	A new book must have been successfully added or book delete book to the system by the librarian through the "Store Books Online" process.	
<b>Basic Flow of Actions</b>	<b>Actor</b>	<b>System Responses</b>
	<p>Step1: librarian adds a new book delete book via the "Store Books Online" process.</p> <p>Step 3: Users access the system (e.g., log in or visit the main page).</p>	<p>Step 2: Detects the addition of the new book/delete book and initiates the notification process.</p> <p>Step 4: Generates a notification with details such as the book's title and author.</p> <p>Step 6: Displays the notification on the main page or a designated announcements section for all users.</p>
<b>Post Conditions</b>	Users are informed of the new book and can search, read, or download it. The notification remains visible until dismissed or expires, based on system configuration.	
<b>Alternative Actions</b>	if the notification fails to generate (e.g., due to system error), the system logs the issue for administrator review, and users are not notified until resolved	

Table 13: use case description for notification

<b>Use Case ID</b>	<b>UC#9</b>	
<b>Use Case Name</b>	<b>Manage Books</b>	
<b>Actors</b>	librarian	
<b>Description</b>	This use case allows the librarian to manage the book inventory, including adding, editing, or deleting books.	
<b>Goal</b>	To keep the book collection accurate and updated in the system.	
<b>Preconditions</b>	librarian must be logged in.	
<b>Basic Flow of Actions</b>	Actor	System Responses
	<b>Step1:</b> librarian logs into the system and selects the "Manage Books" option. <b>Step3:</b> librarian views the list of existing books. <b>Step5:</b> librarian selects a book to edit or delete.	<b>Step2:</b> Displays the list of existing books. <b>Step4:</b> Allows selection of a book to edit or delete. <b>Step6:</b> Displays the book's details for editing. <b>Step7:</b> Confirms the updates or deletion.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• The book inventory is updated accordingly.</li> <li>• Changes are reflected in the system for all users.</li> </ul>	
<b>Alternative Actions</b>	If an error occurs during the update, the system displays a message indicating the issue.	

Table 14: use case description for manage book

<b>Use Case ID</b>	<b>UC#10</b>	
<b>Use Case Name</b>	<b>User Management</b>	
<b>Actors</b>	Department head	
<b>Description</b>	This use case allows the Department head to manage user accounts, including editing and deleting user details.	
<b>Goal</b>	To maintain accurate user information within the online bookstore system.	
<b>Preconditions</b>	Department head must be logged in.	
<b>Basic Flow of Actions</b>	Actor	System Responses
	<b>Step1:</b> Department head navigates to the user management section. <b>Step3:</b> Department head views the list of registered users <b>Step5:</b> Department head selects a user account to edit or delete.	<b>Step2:</b> Displays the list of registered users. <b>Step4:</b> Allows selection of a user account to edit or delete <b>Step6:</b> Displays the user's details for editing. <b>Step7:</b> Confirms the updates or deletion.
<b>Post Conditions</b>	<ul style="list-style-type: none"> <li>• User accounts are maintained accurately.</li> <li>• Changes are reflected in the system.</li> </ul>	
<b>Alternative Actions</b>	If the operation fails, the system notifies the administrator of the issue.	

*Table 15: use case description for user management*



<b>Use Case ID</b>	UC#11	
<b>Use Case Name</b>	Logout	
<b>Actors</b>	User, Administrator, Department head, librarian	
<b>Description</b>	This use case describes the process for users or administrators to securely end their session in the online bookstore system	
<b>Goal</b>	To allow User, Department head, librarian to terminate their active session, ensuring security and freeing system resources.	
<b>Preconditions</b>	The User, Administrator, Department head, librarian must be logged into the system.	
<b>Basic Flow of Actions</b>	Actor	System Responses
	Step 1: User, Administrator, Department head, librarian locates the "Logout" button in the navigation menu or profile section. Step 3: User or Administrator clicks the "Logout" button.	Step 2: Displays the logout option as part of the interface. Step 4: Terminates the active session and clears user-specific data from the current browser session. Step 6: Redirects the user or administrator to the login page.
<b>Post Conditions</b>	The User, Administrator, Department head, librarian logged out, and the session is terminated. The system returns to the login page, ready for a new session.	
<b>Alternative Actions</b>	If the logout process fails (e.g., due to a network issue), the system displays an error message and advises the user to try again or contact support.	

Table 16: use case description for logout

## 4.2. Object Model

Object Model encompasses the principles of abstraction, encapsulation, modularity, hierarchy, typing, concurrency and persistence. Object Model basically emphasizes on the *object* and *class*. And it represented in UML with class diagram.

### 4.2.1. Class Diagram

Class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagrams are widely used in the modeling of object-oriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages. Class diagram shows a collection of classes, interfaces, associations, collaborations, and constraints.

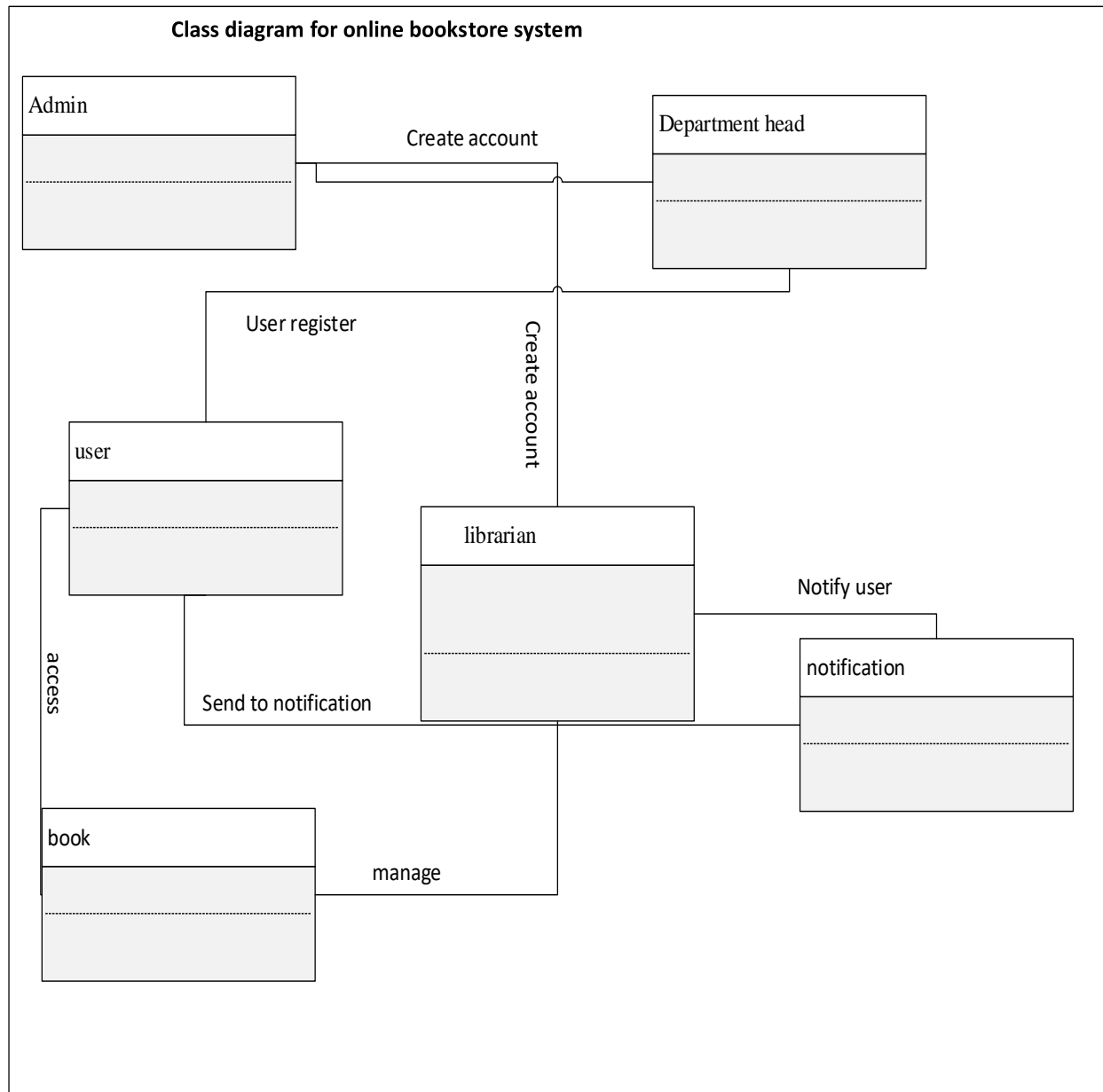


Figure 7: class diagram

#### 4.2.2. Data Dictionary

Data Element	Definition	Type	Constraints	Field size
username	Unique name for logging in as an administrator.	String	Required, unique	20
password	Administrator's password	String	Required, minimum 6 characters	20
name	Full name of the administrator.	String	Required	30

Table 17: Data Dictionary for Administrator

Data Element	Definition	Type	Constraints	Field size
username	Unique name for logging in as a Department Head.	String	Required, unique	20
password	Department head password for authentication	String	Required, minimum 6 characters	20
name	Full name of the Department Head.	String	Required	20

Table 18: Data Dictionary for department head

Data Element	Definition	Type	Constraints	Field size
username	Unique name for logging in as a user.	String	Required, unique	20
password	user password for authentication	String	Required, minimum 6 characters	20
name	Full name of the user.	String	Required	20

Table 19: Data Dictionary for user

<b>Data Element</b>	<b>Definition</b>	<b>Type</b>	<b>Constraints</b>	<b>Field size</b>
username	Unique name for logging in as a Librarian.	String	Required, unique	20
password	Librarian's password for authentication.	String	Required, minimum 6 characters	20
name	Full name of the Librarian.	String	Required	30

Table 20: Data Dictionary for Librarian

<b>Data Element</b>	<b>Definition</b>	<b>Type</b>	<b>Constraints</b>	<b>Field size</b>
title	Title of the book.	String	Required	
author	Author of the book.	String	Required	50
department	Department or category of the book.	String	Optional	30
availability	Availability status of the book.	Boolean	Default: true	20

Table 21: Data Dictionary for Book

<b>Data Element</b>	<b>Definition</b>	<b>Type</b>	<b>Constraints</b>	<b>Field size</b>
Notification-id	Unique identifier for notification	integer	Required, unique	20
message	Content of notification	String	Required	200
Date creates	Date and time notification was created	Date	Required	30
status	Status of notification	string	required	15

Table 22: Data Dictionary for notification

### 4.3. Dynamic Model

The dynamic model is used to express and model the behavior of the system over time. It includes support for activity diagrams, state diagrams, and sequence diagrams.

### 4.3.1. Sequence Diagram

Sequence Diagrams are interaction diagrams that detail how operations are carried out. They capture the interaction between objects in the context of a collaboration. Sequence Diagrams are time focus and they show the order of the interaction visually by using the vertical axis of the diagram to represent time what messages are sent and when.

