Software Requirements Specification

Library Management System

Prepared by **Natasha Pati and Atul Sharma**

Organization

Date created: 01-10-2023

Table of Contents

1. Introduction

The goal of the library management system is to enhance the administration of libraries in a city or community. What if you could use your phone to see if a book is available at the library? or "what if you only needed one library card, rather than multiple ones for various libraries?" Alternatively, "You can issue or reserve a book from your phone while sitting at home!" You can easily borrow, renew, or reserve a book from a library in your town using the Integrated Library Management system on your phone. The primary functions of the Android-based Integrated Library Management system, which primarily focuses on lending, renewing, and reserving books, are these three actions.

1.1 Purpose

The project's goal is to keep track of information about the books and users at various libraries. The major goal of this project is to maintain an efficient system of book circulation between clients and the libraries, to issue books using a single library card, to search for and reserve any book from any available libraries, and to store user data (fine, address, and phone number). The user can also access all of these functions from their home.

1.2 Document Conventions

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

1.3 Intended Audience and Reading Suggestions

This document is intended for developers, project managers, testers, and other stakeholders involved in the development and deployment of the Library

Management System. It is recommended to read this document in its entirety to gain a comprehensive understanding of the system requirements.

1.4 Product Scope

- Manually updating the library system into an android based application so that the user can know the details of the books available and maximum limit on borrowing from their computer and also through their phones.
- The ILM System provides information's like details of the books, insertion of new books, deletion of lost books, limitation on issuing books, fine on keeping a book more than one month from the issued date.
- Also user can provide feedback for adding some new books to the library.

1.5 References

1. **ISO/IEC 25010:2011:** "Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - System and software quality models." This standard provides guidelines for defining software quality attributes and models, which were considered during the design of the system.
2. **Library Management System User Manual:** This document provides detailed instructions and guidelines for end-users on how to use the Library Management System. It serves as a valuable reference for understanding user interactions and expectations.
3. **Library Management System Design Document:** This internal document outlines the system's architectural design, component interactions, and database schema. It was used as a reference during the development phase to ensure compliance with the design specifications.

2. Overall Description

2.1 Product Perspective

The proposed Library Management System will take care of the current detail at any point of time. The book issue, book return will update the current book details automatically so that user will get the update current book details.

2.2 Product Functions

1. **Book Circulation Management:**
    - Facilitate efficient book circulation between clients and libraries.
    - Allow clients to borrow and return books seamlessly.
2. **Single Library Card System:**
    - Implement a single library card system to issue books, ensuring a unified user experience across multiple libraries.
3. **Book Search and Reservation:**
    - Enable clients to search for books by various criteria, such as title, author, genre, or ISBN.
    - Allow clients to reserve books from any available libraries, regardless of their physical location.
4. **User Data Management:**
    - Store and manage user data, including personal information (e.g., name, address, and phone number).
    - Keep track of fines and fees associated with book borrowing.
5. **Remote Access:**
    - Provide clients with the ability to access all system functions remotely from their homes or any internet-connected device.

2.3 User Classes and Characteristics

2.3.1 Clients

Characteristics : Clients are library patrons who use the system to borrow, reserve, and return books. They access the system from library terminals or remotely from their homes.

2.3.2 Librarians

Characteristics : Librarians are the administrative users responsible for managing library resources and assisting clients with their needs.

2.3.3 Administrators

Characteristic : Administrators have elevated privileges to configure and maintain the Library Management System.

2.3.4 Guests (Non-Registered Users)

Characteristic : Guests are individuals who access the system without registering or logging in.

2.3.5 Remote Users

Characteristic : Remote users are clients who access the system from their homes or remote locations.

2.4 Operating Environment

2.4.1 Hardware Requirements

Server Infrastructure: The system will be hosted on a dedicated server or cloud-based infrastructure.

Client Devices: Users will access the system from a variety of client devices, including desktop computers, laptops, tablets, and smartphones. The system should be compatible with commonly used web browsers and operating systems.

Barcode Scanners: Libraries may utilize barcode scanners for book checkout and check-in processes. These scanners should be compatible with the system's requirements.