Here is sequence diagram for the proposed system

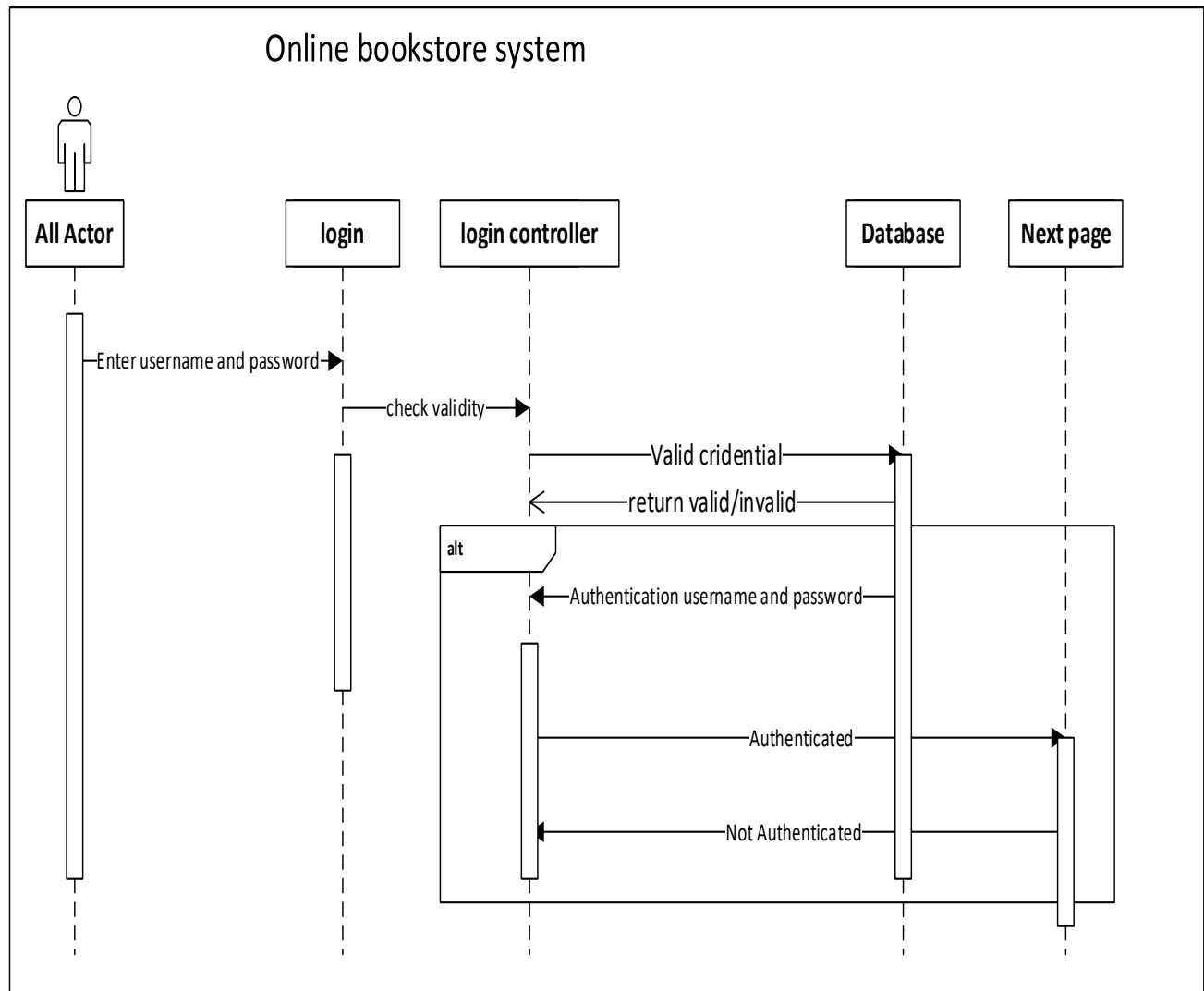


Figure 8: sequence diagram for login

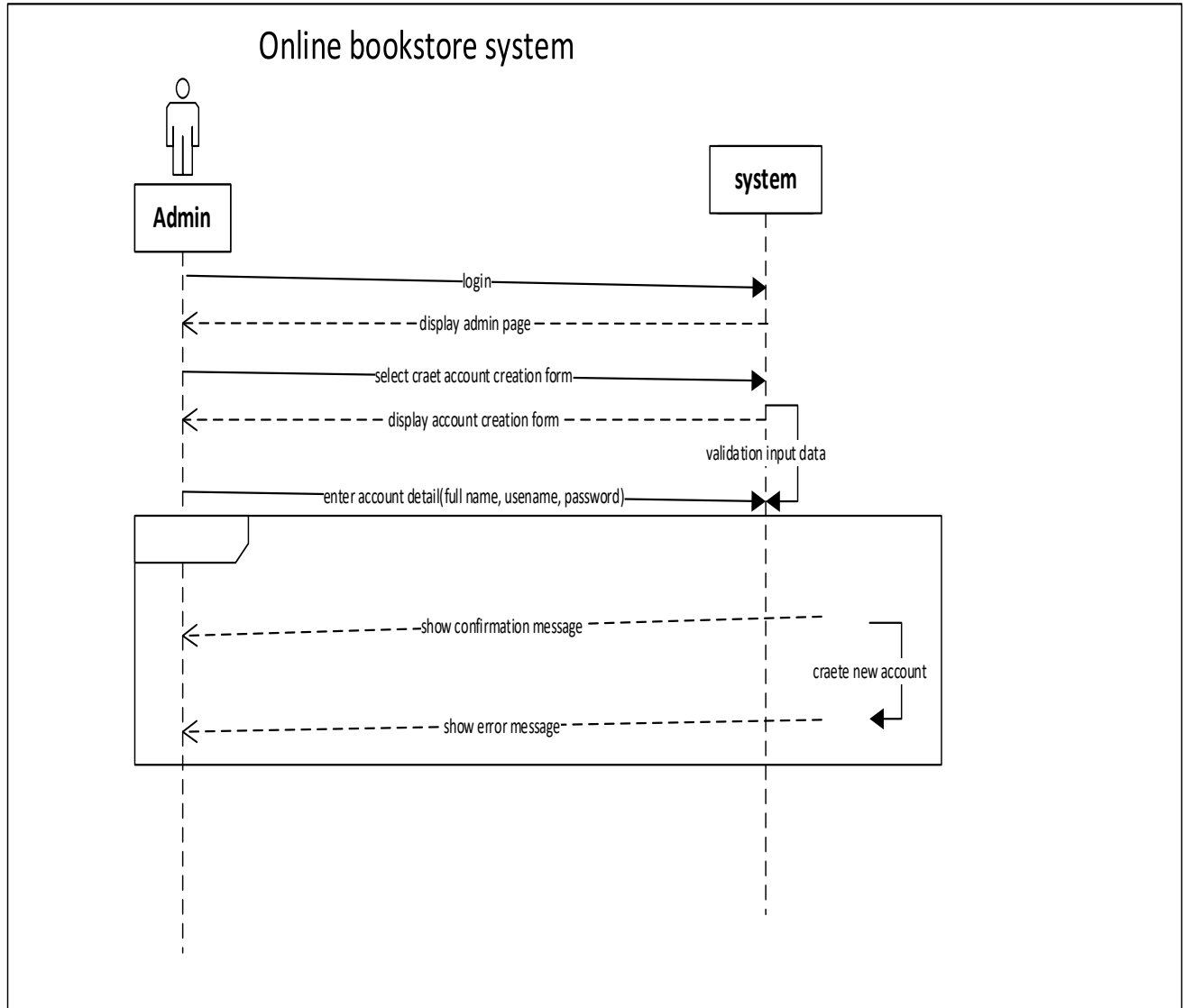


Figure 9: sequence diagram for create account

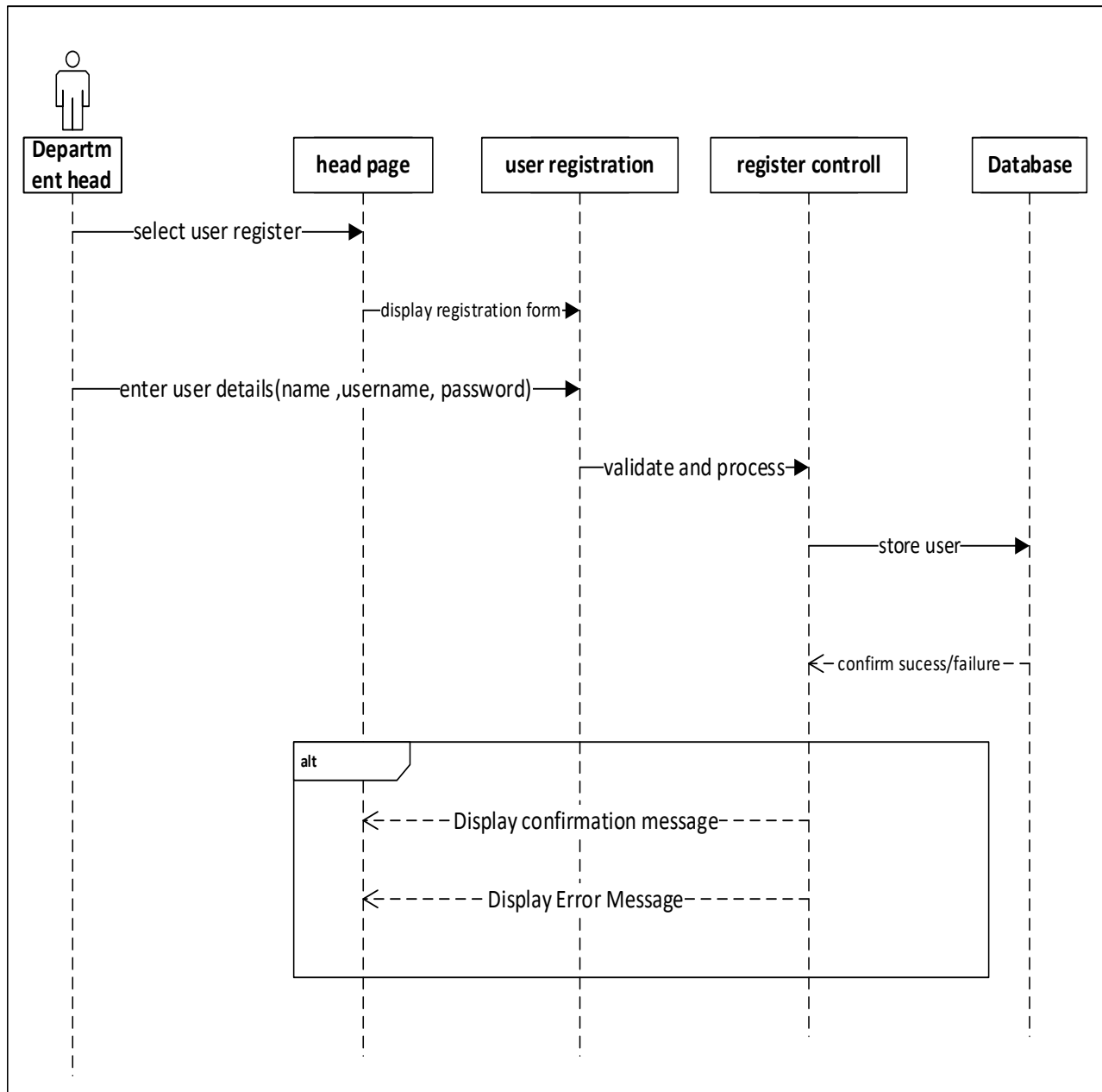


Figure 10: sequence diagram for user registration

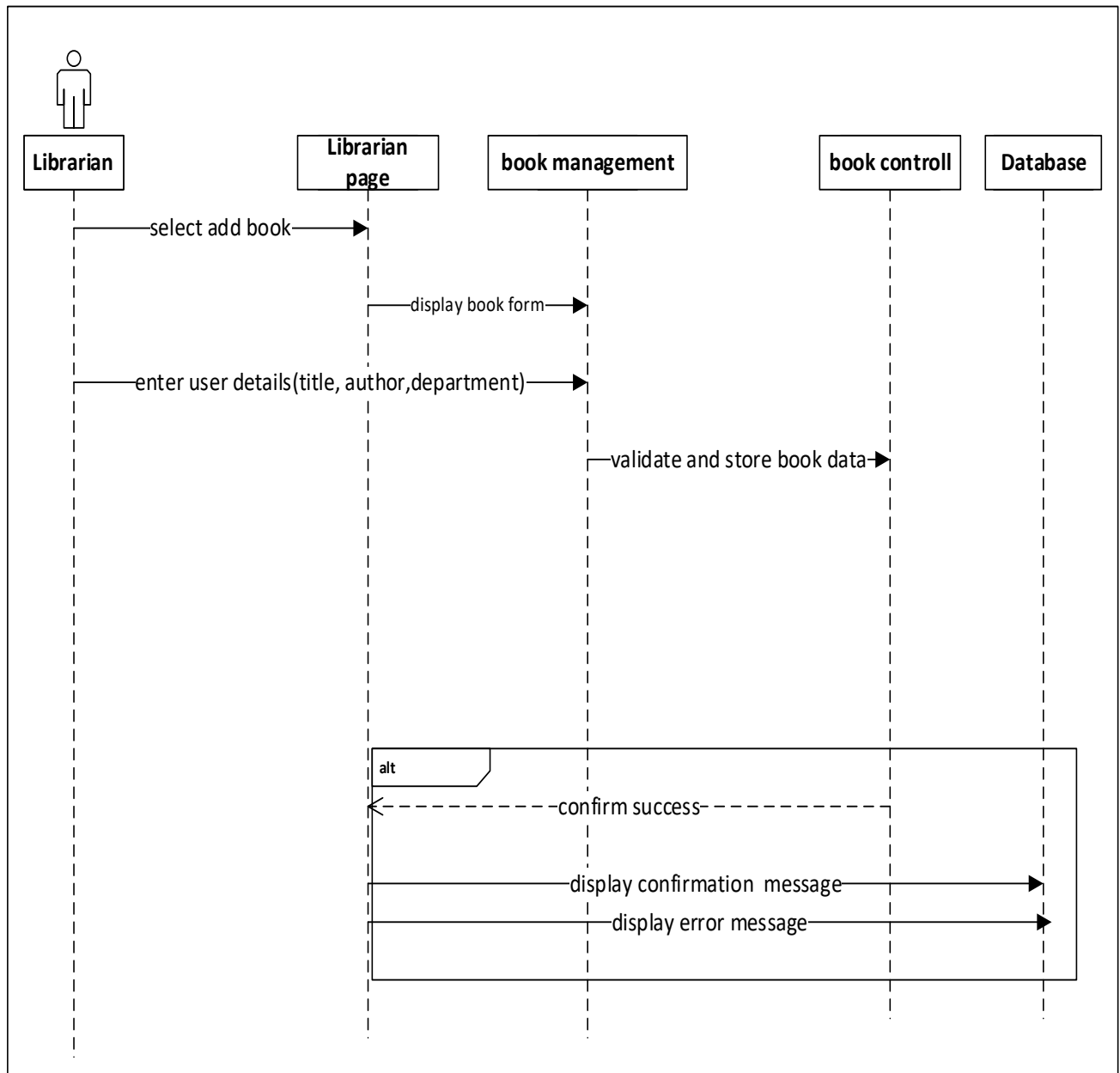


Figure 11: sequence diagram for store book online



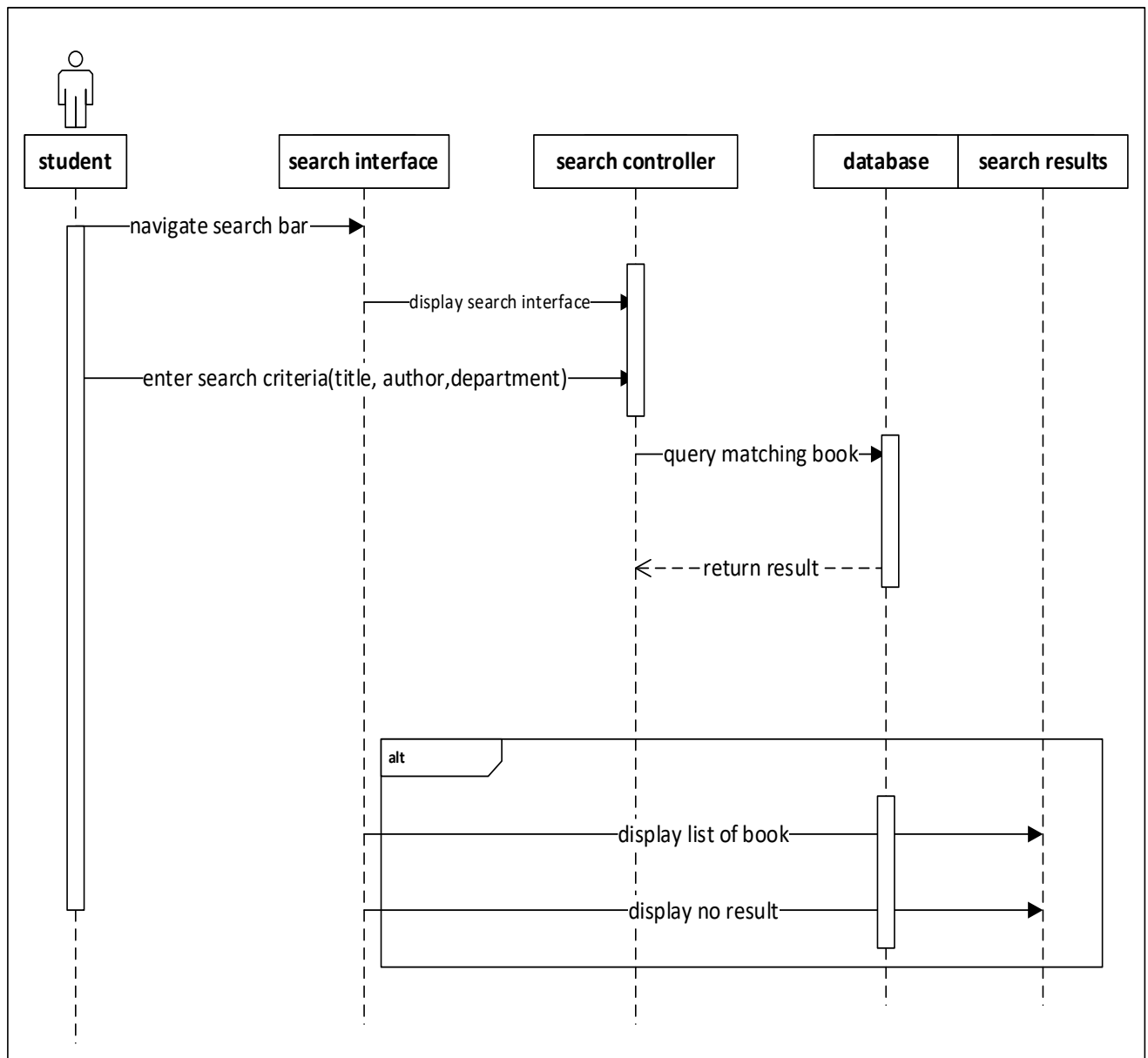


Figure 12: sequence diagram for search book

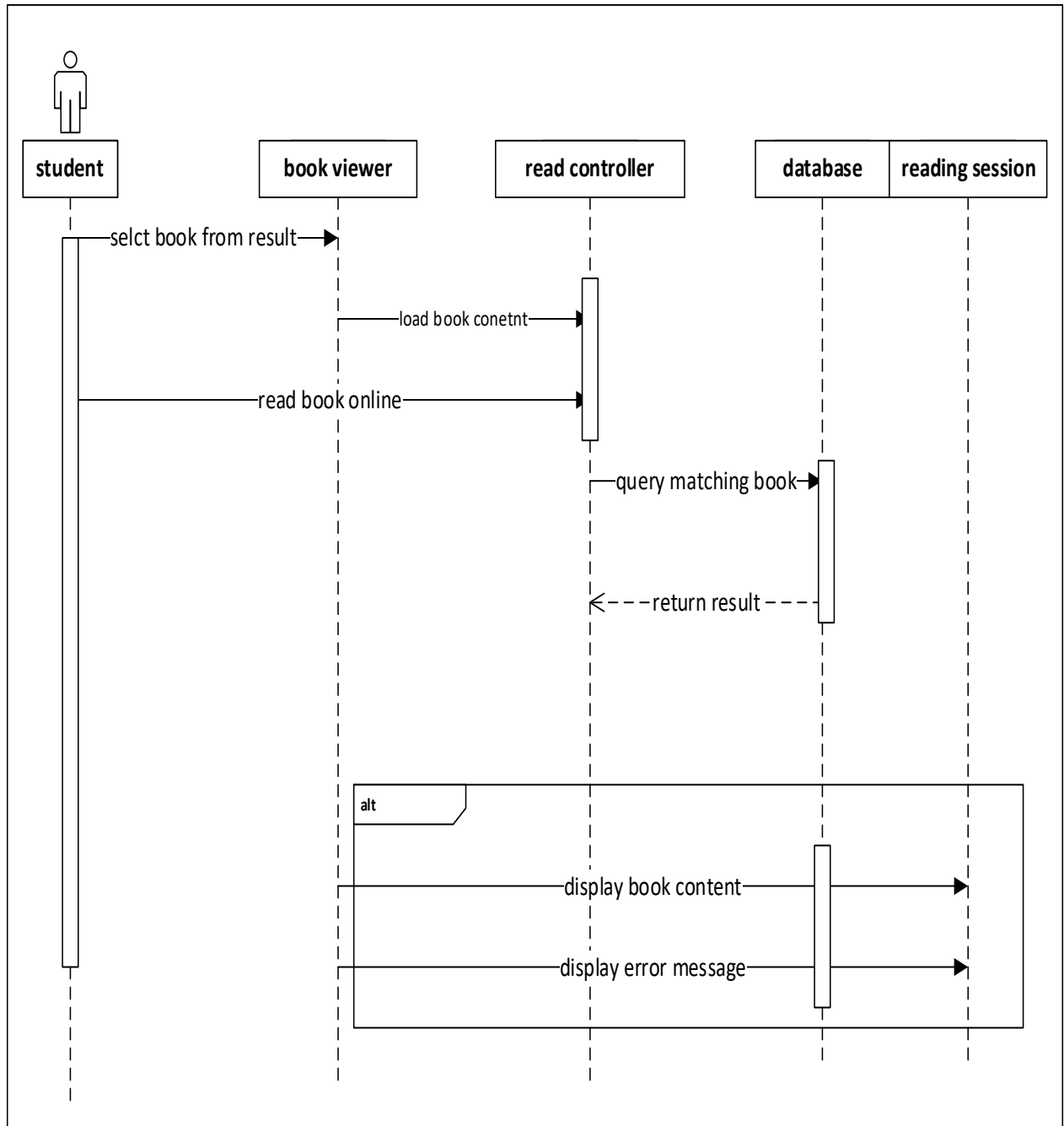


Figure 13: sequence diagram for read book online

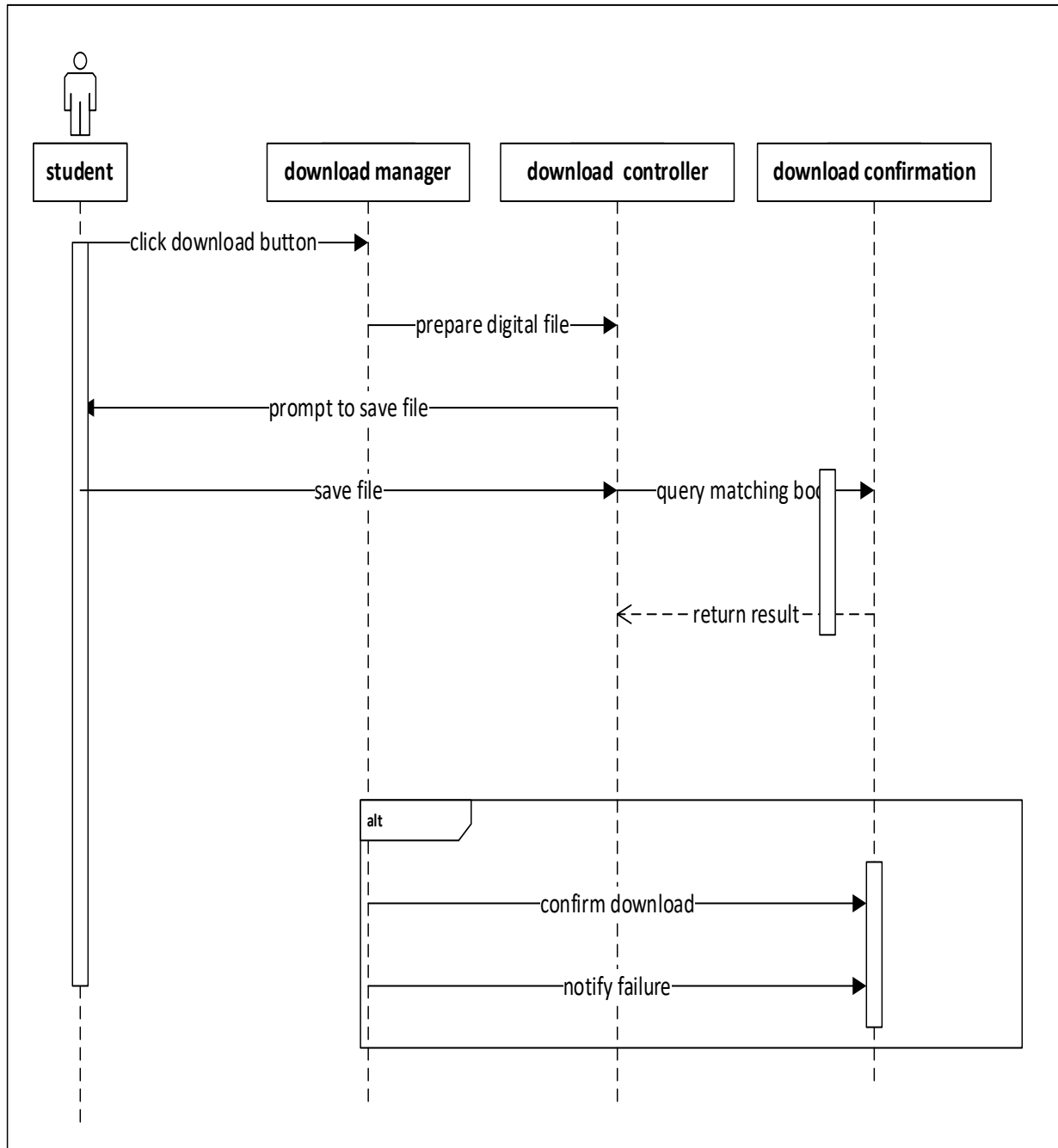


Figure 14: sequence diagram for download book

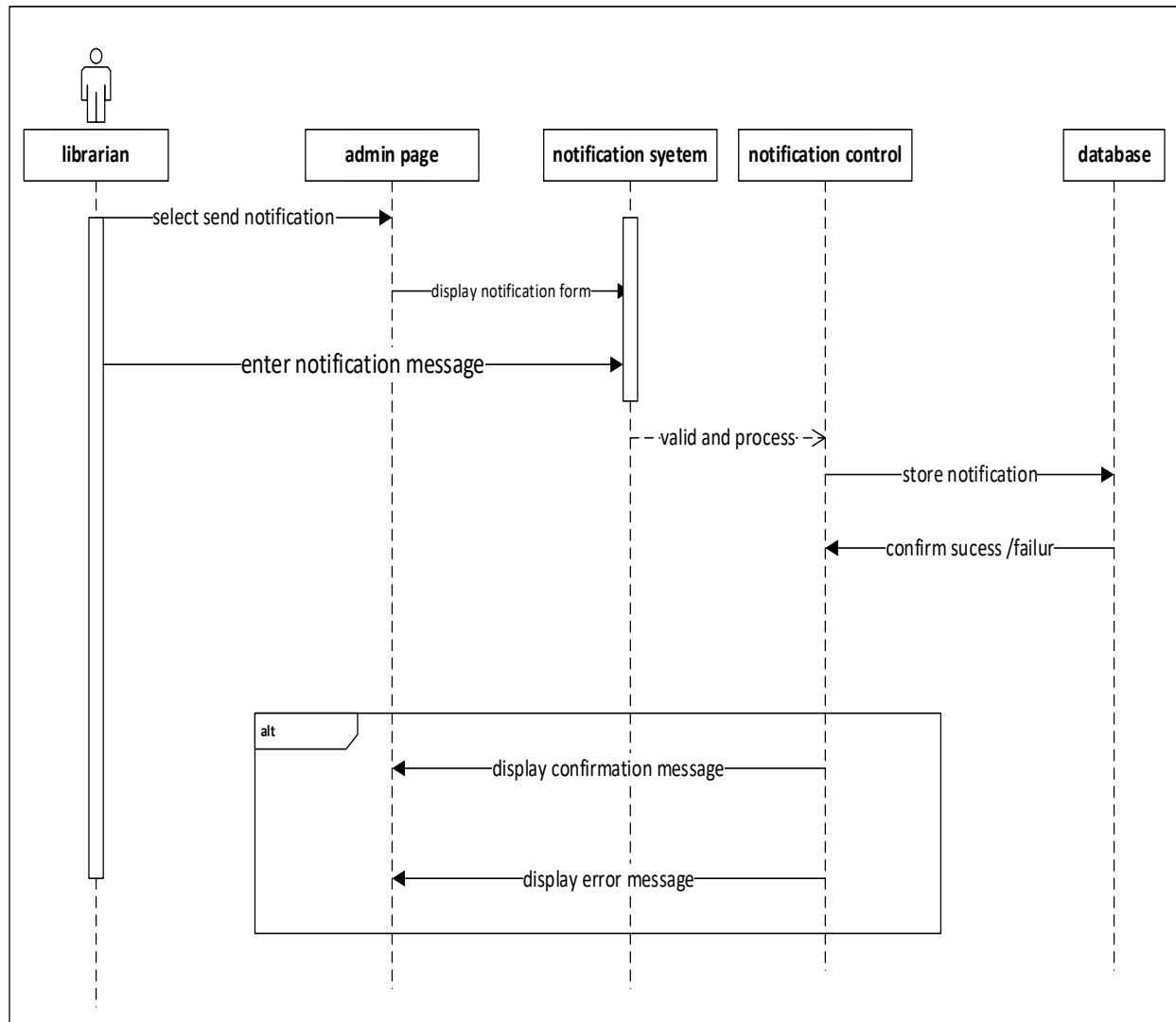


Figure 15: sequence diagram for notification

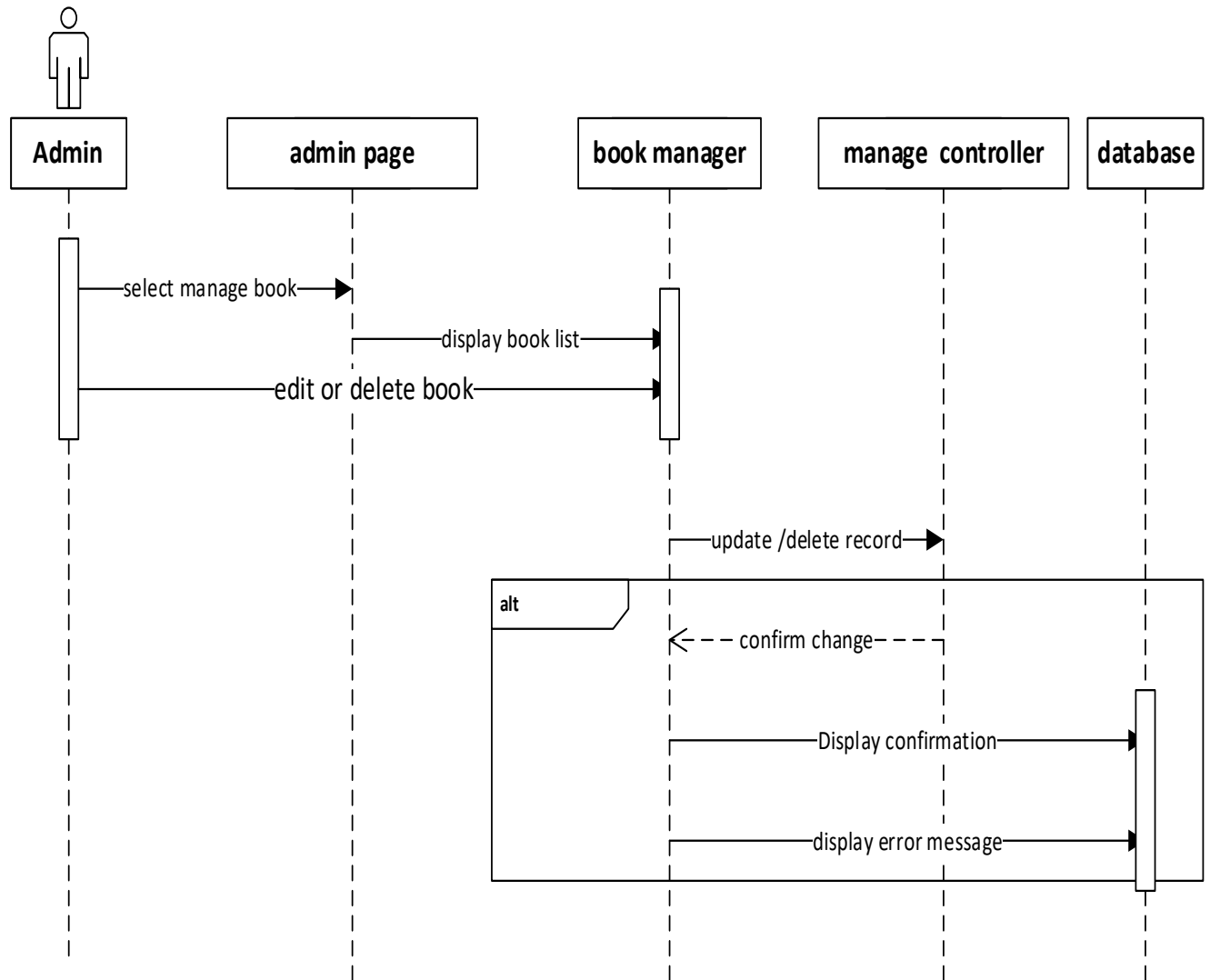


Figure 16: sequence diagram for manage book

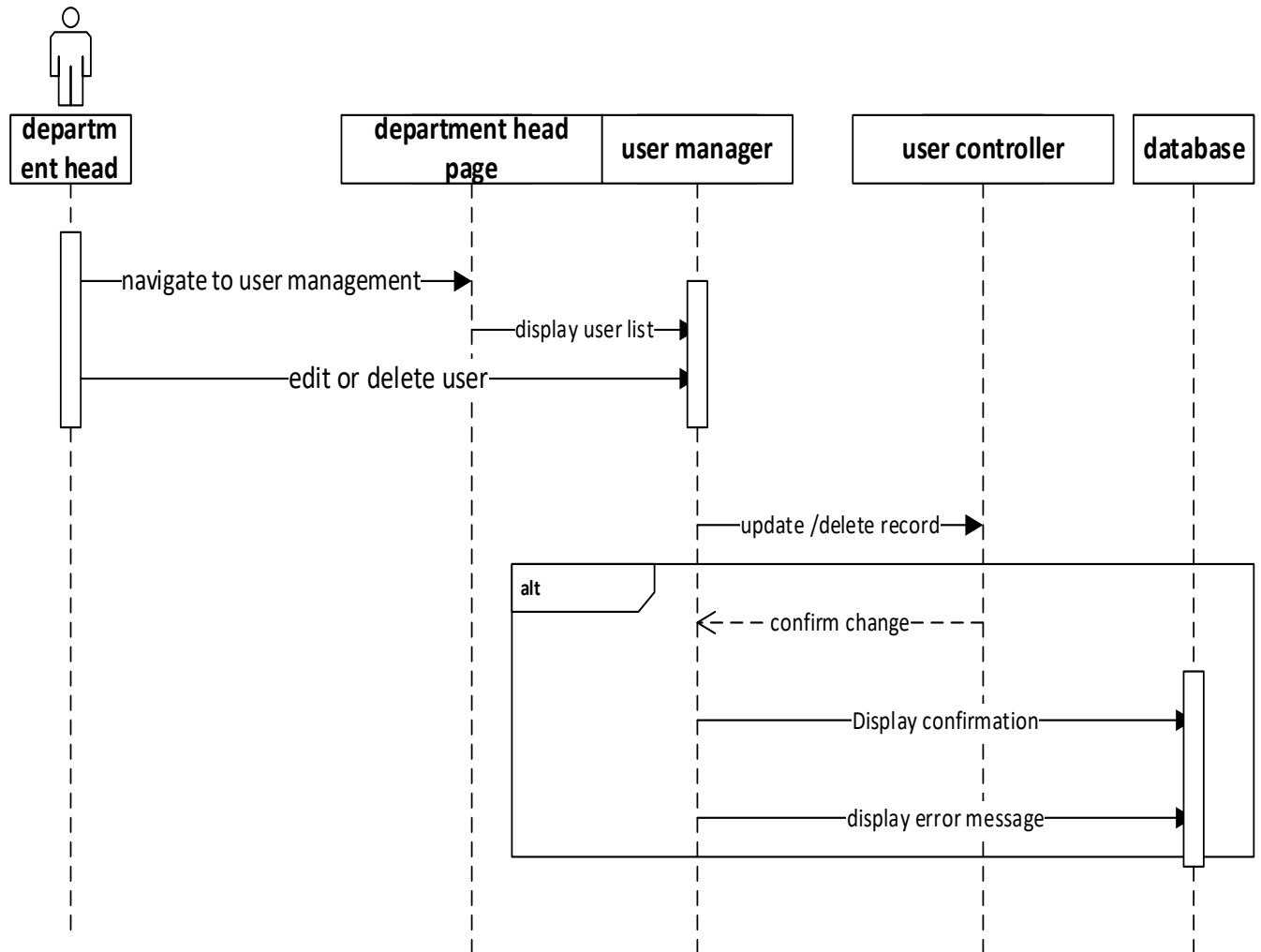