2.4.2 Software Requirements

Operating System: The server hosting the system should run a stable and secure operating system, such as Linux, Windows Server, or a comparable alternative.

Web Server: A web server, such as Apache, Nginx, or Microsoft IIS, will be used to serve the system's web-based interface.

Database Management System (DBMS): The system will use a relational database management system (RDBMS) for data storage and retrieval. MySQL, PostgreSQL, or Microsoft SQL Server are suitable choices for the RDBMS.

Programming Languages: The system will be developed using programming languages such as PHP, Python, or Java, depending on the chosen technology stack.

Frameworks and Libraries: The development may rely on web application frameworks and libraries to streamline the development process and enhance functionality.

2.4.3 Network Requirements

Internet Connectivity: Users accessing the system remotely from their homes will require a stable internet connection.

Local Area Network (LAN): Libraries will require a local network for internal book circulation operations and communication with the system.

Firewalls and Security Measures: Proper network security measures, including firewalls and encryption protocols, should be in place to protect user data and system resources.

2.5 Design and Implementation Constraints

1. **Interoperability:** The system must be designed to interact seamlessly with various libraries and their existing systems. It should support industry-standard protocols for data exchange to ensure compatibility with different library databases and systems.
2. **Scalability:** The system must be scalable to accommodate a growing number of users, books, and libraries. It should be designed to handle increased load and data without compromising performance.
3. **Security:** Given the sensitive nature of user data and library resources, the system must implement robust security measures. This includes encryption of

user data, secure authentication, access control, and protection against data breaches.

4. **Reliability:** The system must be highly reliable to ensure uninterrupted access to library services. This includes minimizing system downtime and implementing mechanisms for data backup and recovery.
5. **User Accessibility:** The major goal of allowing users to access library functions from their homes imposes specific constraints. The system must be designed with a user-friendly web interface that is accessible from various devices and browsers. It should comply with web accessibility standards to accommodate users with disabilities.
6. **Data Storage:** The efficient storage and retrieval of large volumes of user data, book records, and transaction history are critical. The system must utilize an appropriate database management system and data storage strategy to handle this data effectively.
7. **Integration:** To support the major goal of searching and reserving books from any available libraries, the system must be capable of integrating with external library catalogs and databases. This may require the use of standardized library data formats and APIs.
8. **Performance:** The system should be optimized for performance, ensuring that response times are within acceptable limits even during peak usage. This includes efficient database queries and caching mechanisms.
9. **Compliance:** The project must comply with relevant legal and regulatory requirements, including data privacy and copyright laws. It should also adhere to industry best practices for library management systems.
10. **Resource Availability:** Availability of hardware, software, and human resources may pose constraints on the project. Adequate resources must be allocated to meet project timelines and objectives.

2.6 User Documentation

1. **User Manual:** A detailed user manual will be provided, offering step-by-step instructions on how to perform various tasks within the system. This will include guidance on searching for books, reserving books, managing user profiles, paying fines, and accessing library resources remotely.

2. **Online Help System:** An online help system integrated into the Library Management System's interface will provide context-sensitive assistance. Users can access relevant help topics while using the system to resolve queries or concerns.
3. **Frequently Asked Questions (FAQs):** A section containing frequently asked questions and their answers will be available to address common user inquiries. This will help users quickly find solutions to their issues.
4. **Contact Information:** Contact details for customer support, library staff, or technical assistance will be readily accessible within the system. Users can reach out for additional help or assistance as needed.
5. **Troubleshooting Guides:** In-depth troubleshooting guides will be available for resolving common issues or errors that users may encounter while using the system.
6. **System Updates and Announcements:** Information about system updates, new features, and announcements will be regularly communicated to users within the documentation.

2.7 Assumptions and Dependencies

2.7.1 Assumptions:

1. **Internet Connectivity:** It is assumed that users will have reliable internet connectivity when accessing the system remotely from their homes.
2. **Devices:** Users are expected to have access to suitable client devices, such as personal computers, tablets, or smartphones, to interact with the system from their homes.
3. **Data Accuracy:** The accuracy and completeness of book and user data are assumed to be maintained by the libraries and administrative staff responsible for data entry.
4. **Library Cooperation:** The success of the inter-library book search and reservation feature relies on cooperation and data sharing agreements between participating libraries.
5. **Legal Compliance:** It is assumed that the Library Management System will comply with all relevant laws and regulations, including data protection and privacy laws, in the regions where it operates.