Figure 17: sequence diagram for manage user

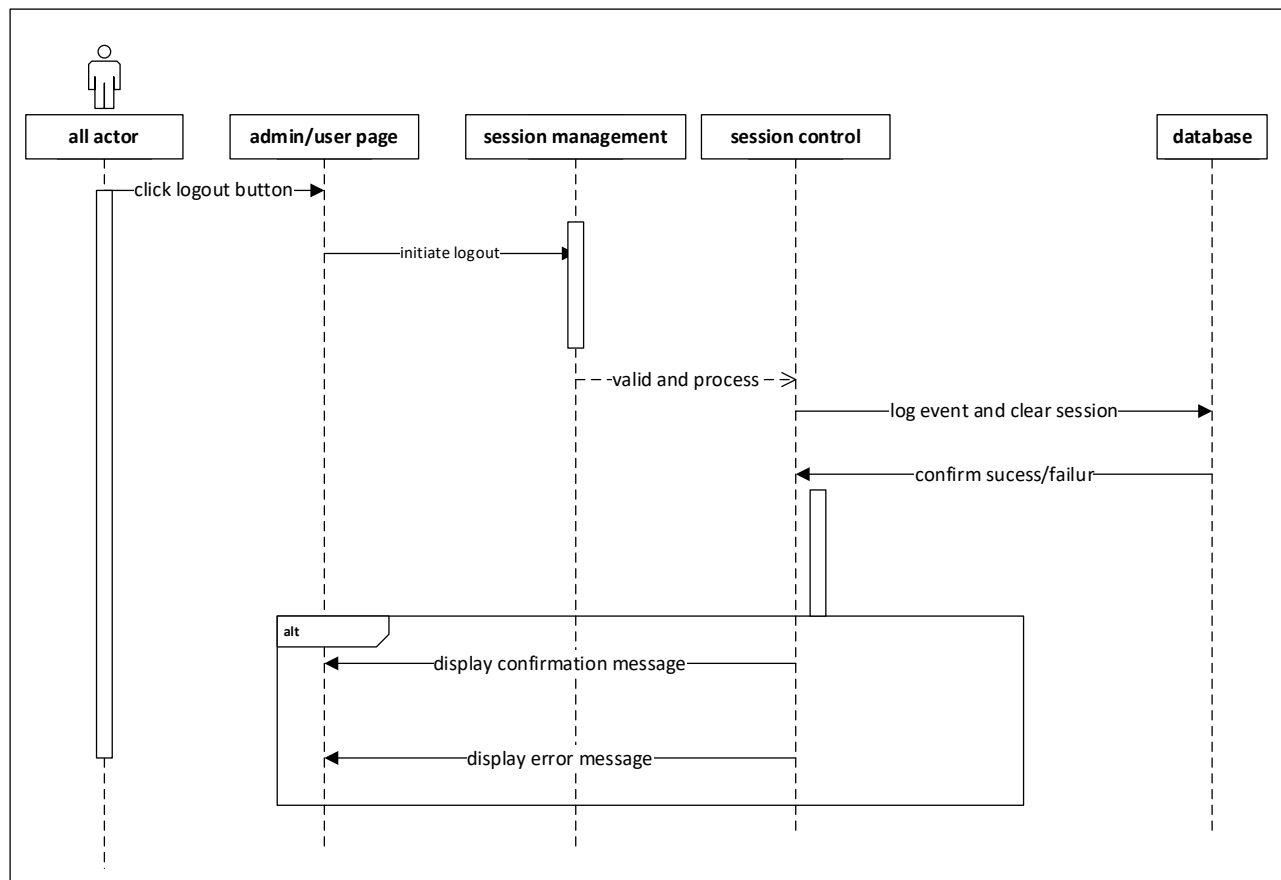


Figure 18: sequence diagram for logout

### 4.3.2. Activity Diagram

Activity diagram is another important diagram in UML to describe dynamic aspects of the system. Activity diagram is a flow chart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. Therefore, the control flow is drawn from one operation to another. This flow can be sequential, branched or concurrent.

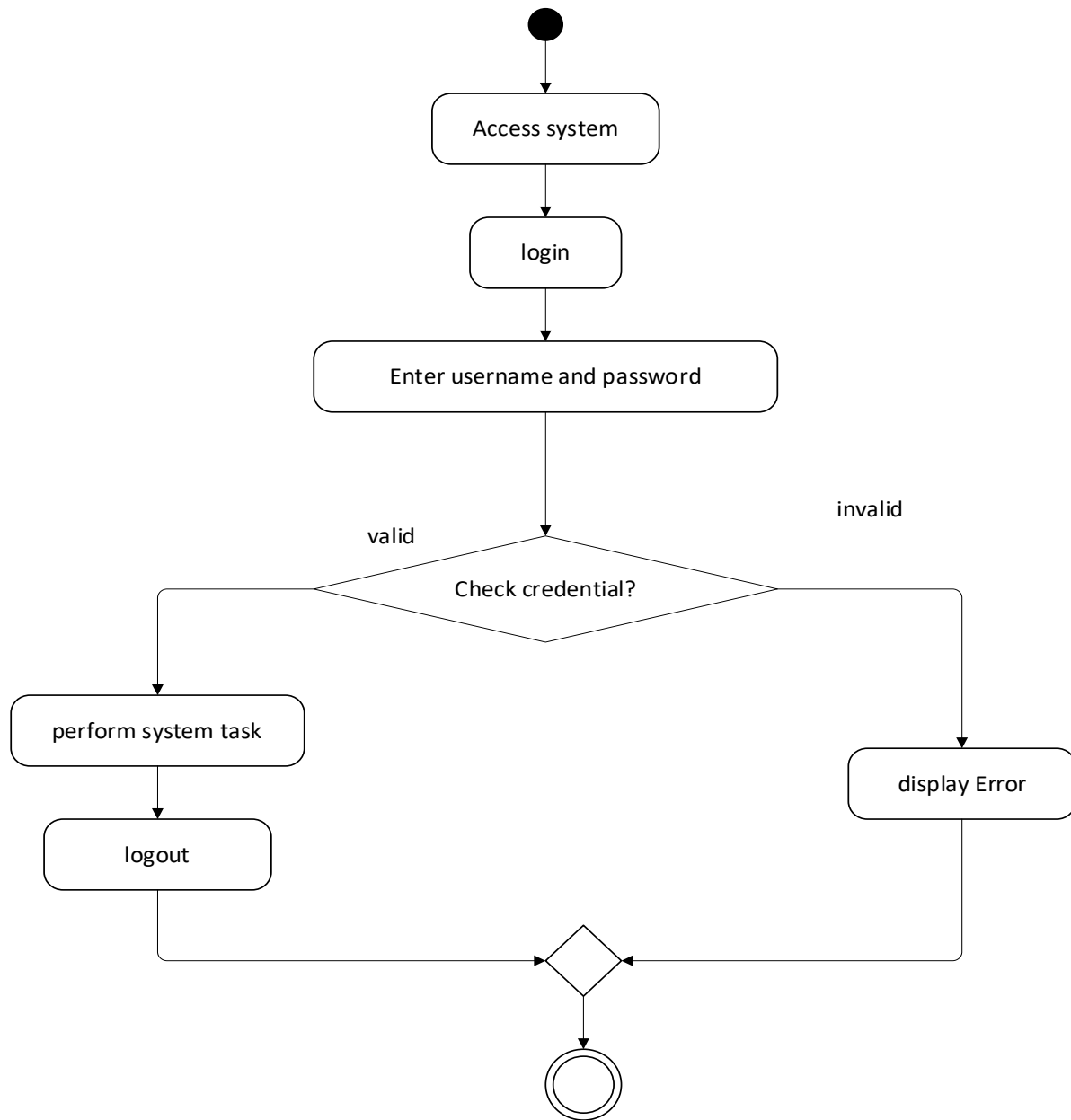


Figure 19: activity diagram



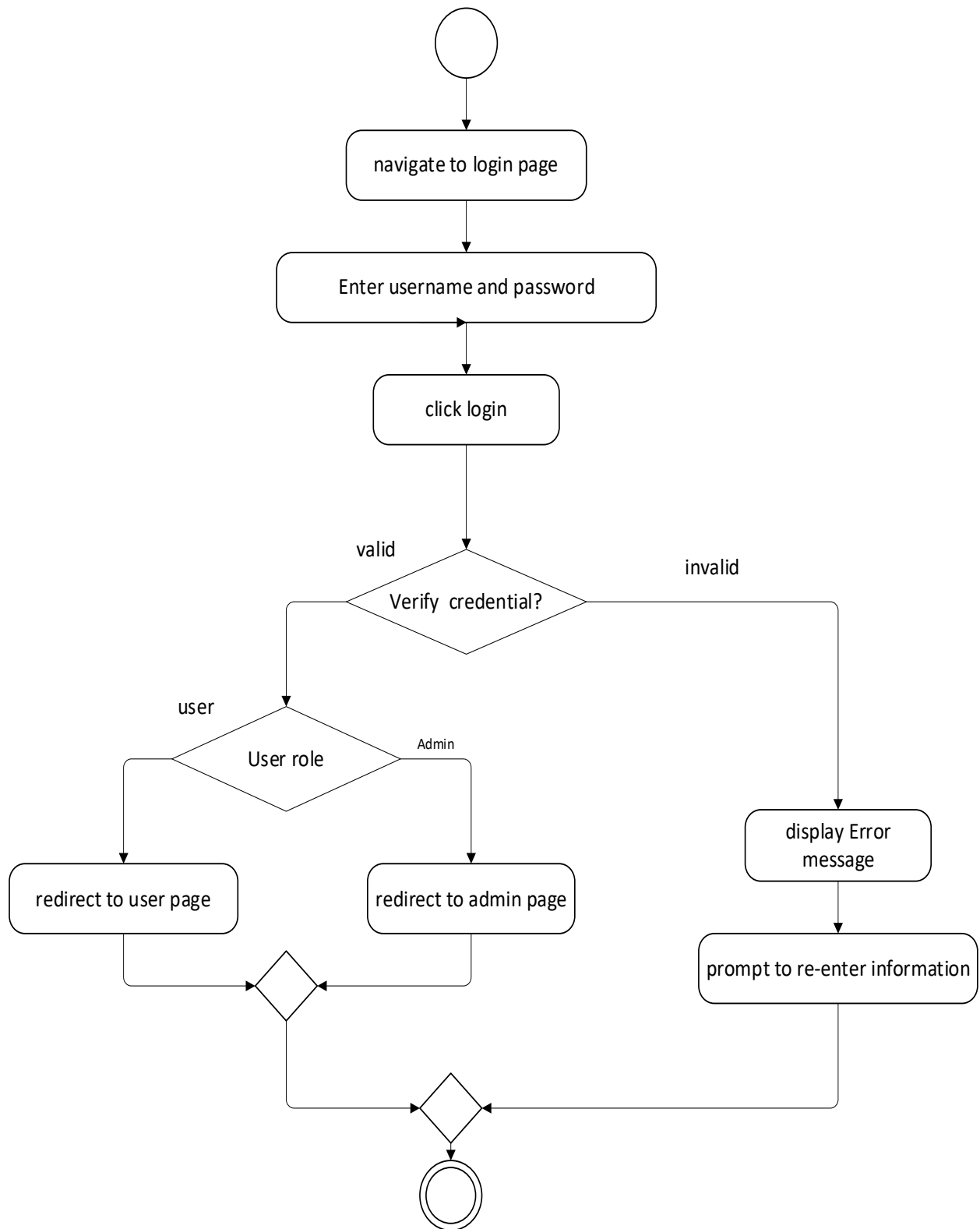


Figure 20: activity diagram for login

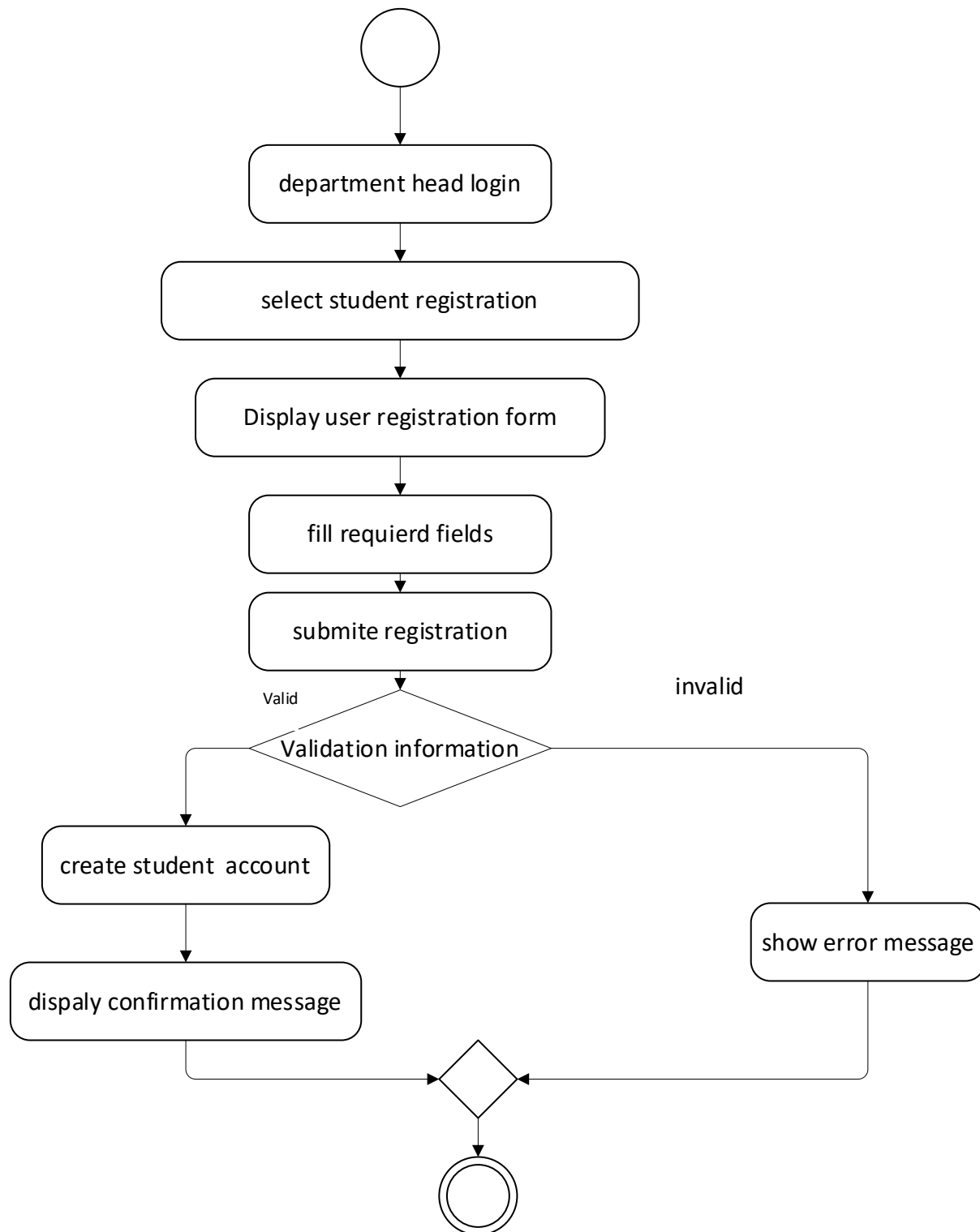


Figure 21: activity diagram for user registration

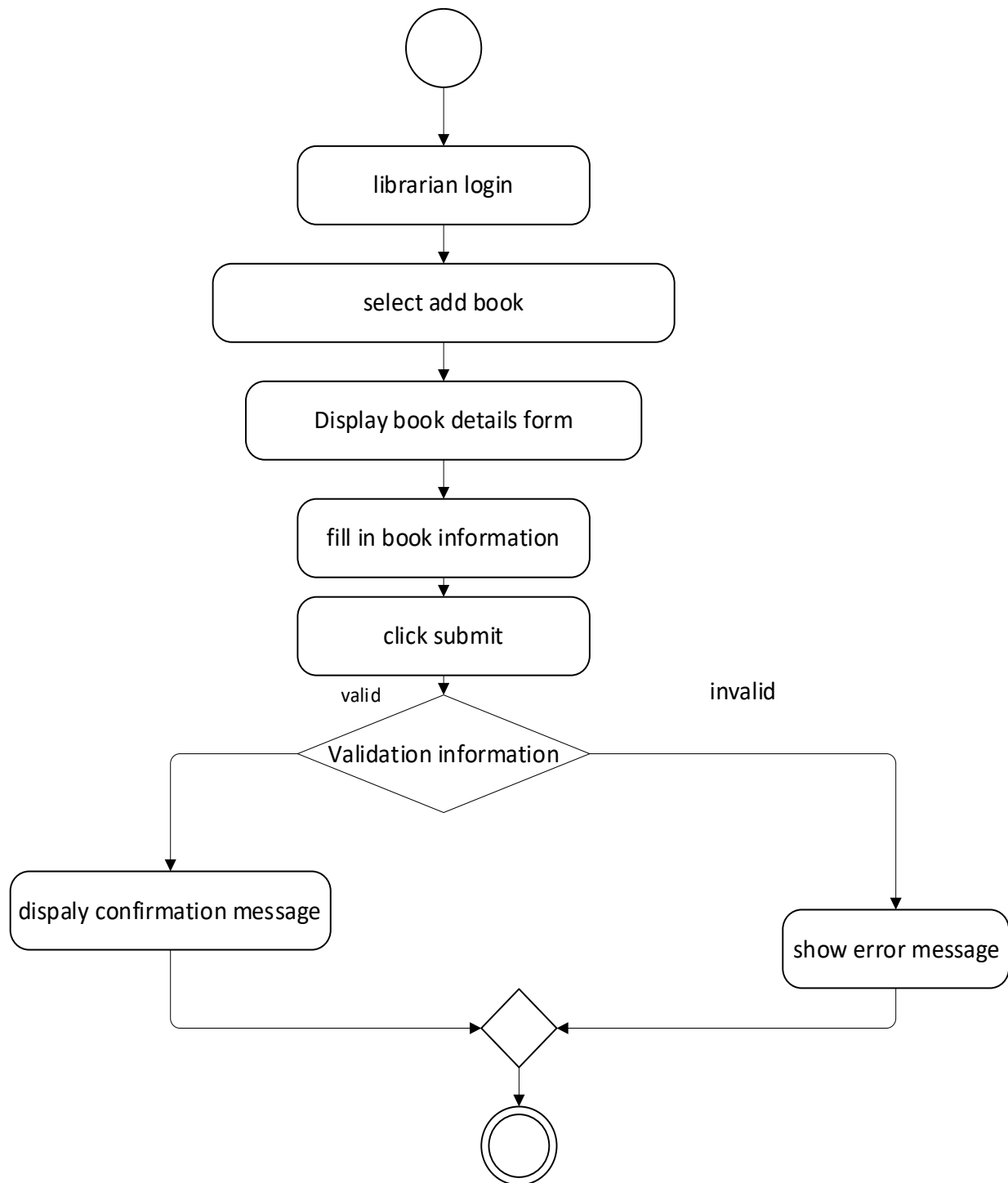


Figure 22: activity diagram for store book

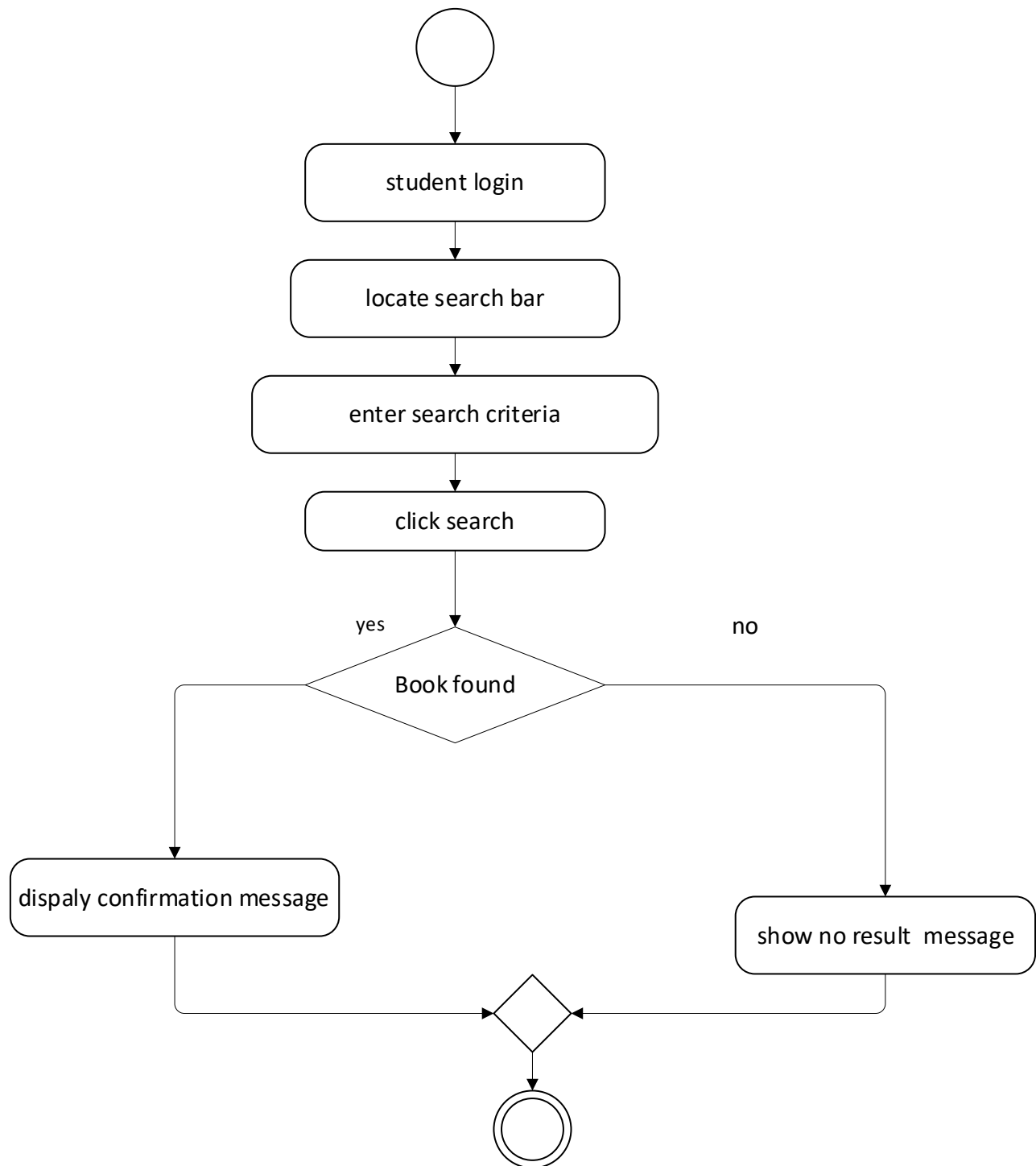


Figure 23: activity diagram for search book

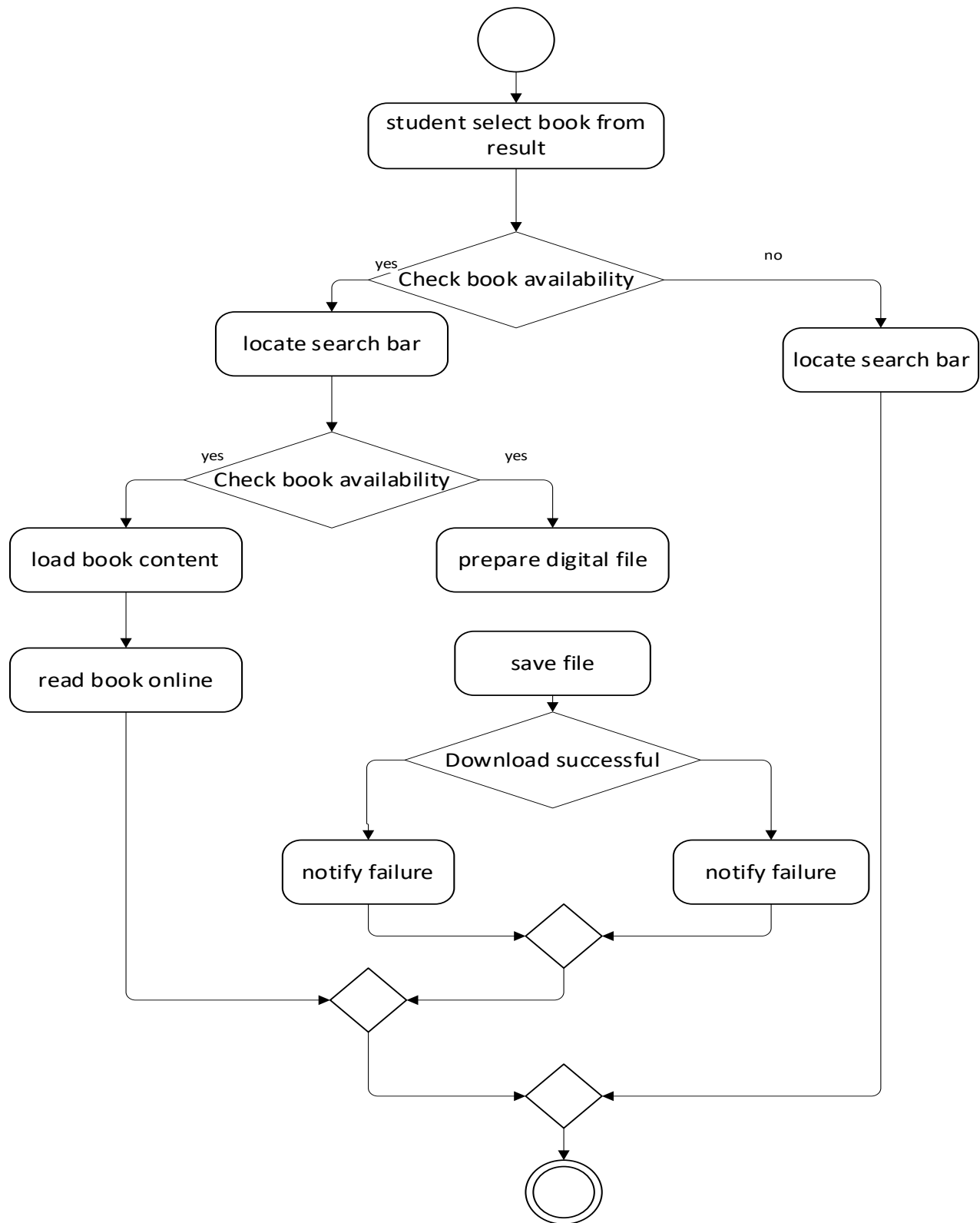