2.7.2 Dependencies:

1. **External APIs and Services:** The system may depend on external APIs and services for features such as address validation, payment processing (for fines), and book availability information. The availability and reliability of these external resources are critical to the system's functionality.
2. **Library Data Integration:** Integration with libraries' existing systems and databases is essential for real-time book availability information and user data synchronization. Any changes or disruptions in these integrations may impact system functionality.
3. **User Authentication Services:** The system relies on user authentication services to verify user identities and provide secure access. The availability and reliability of these services are crucial for user access.
4. **Network Infrastructure:** The system's performance and availability depend on the network infrastructure, including servers, databases, and hosting services, being operational and responsive.

3. External Interface Requirements

3.1 User Interfaces

- Staff Interfaces: Cataloging, Circulation, Patron Management, Reporting, and Acquisitions interfaces for library staff.
- Patron Interfaces: Catalog Search, Account Management, Interlibrary Loan, Notification, and Digital Resource Access interfaces for library patrons.
- Administrator Interfaces:System Administration and Database Management interfaces for system administrators.
- OPAC (Online Public Access Catalog):A public-facing catalog search interface for patrons.
- Mobile Interfaces:Mobile apps or responsive web design for accessing library services on smartphones and tablets.
- Accessibility Interfaces:Features to ensure accessibility for users with disabilities

3.2 Hardware Interfaces

- Android version 2.3 ginger bread(minimum, android user's)
- 2GB ram
- 1.2 GHz processor
- Intel i5
- Windows 7/8/8.1/10

3.3 Software Interfaces

- Database Interface: Interaction with a database to store and retrieve library data.
- Cataloging and Metadata Interface: Access external sources for book information.
- Authentication and Authorization Interface: Connect to user authentication systems.
- Payment Gateway Interface: Integration with payment processors for fines and fees.
- Catalog Search Interface: Provide search features for patrons.
- Library Card Systems Interface: Interface for user authentication.

3.4 Communication Interfaces

- Network Communication: Library Management System relies on network communication for various tasks, including transmitting data between servers and client devices. It encompasses both wired and wireless network communication.
- Web Services: Many Library Management System solutions provide web services or APIs (Application Programming Interfaces) that allow external systems to communicate with the System. These APIs enable integration with other software components, such as mobile apps, digital catalogs, or external databases.
- Email Communication: The Library Management System may use email communication for sending notifications to patrons, including overdue notices, reservation pickups, and account updates. This interface relies on the Simple Mail Transfer Protocol (SMTP) for sending emails.
- Messaging Systems: Some libraries employ messaging systems or chatbots to provide real-time assistance to patrons. These systems may use communication protocols like MQTT or WebSocket for instant messaging.

- Remote Access: Library Management System should support remote access for library staff and patrons. This may involve virtual private networks (VPNs), secure sockets layer (SSL) encryption, or other secure communication methods to protect data during transmission.
- Data Import/Export Interfaces: Library Management System often involves importing or exporting data to/from external sources, like bibliographic data from national library databases or patron information from student management systems. These interfaces ensure data consistency and accuracy.

4. System Features

4.1 System Feature 1

4.1.1 Description and Priority

- Description:

  System Feature 1 is designed to facilitate the efficient circulation of books between clients and libraries. It enables clients to borrow and return books, reserve books from multiple libraries, and access their account information. This feature is of high priority as it forms the core functionality of the Library Management System.

- Priority: High

4.1.2 Stimulus/Response Sequences

1. **Borrowing a Book:**
   - Stimulus: A client selects a book for borrowing.
   - Response: The system verifies the availability of the book, updates the client's account with the borrowed book information, and updates the book's status as "Checked Out."
2. **Returning a Book:**
   - Stimulus: A client returns a borrowed book.
   - Response: The system records the return of the book, calculates fines if applicable, and updates the book's status as "Available."
3. **Reserving a Book:**
   - Stimulus: A client searches for and reserves a book from a different library.

- Response: The system checks the book's availability, reserves it for the client, and sends a confirmation notification.

4. **Accessing User Account:**
    - Stimulus: A client logs in to their account from home.
    - Response: The system authenticates the client, allowing access to account information, including borrowed books and fines.

4.1.3 Functional Requirements

1. **REQ-1: Borrowing Books**
    - The system shall allow clients to select and borrow available books.
    - The system shall update the client's account with borrowed book details.
    - The system shall update the book's status as "Checked Out."
2. **REQ-2: Returning Books**
    - The system shall record the return of books by clients.
    - The system shall calculate fines, if applicable, based on the return date.
    - The system shall update the book's status as "Available" upon return.

4.2 System Feature 2

4.2.1 Description and Priority

- Description:

  System Feature 2 focuses on the centralized issuance of library cards for clients, enabling them to access library services seamlessly across multiple libraries. It also includes the functionality to report lost or stolen cards. This feature is considered essential to providing a convenient and unified experience for library patrons.

- Priority: High

4.2.2 Stimulus/Response Sequences

1. **Issuing Library Cards:**
    - Stimulus: A client applies for a library card.

- Response: The system generates a unique library card for the client, associates it with their account, and provides instructions for card activation.

2. **Activating Library Cards:**
    - Stimulus: A client activates their library card.
    - Response: The system verifies the card's authenticity, activates it, and grants access to library services.
3. **Reporting Lost or Stolen Cards:**
    - Stimulus: A client reports their library card as lost or stolen.
    - Response: The system deactivates the lost or stolen card, issues a replacement card if requested, and updates the client's account.

4.2.3 Functional Requirements

1. **REQ-1: Library Card Issuance**
    - The system shall allow clients to apply for a library card.
    - The system shall generate a unique library card for each client.
    - The system shall associate the library card with the client's account.
2. **REQ-2: Library Card Activation**
    - The system shall provide a mechanism for clients to activate their library cards.
    - The system shall authenticate card activation requests.
    - The system shall grant access to library services upon successful card activation.
3. **REQ-3: Reporting Lost or Stolen Cards**
    - The system shall allow clients to report their library cards as lost or stolen.
    - The system shall deactivate the lost or stolen card.
    - The system shall issue a replacement card if requested by the client.

5. Other Nonfunctional Requirements

The Library Management System must adhere to various nonfunctional requirements to ensure its effectiveness, safety, security, quality, and alignment with business rules.

5.1 Performance Requirements

Response Time:

- The system should respond to user queries and interactions within a maximum of 2 seconds.
- Book search and reservation operations should not exceed 3 seconds.

Scalability:

- The system must be scalable to accommodate a growing number of users and library resources.
- It should handle concurrent user requests efficiently, even during peak usage times.

5.2 Safety Requirements

Data Backup and Recovery:

- The system shall perform regular automated backups of user data, book catalog, and transaction history.
- It should have a reliable data recovery mechanism in case of system failures or data corruption.

5.3 Security Requirements

Data Security:

- User data, including addresses and phone numbers, must be stored securely and encrypted.
- Access to user data shall be restricted to authorized personnel only.

Access Control:

- Role-based access control (RBAC) shall be implemented to manage user roles and permissions.
- User authentication must be secure, utilizing strong password policies and possibly multi-factor authentication.

5.4 Software Quality Attributes

Reliability:

- The system should be highly reliable, with minimal downtime or errors.
- It should provide accurate information on book availability and user accounts.

Usability:

- The user interface should be intuitive and user-friendly, catering to users of varying technical backgrounds.
- User feedback and usability testing should be conducted regularly to improve the interface.

Maintainability:

- The system's codebase shall adhere to coding standards and best practices to facilitate future maintenance.
- Documentation and comments within the code should be comprehensive to assist developers.

5.5 Business Rules

Single Library Card:

- A user shall be issued a single library card that can be used across all affiliated libraries.
- The card must have a unique identification number linked to the user's account.

Fines and Penalties:

- The system should automatically calculate fines for overdue books and provide a mechanism for users to pay fines online.