Figure 24: activity diagram for read and download book

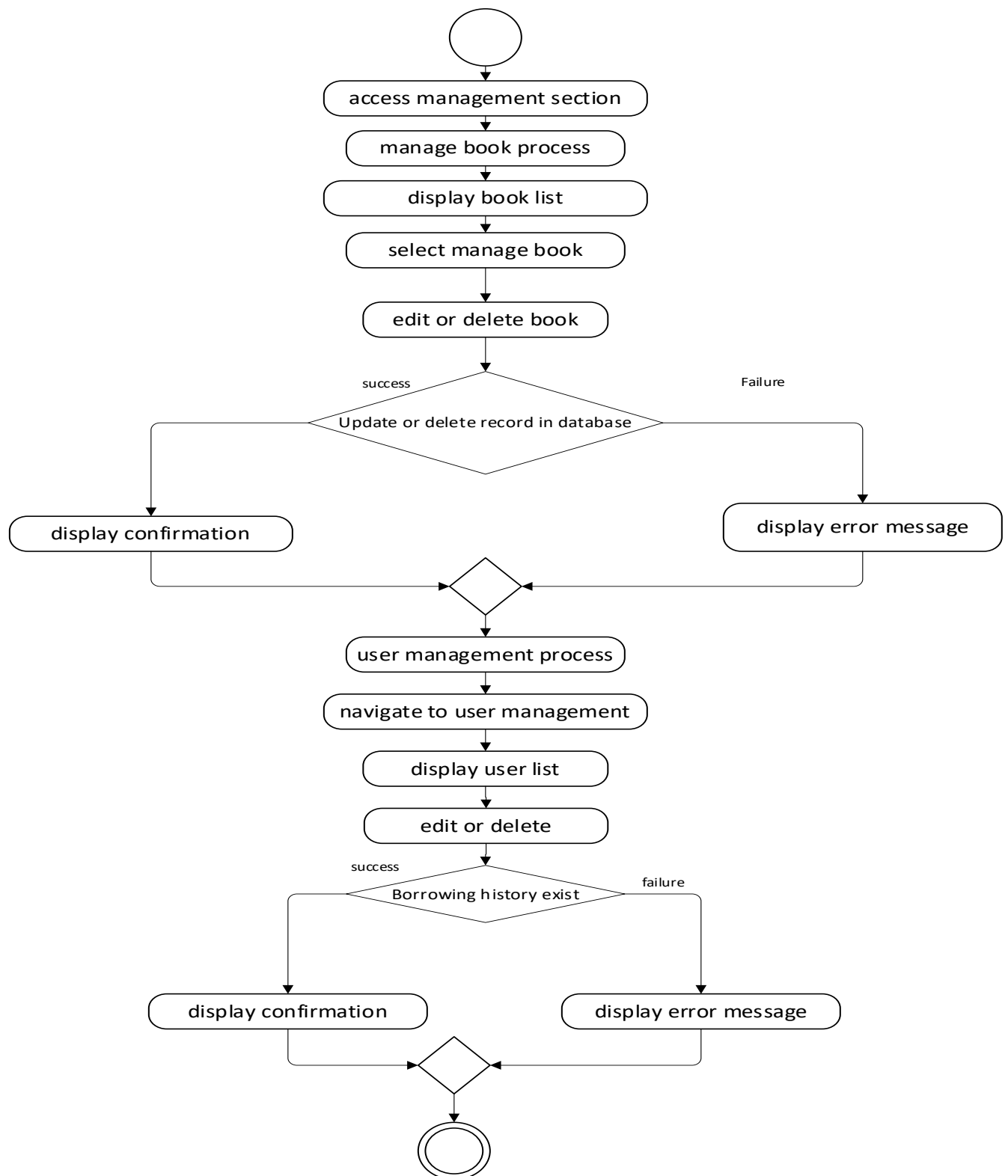


Figure 25: activity diagram for book and user management

### 4.3.3. State Chart Diagram

A state chart diagram is a view of a state machine that models the changing behavior of a state. State chart diagrams show the various states that an object goes through as well as the events that cause a transition from one state to another