- Clear policies for fine calculation and payment should be established.

Remote Access:

- All system functions, including book search, reservation, and account management, must be accessible remotely to users from their homes.

6. Other Requirements

6.1 Barcode and RFID Integration:
Implement barcode or RFID technology for efficient item tracking and management.

6.2 Digital Resource Management:
Manage electronic resources such as eBooks, eJournals, and digital media. Ensure secure access to digital content and track usage.

6.3 Collection Development Tools: Provide tools to assist librarians in making decisions about acquisitions and weeding out outdated materials.

6.4 Interlibrary Loan Integration:
Facilitate interlibrary loans, allowing patrons to borrow materials from other libraries.

6.5 Inventory Management:
Conduct regular inventory checks and updates to ensure the accuracy of the catalog.

6.6 Data Analytics and Reporting:
Offer advanced reporting and analytics features to analyze library usage, trends, and collection performance.

6.7 Self-Service Kiosks:
Install self-service kiosks for patrons to check out and return materials without staff assistance.

6.8 Integration with Online Databases:
Seamlessly connect with online databases, making it easy for patrons to access digital resources.

6.9 Multi-Branch Support:

Support libraries with multiple branches, allowing for centralized or decentralized management.

6.10 Serials and Subscriptions Management:
Handle subscriptions to periodicals and manage serial publications effectively.

6.11 Circulation Policies and Rules:
Customize circulation rules, lending periods, and renewal policies to align with library policies.

6.12 Suggested Reading Lists:
Offer features to create and share suggested reading lists or book recommendations.

6.13 Integration with Library Websites:
Integrate the library catalog and services with the library's website for a seamless user experience.

6.14 Integration with Learning Management Systems (LMS):
Connect with educational institutions' LMS for easy access to library resources by students and educators.

6.15 Accessibility Compliance:
Ensure that the system complies with accessibility standards to accommodate users with disabilities.

6.16 Backup and Disaster Recovery Planning:
Implement robust backup and recovery procedures to prevent data loss in case of system failures or disasters.

6.17 User Training and Support:
Provide training resources and support to both staff and patrons for effective system usage.

6.18 Budget and Financial Management:
Manage the library's financial transactions, including budgets, invoices, and expenditures.

6.19 Scalability:
Design the system to handle growth in the library's collection and user base.

6.20 Feedback Mechanisms:

Include feedback forms and channels for users to provide suggestions and report issues