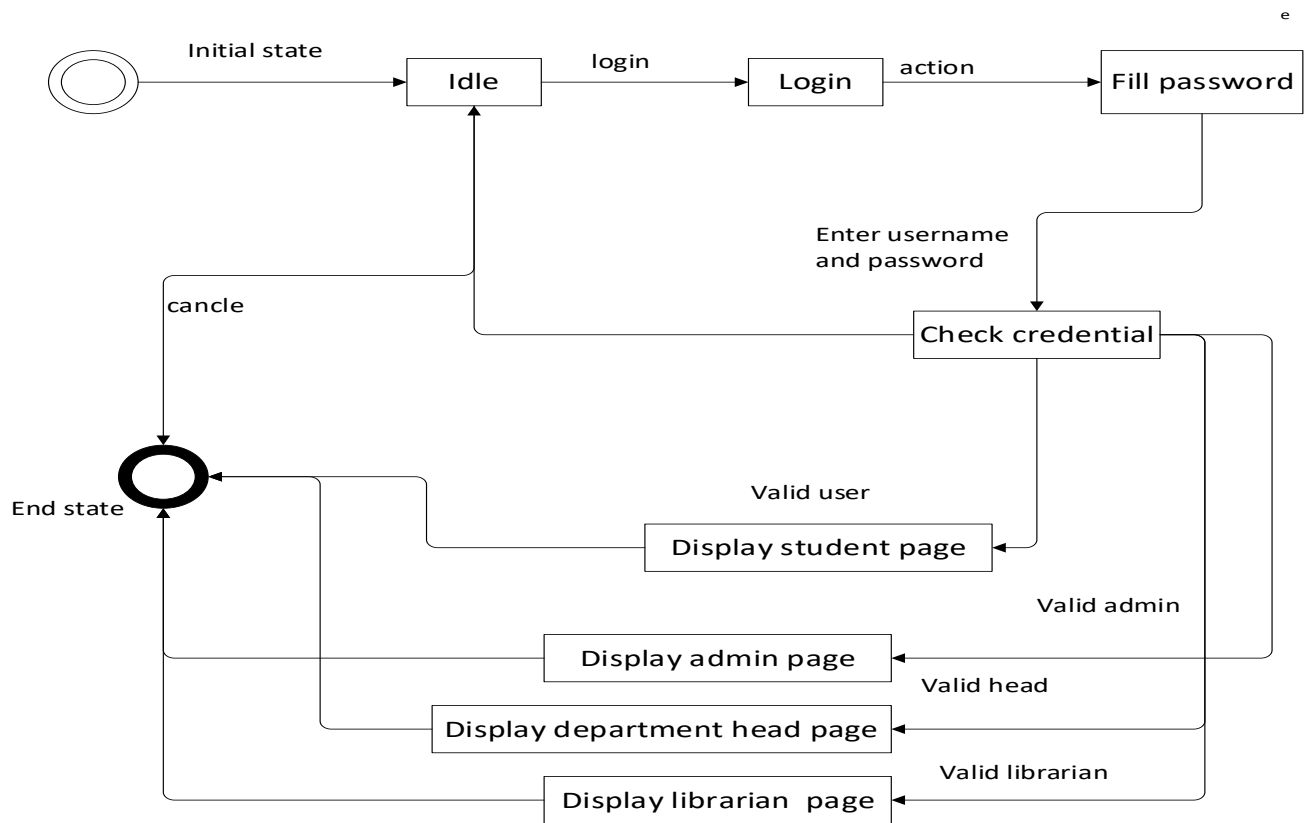


Figure 26: state chart diagram for login

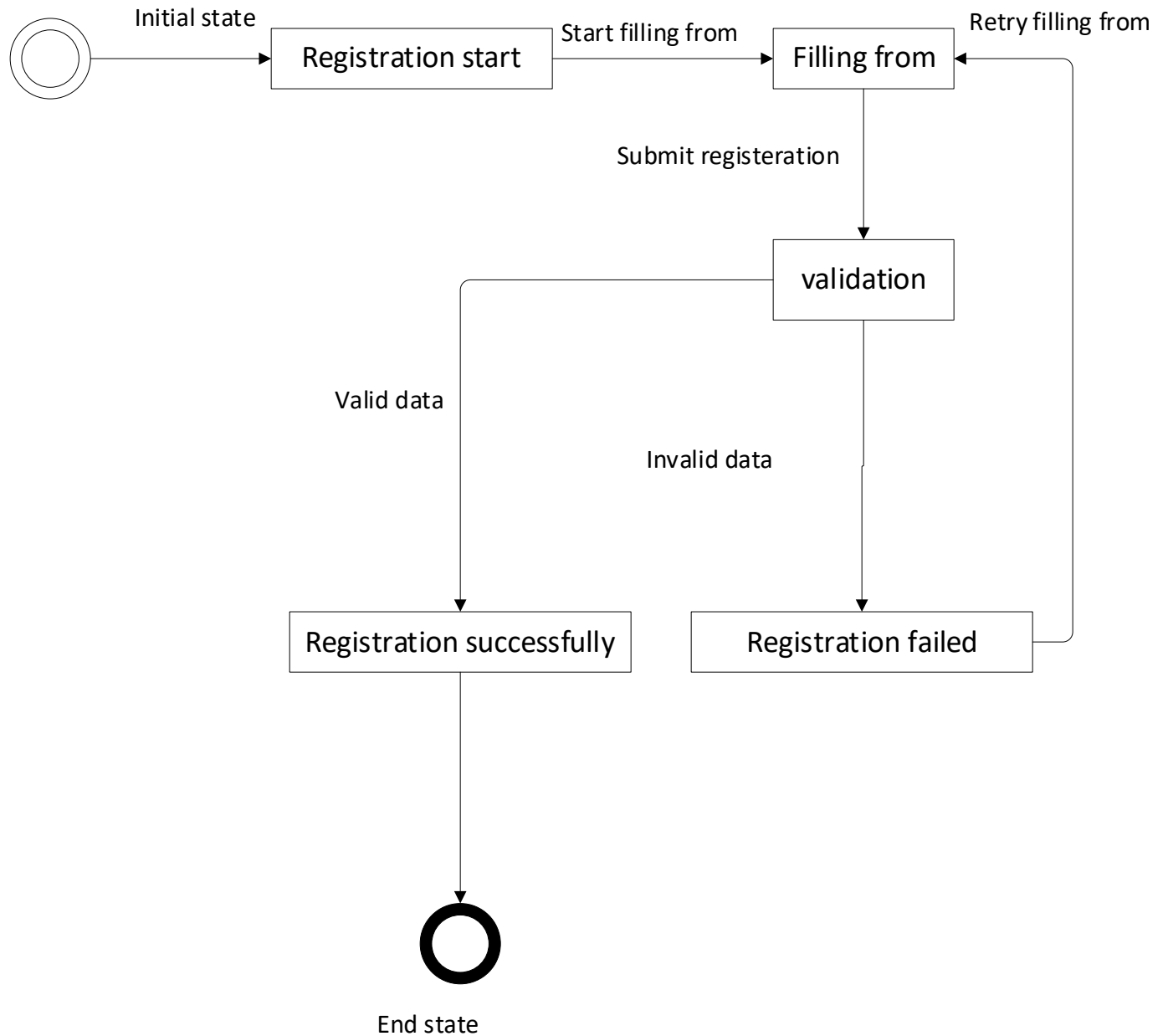


Figure 27: state chart diagram for user registration



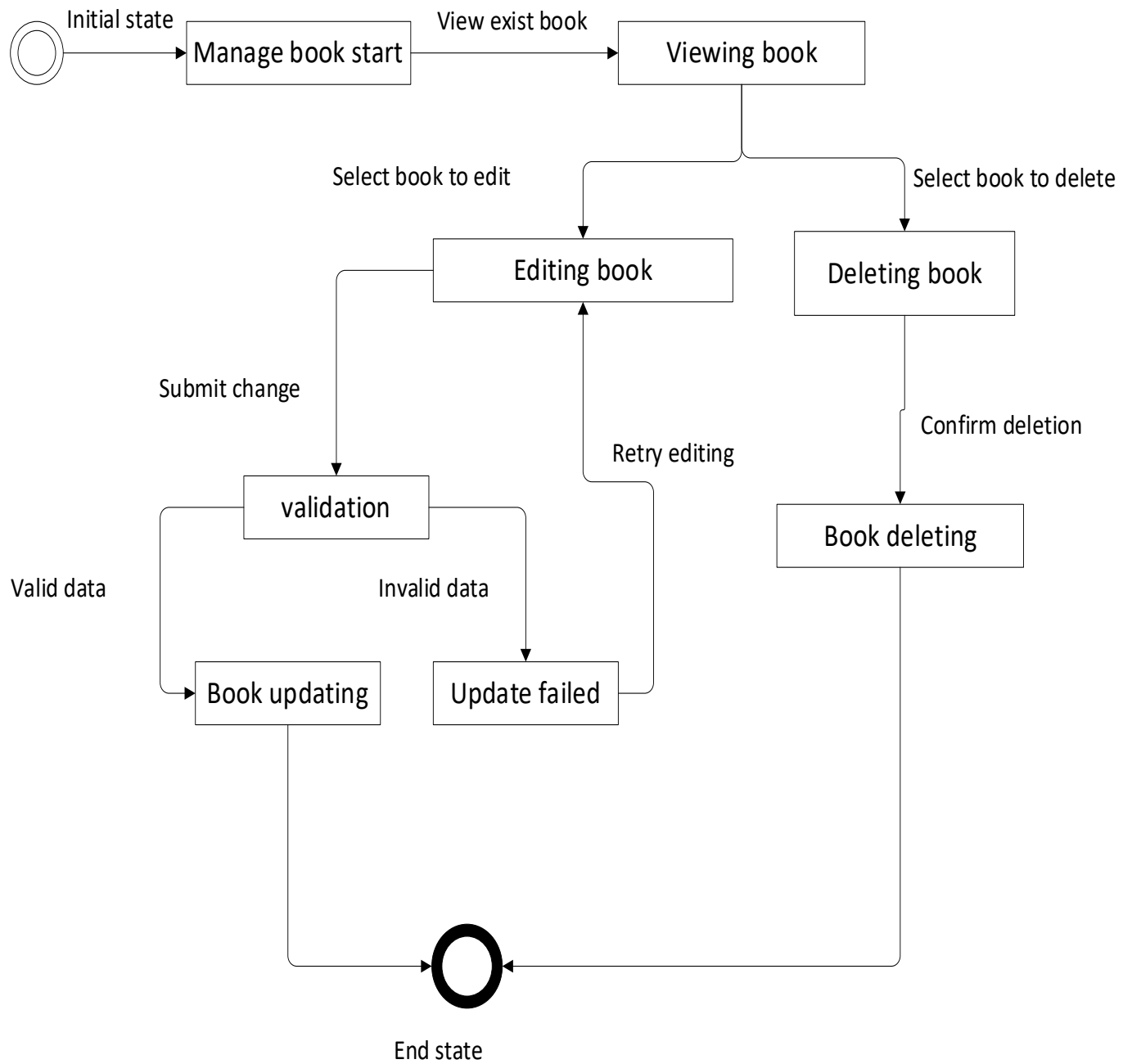


Figure 28: state chart diagram for manage book

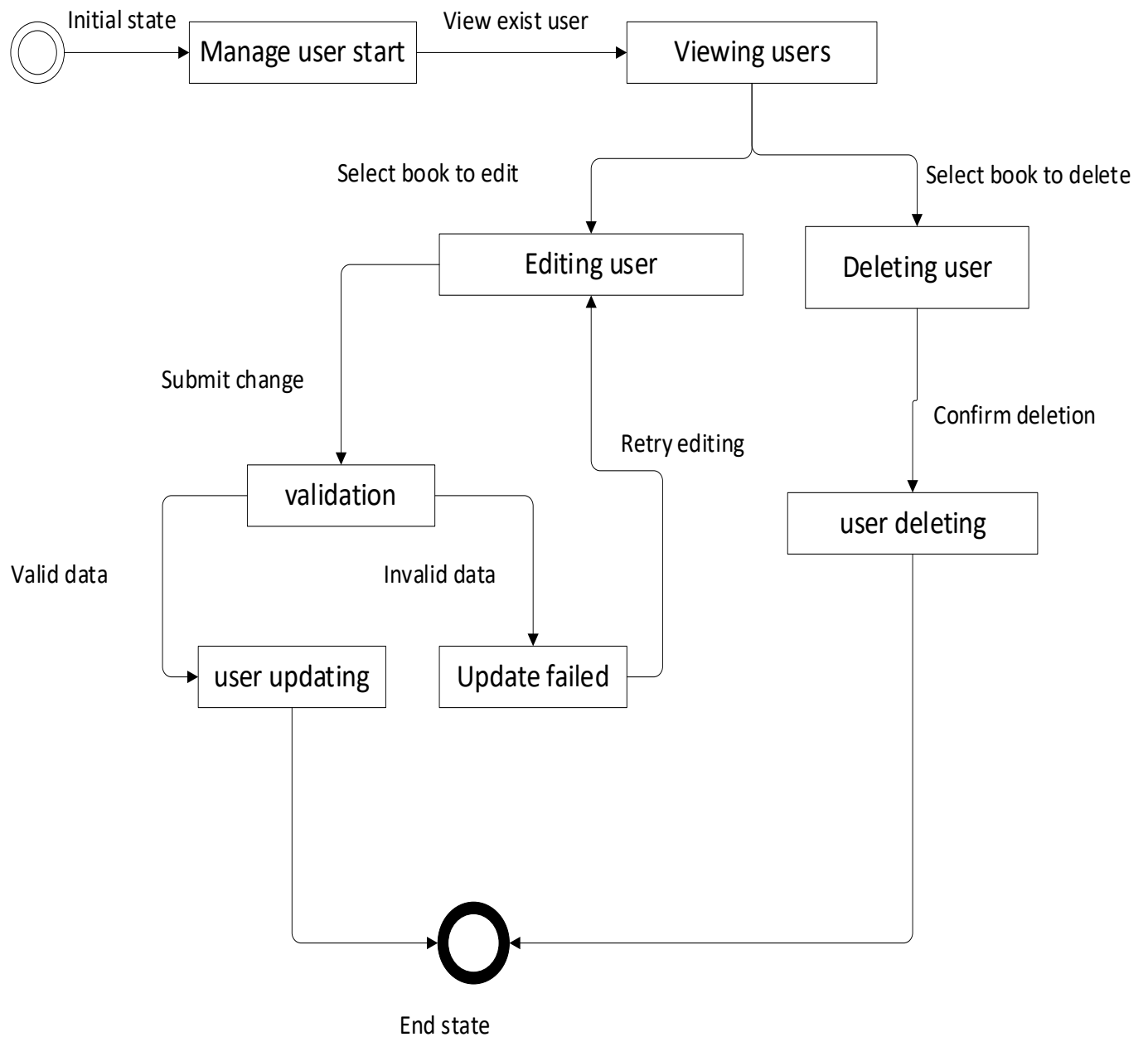


Figure 29:state chart diagram for user management

## CHAPTER FIVE

### 5. SYSTEM DESIGN

The design goals are established to ensure that the system meets the needs of its users while providing an efficient and user-friendly experience.

1. **Performance:** The system should provide quick response times for all user interactions, including searching for books and downloading. It aims to minimize loading times and ensure smooth navigation, even during peak usage times.
2. **Usability:** A user-friendly interface is crucial. The design will focus on intuitive navigation, clear labeling of features, and accessible layout to accommodate users of varying technical skills. This will enhance the overall user experience and encourage engagement with the system.
3. **Security:** The system will implement robust security measures to protect user data and ensure that only authorized individuals have access to sensitive information. This includes secure authentication methods, data encryption, and role-based access controls for different user types (students, faculty, administrators).
4. **Extensibility:** The architecture will be designed with future enhancements in mind, allowing for the easy addition of new features and functionalities without disrupting existing operations. This will ensure the system remains relevant and adaptable to evolving user needs.
5. **Maintainability:** The code base will be structured to facilitate easy updates and maintenance. This includes using modular programming practices, clear documentation, and standardized naming conventions to ensure that future developers can efficiently manage and modify the system.
6. **Accessibility:** The design will ensure that the system is accessible to all users. This may involve compliance with web accessibility standards and providing alternative means of accessing content.

#### 5.2 Proposed System Architecture

The proposed architecture for the Web-Based Online Book Store System is designed to ensure scalability, maintainability, and user accessibility. The system follows a three-tier architecture model, which separates the application into three distinct layers: the client layer, the application server layer, and the database layer. This separation enhances the management of the system and optimizes performance.

##### 1. Client Layer:

- This layer consists of user interfaces accessible through web browsers on various devices, including desktops, laptops, tablets, and smartphones.

- Users interact with the system through a responsive web interface designed using HTML, CSS, and JavaScript, which allows for seamless navigation and access to features like searching for books, reading and downloading.

## 2. Application Server Layer:

- The application server handles the business logic of the system. It processes user requests, executes the necessary operations, and generates responses.
- This layer is implemented using PHP, which interacts with the database to retrieve or update information based on user actions.
- The server also manages user sessions, ensuring secure access and maintaining state throughout the user's interaction with the system.

## 3. Database Layer:

- The database layer is responsible for data storage and management. It utilizes MySQL as the database management system to store user profiles, book records and other necessary data.
- This layer ensures that data is organized efficiently, allowing for quick retrieval and updates. It incorporates security measures to protect sensitive information and supports real-time inventory tracking to provide users with accurate availability status.

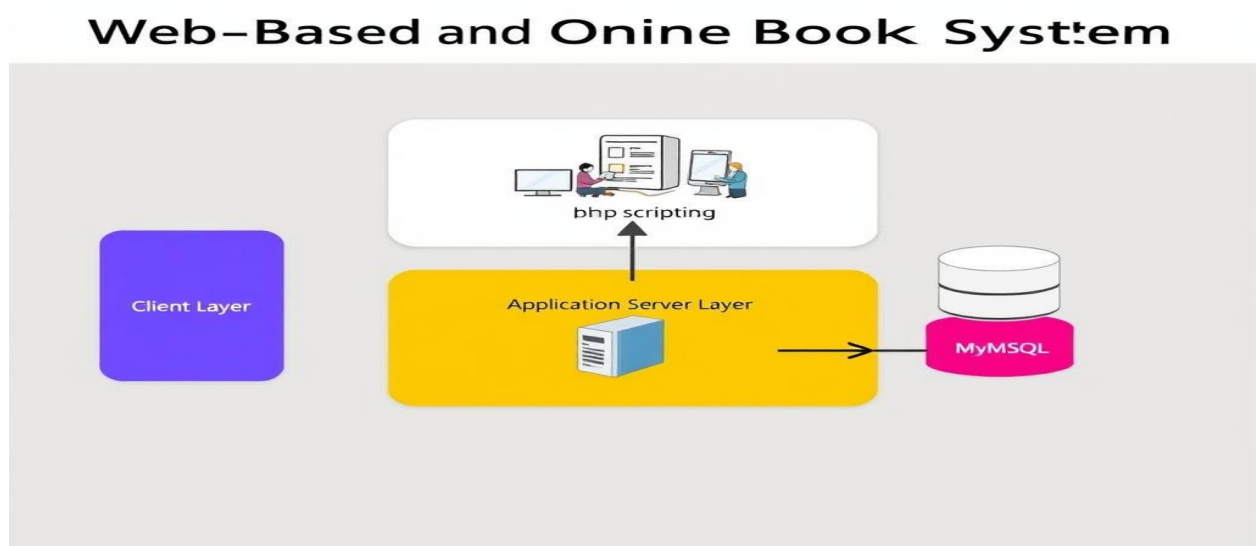


Figure 30: propose system architecture

### 5.2.1 Subsystem Decomposition and Description

Subsystem decomposition will help reduce the complexity of the system. The subsystems can be considered as packages holding related classes/objects. Our system is decomposed into: -

#### 1. User Management Subsystem:

Description: This subsystem is responsible for handling user registration, authentication, and profile management. It ensures that users can create accounts, log in securely, and manage their personal information.

#### 2. Book Management Subsystem:

Description: This subsystem manages the life-cycle of books in the online store, including adding new books, updating existing records, and deleting books that are no longer available. It ensures that the book inventory is up-to-date and accurately reflects available resources.

#### 3. Search and Retrieval Subsystem:

Description: This subsystem enables users to search for books based on various criteria such as title, author, and department. It retrieves relevant book information from the database and presents it to the user in an easily navigable format.

#### 4. Read and Downloading Subsystem:

Description: This subsystem manages the user process for digital copies of books, allowing users to read, and download books as needed.

#### 5. Notification Subsystem:

Description: This subsystem handles notifications related to user actions, such as new book additions, and system updates. It ensures that users stay informed about their activities within the system.

### 5.2.2 Hardware/Software Mapping

The Web-Based Online Book Store System for ARU University is deployed using a client-server architecture, where hardware components support the software artifacts to ensure efficient operation. This mapping outlines the hardware and software required to deliver the system's functionalities, including user management, book browsing, downloading, and inventory tracking.

### 5.2.2.1 Hardware mapping

#### 1. **Server:**

- **Processor:** Intel Xeon or AMD Ryzen (multi-core) to handle multiple user requests, such as searches, downloads, and reading processes.
- **RAM:** Minimum 8 GB (scalable based on user load) to support simultaneous access by ARU students and administrators.
- **Storage:** SSD with at least 1 TB capacity for storing the database and digital book files (e.g., PDFs) for unlimited downloads.

#### 2. **Client Devices:**

- PCs, laptops, tablets, and smartphones with modern web browsers, requiring at least 4 GB RAM and 64 GB storage (for downloaded books), plus a stable internet connection (minimum 5 Mbps) to access the system from anywhere (e.g., classrooms, dorms, home).

### 5.2.2.2 Software mapping

#### 1. **Operating System:**

- **Server:** Linux (e.g., Ubuntu Server) or Windows Server to host the web and database servers securely and reliably.
- **Client Devices:** Windows, macOS, Linux, Android, or iOS to support browser-based access for students and administrators.

#### 2. **Web Server:** Apache (via XAMPP) to serve web pages, manage user requests (e.g., login, search, download), and deliver book content efficiently.

#### 3. **Database Management System (DBMS):**

- MySQL (via XAMPP) to store and manage persistent data, including user accounts, book details (title, author, department, availability).

#### 4. Backend Programming Language and Framework:

- PHP to implement the application logic, such as processing searches by title/author/department, handling unlimited book downloads and updating inventory in real-time.

#### 5. Frontend Framework:

- HTML, CSS, and JavaScript to build a responsive, user-friendly interface for browsing books, reading online, and managing user/admin tasks, ensuring compatibility across devices.