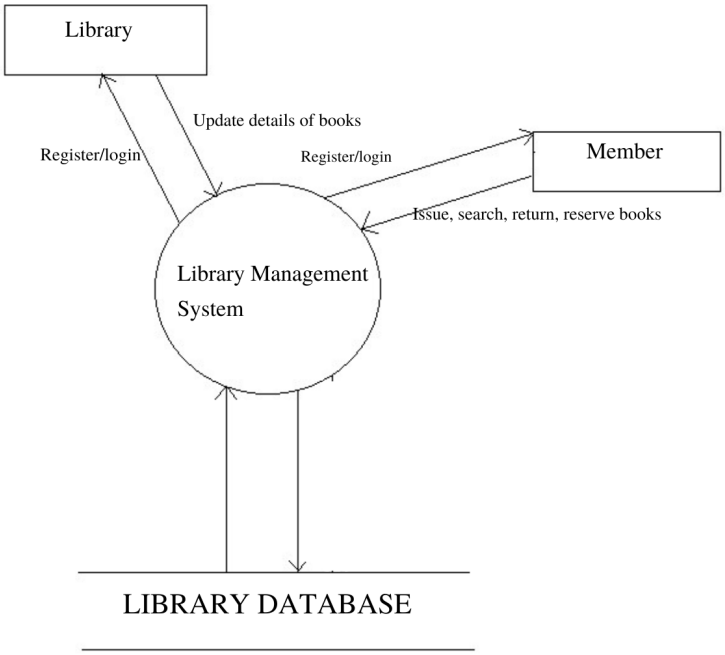
Appendix A: Glossary

- **Android:** A mobile operating system developed by Google, commonly used on smartphones and tablets.
- **API:** Abbreviation for Application Programming Interface. It defines a set of rules and protocols that allow different software applications to communicate with each other.
- **Barcode:** A series of parallel lines or squares of varying widths that represent data, often used for quick identification of books and other items in a library.
- **Client:** In the context of this document, a client refers to library patrons or users who interact with the Library Management System to borrow, return, and reserve books.
- **DFD:** Abbreviation for Data Flow Diagram. It is a graphical representation of the flow of data within a system.
- **Entity Relationship (ER):** A data modeling technique used to describe the entities or objects in a system and the relationships between them.
- **IDE:** Abbreviation for Integrated Development Environment. It is a software application that provides a comprehensive set of tools for software development.
- **ILM System:** Abbreviation for Integrated Library Management System, which is the primary focus of this document.
- **ISBN:** Abbreviation for International Standard Book Number. It is a unique identifier for books.
- **Java:** A popular programming language known for its platform independence.
- **LAN:** Abbreviation for Local Area Network. It refers to a network of interconnected computers and devices within a limited geographic area, such as a library.
- **LDAP:** Abbreviation for Lightweight Directory Access Protocol. It is a protocol used for accessing and managing directory services.
- **MySQL:** A widely used open-source relational database management system (RDBMS).
- **OPAC:** Abbreviation for Online Public Access Catalog. It is a public-facing catalog search interface for library patrons.
- **PHP:** A server-side scripting language commonly used for web development.

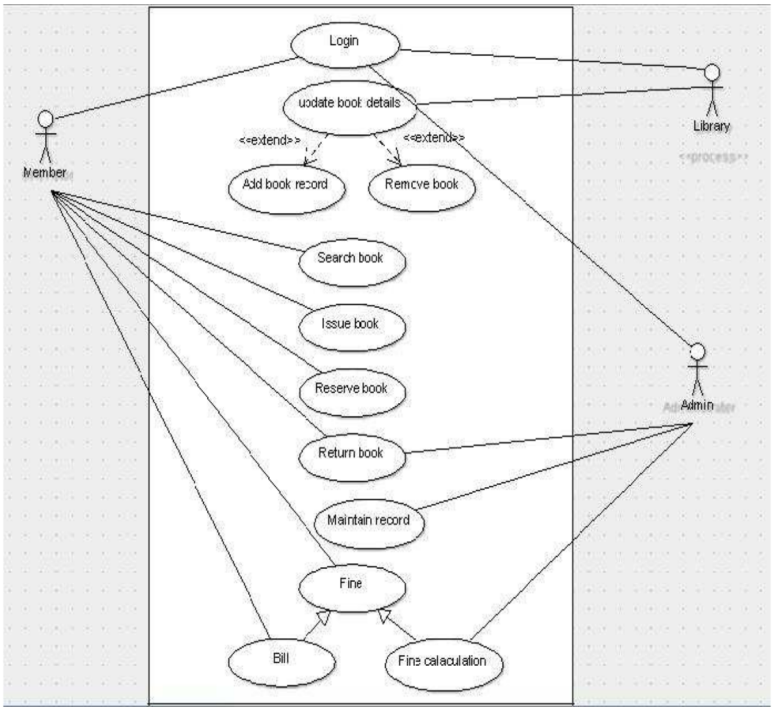
- **RFID:** Abbreviation for Radio-Frequency Identification. It is a technology that uses radio waves to identify and track objects.
- **SQL:** Abbreviation for Structured Query Language. It is a domain-specific language used for managing and querying relational databases.
- **SRS:** Abbreviation for Software Requirements Specification. It is a comprehensive document that defines the requirements for a software system.
- **SSL:** Abbreviation for Secure Sockets Layer. It is a cryptographic protocol used to secure data transmission over the internet.
- **VPN:** Abbreviation for Virtual Private Network. It is a technology that creates a secure network connection over a public network, such as the internet.
- **WebSocket:** A communication protocol that enables full-duplex communication channels over a single TCP connection.
- **Wi-Fi:** A technology that allows electronic devices to connect to a wireless local area network (WLAN) using radio waves.
- **XML:** Abbreviation for Extensible Markup Language. It is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Appendix B: Analysis Models

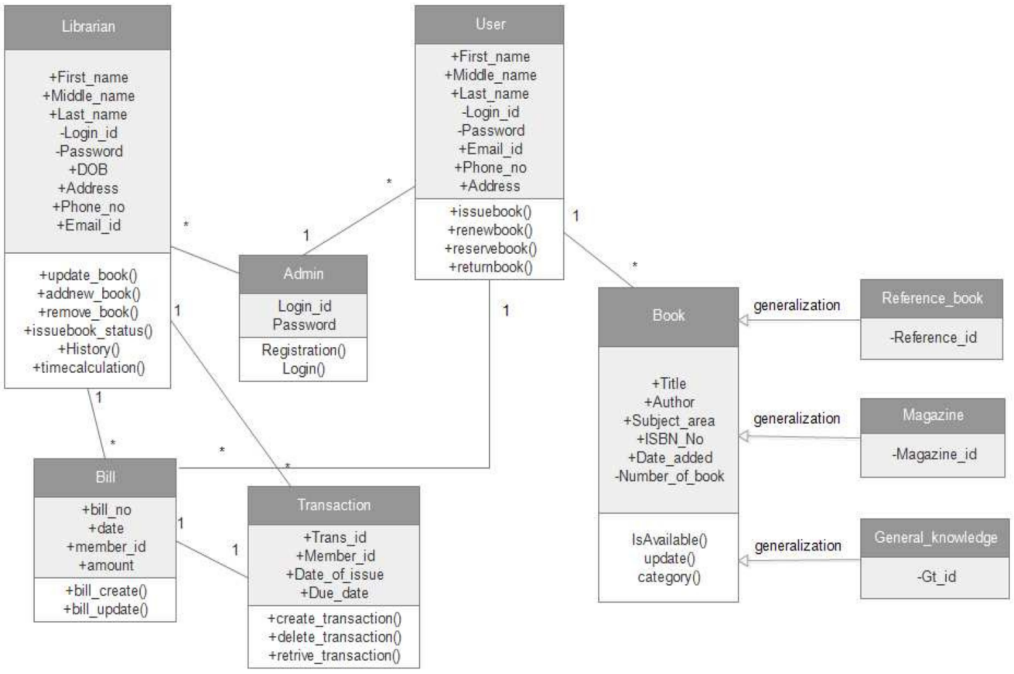
1.FLOW DIAGRAM



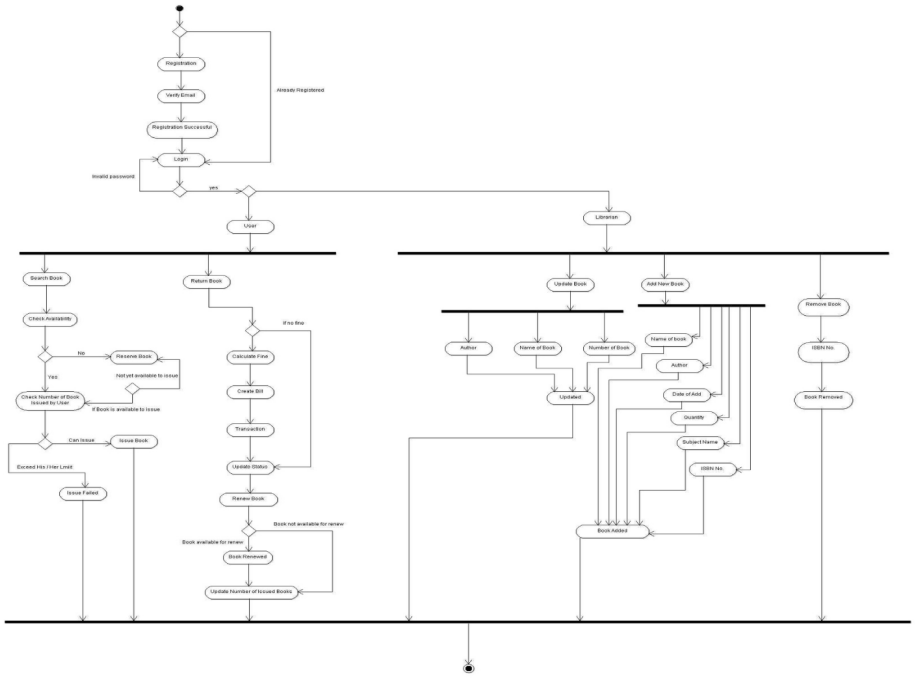
2.USER CASE DIAGRAM



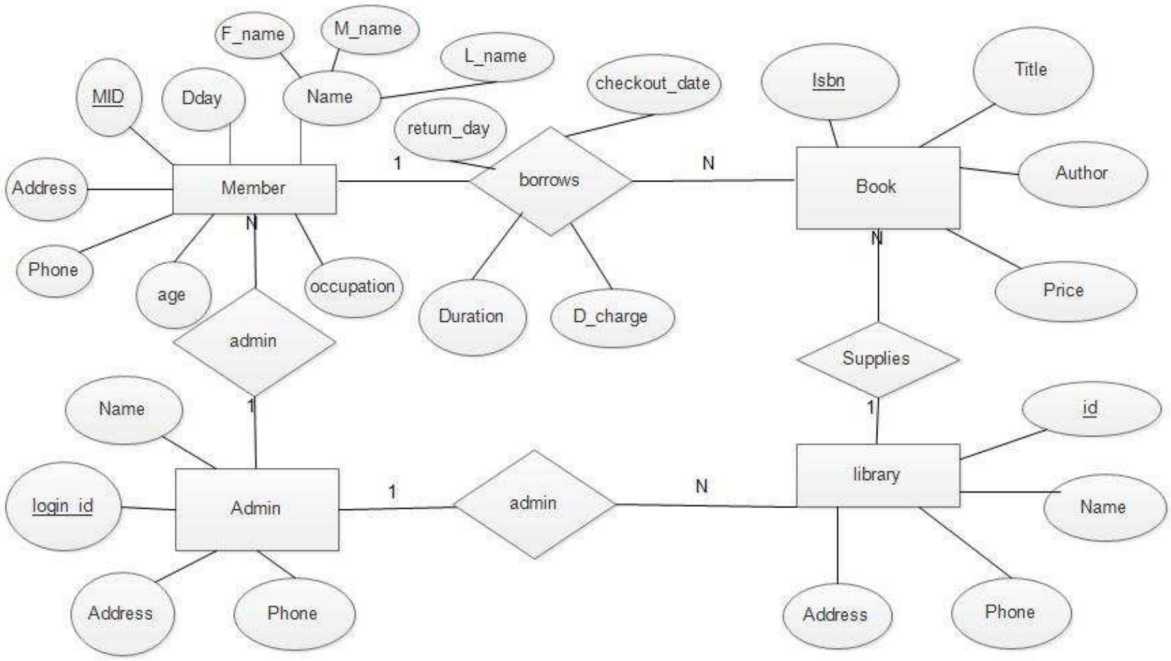
3.CLASS DIAGRAM



4.ACTIVITY DIAGRAM



5.ENTITY-RELATIONSHIP DIAGRAM



Appendix C: To Be Determined List

1. **Notification Preferences:** Determine how patrons prefer to receive notifications, such as email, SMS, or app notifications. This is crucial for ensuring that patrons receive important updates and reminders in their preferred communication channels.
2. **Authentication Methods:** Specify the specific methods for user authentication, including username/password, biometrics, or single sign-on (SSO). This decision impacts the security and usability of the system.
3. **Interlibrary Loan Policies:** Define the policies and procedures for interlibrary loans, including loan durations and request processing. This is essential for facilitating resource sharing among libraries.
4. **Digital Resource Licensing:** Establish licensing agreements and terms for digital resources, including e-books and e-journals. Proper licensing ensures compliance with copyright laws and the legal use of digital materials.
5. **Accessibility Compliance Standards:** Identify and adhere to specific accessibility standards (e.g., WCAG) for ensuring accessibility for users with disabilities. Ensuring accessibility is not only a legal requirement but also promotes inclusivity and usability.