#### 5.2.3. Detailed Class Diagram

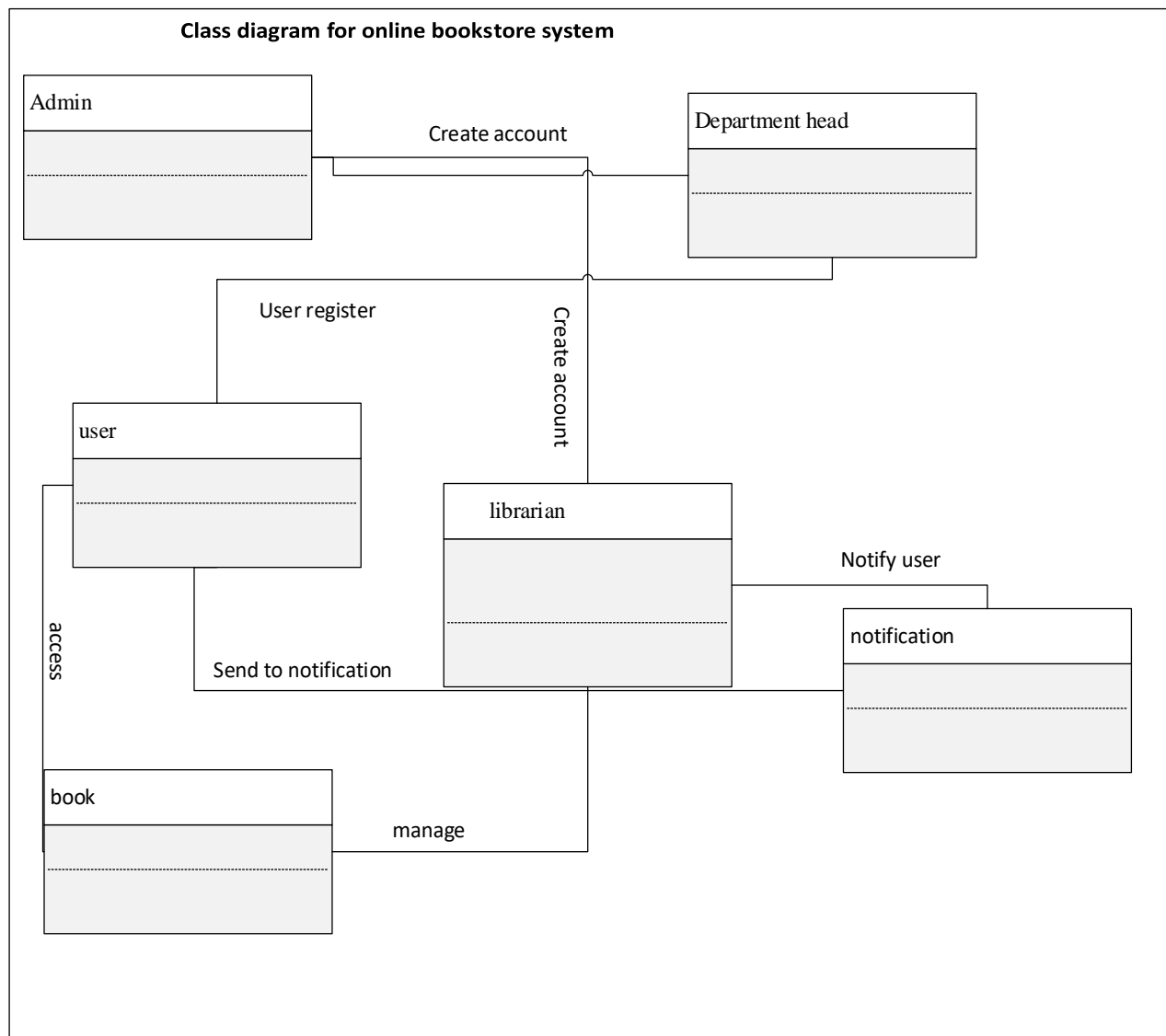


Figure 31: class diagram detail

### 5.2.3.1 Class Diagram Description

<b>Class name</b>	<b>Description</b>
Administrator	Represents the system administrator responsible for managing the system. The admin creates accounts for Department Heads and Librarians, ensuring they can access the system. Attributes include username, password, and name. Operations include creating accounts for Department Heads and Librarians and triggering notifications when new books are added by the Librarian.
Department Head	Represents a Department Head who manages user accounts for students and college employers. The Department Head registers new Users, allowing them to access the system. Attributes include username, password, name, and department. Operations include registering new Users and managing their details (edit/delete).
User	Represents students or college employers who interact with the system to access books. Users can search for books, view book details, read books online, and download books. Attributes include username, password, and name. Operations include searching for books by title, author, or department, reading books online, downloading books, and receiving notifications about new books.
Librarian	Represents a Librarian responsible for managing the book inventory. The Librarian adds new books to the system and manages existing books through the Inventory Manager. Attributes include username, password, and name. Operations include storing books online (adding new books) and managing books (edit/delete). reading books online, downloading books, and receiving notifications about new books.
Book	Represents a book in the online bookstore, storing details for user access. Attributes include book, title, author, department, and availability. Operations include retrieving book details for display to Users and updating availability status when managed by the Librarian.
Notification.	Represents notifications generated by the system to inform Users about events, such as the addition of a new book. It is triggered by the Librarian's actions through the Inventory Manager. Attributes include notification, message, date created, and status (e.g., active, expired). Operations include generating a notification message when a new book is added and displaying it to Users on their main page.

Table 23: class diagram detail



## 5.2.4 Persistent Data Management

Persistent data management refers to the storage of the data that will be used in the system. The data that will be stored in the system include user data, book data. Persistent data management encompasses the way these data are stored, retrieved, and updated in the system.

**Database Design:** The system's database consists of several tables to manage different types of data:

- User Table: Stores user information such as username, password (hashed for security), and name.
- Book Table: Stores book details including title, author, department, and availability status (true/false).

### **Data Storage and Retrieval:**

- MySQL tables are designed with appropriate primary and foreign keys to ensure data integrity and efficient retrieval.
- Data retrieval is optimized using SQL queries, with indexes applied to frequently searched fields like book title and author to improve performance.

### **Data Security:**

- User passwords are hashed using PHP's password hash() function to protect sensitive information.
- Access to the database is restricted to the application server (via PHP scripts), preventing direct external access.

**Performance Optimization:** The performance of online bookstore system is critical to its success. The database should be optimized for fast access and retrieval of data. This includes the use of indexes, caching, and database partitioning.

## 5.2.5 Access Control and Security

Access control ensures that the system's functionalities are restricted based on user roles, allowing only authorized users to perform specific actions. The Web-Based Online Book Store System for ARU has two main user roles: Administrator and User (students or collage employer). The table below outlines the access privileges for each role

function	student	administrator	librarian	Department head
login	yes	yes	yes	yes
User registration	no	yes	no	yes
Create account	no	yes	no	no
Bookstore online	no	no	yes	no
Search book	yes	yes	yes	yes
Read book online	yes	yes	yes	yes
Download book	yes	yes	yes	yes
Notification	no	yes	yes	no
Manage book	no	yes	yes	no
Manage user	no	yes	no	yes
logout	yes	yes	yes	yes

Table 24: for Access Control and Security

### 5.3 Packages

In order to develop the proposed system, we are going to use the following package that helps us to simplify development, enhance functionality, and maintain code efficiency of the system that we are going to develop.

**PHP:** is a server-side scripting language widely used for web development. It provides the core functionality for handling user requests, processing data, and interacting with the MySQL database in the Web-Based Online Book Store System.

**MySQL:** MySQL is an open-source relational database management system that provides packages for creating, managing, and querying databases. It is used to store and retrieve data such as user profiles, book records.

#### **Bootstrap:**

The Bootstrap framework provides a collection of CSS and JavaScript tools for building responsive and mobile-friendly web interfaces. It is used to design the user interface, including layouts for the home page, search interface, and admin panel, ensuring a consistent and modern look.

**Font Awesome:** Font-awesome is a popular icon toolkit that provides a vast collection of saleable vector icons.

## 5.4 Algorithm Design

A system requires efficient algorithms to ensure that the system can handle large amounts of data and provide interactive use of the system for the user. Here are some key aspects of algorithm design.

- ❖ **Search Algorithm:** These algorithms can be used for fast retrieval of books based on specific criteria like title, author, or department. The system uses SQL queries to search the MySQL database efficiently.
- ❖ **Sorting Algorithm:** Sorting algorithms like quick-sort, merge sort, or others may be used for organizing books in the search results or inventory list, such as sorting by title or author for better user experience.
- ❖ **Notification Algorithms:** Efficient algorithms for sending timely notifications to users about due dates, new book additions request statuses through the web interface.

## 5.5. User Interface Design

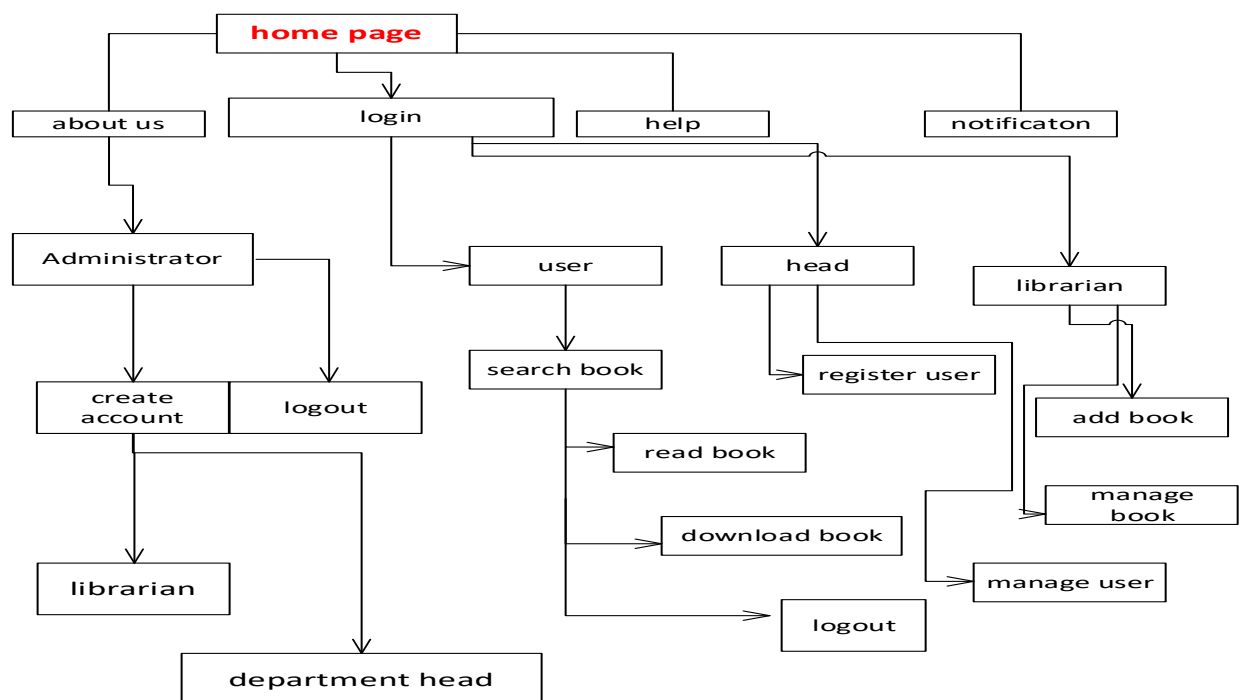


Figure 32: user interface design diagram

## 5.6 user interface

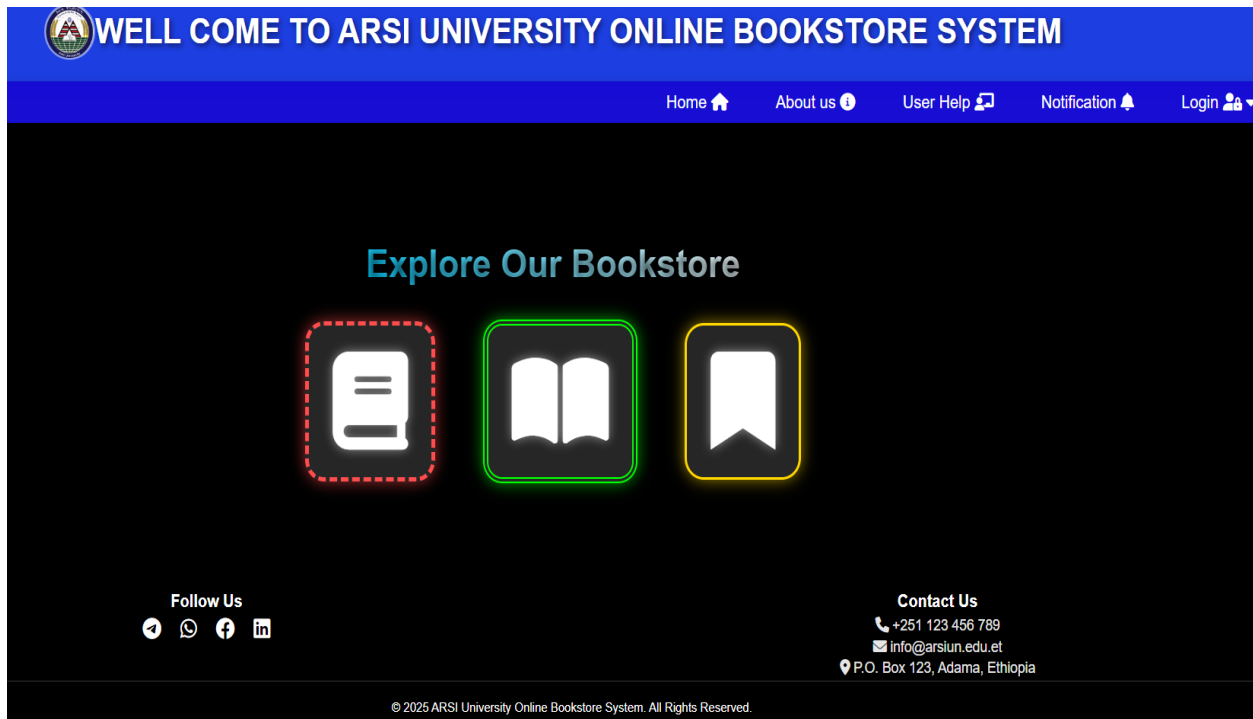


Figure 33: home page

The image shows a "User Registeration form" with the following fields: "Full Name", "Department", "Email", "Password", "Confirm Password", and "User" (with a dropdown arrow). A "Register" button is located at the bottom right of the form.

Figure 35: user registration form

The image shows a "LOGIN PAGE" with the following fields: "Email:" (containing "admin") and "Password:" (containing "\*\*\*\*\*"). A red "Login" button is positioned below the password field.

Figure 34: login page

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