Software Requirements Specification

Library Book Management App

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1. Introduction

1.1 Purpose

The main objective of this document is to illustrate the requirements of the project Library Book Management system. The document gives a detailed description of both the functional and non-functional requirements. The purpose of this project is to provide students with a user friendly application to search books available in the library. This document also describes the hardware and software interface requirements using ER diagrams and UML diagrams.

The purpose of the requirement document is to specify all the information required to design, develop and test the software.

- The purpose of this project is to provide a friendly environment to maintain the details of books and library members.
- The main purpose of this project is to maintain easy circulation system using computers and to provide different reports.

1.2 Scope

This product is designed to reduce the workload on students. Students today go to the library and manually search for a book, ultimately to find out that the book isn't available. This app will let the student know if the book he wants is available or not. It will also provide details of the book. The user can also keep a check on his maximum limit of borrowing. All the external interfaces and the dependencies are also identified in this document.

The product can be easily implemented under various situations. We can add new features as and when we require, making reusability possible as there is flexibility in all the modules.

The language used for developing is Java as it is quite advantageous than other languages in terms of performance, tools available, cross platform compatibility, libraries, cost, and development process.

Feasibility study: The overall scope of the feasibility study was to provide sufficient information to allow a decision to be made as to whether the Library Management System project should proceed and if so, its relative priority in the context of other existing Library Management Technology.

1.3 Intended Audience and Reading Suggestions

We are developing our project Library Management System for the college or any Institute. But this project can be deployed in any organization. This SRS is mainly developed for the project development team. In this team there are the project manager,developer, coder, tester and documentation writer and the user of the project also.
This SRS will also be viewed by:

- The Institute Student Council. They represent the end users of this application.This document is intended to user and customer to make them ensure that this document is well meeting the need of the users.
- The administrative staff of the institute. They are the clients.
- Prof. K Chandrasekaran and respective Assistant Professors and Teaching Assistants. They are the project managers, supervisors and coordinators.

This document will be reviewed frequently by the above audiences to check if the different phases of the project are being completed by meeting the given requirements. If there are any changes in the requirements in the course of the project, they must be included in this document by making the necessary changes.

Suggestions

1. The user can read the whole SRS document but for him Introduction, Overall description and System features is more important than software performance.
2. For the project manager the system features is very important.
3. The developer must go through the whole SRS for understanding the requirement and functioning of software.

1.4 Definitions, Acronyms and Abbreviations

-	-
ER	Entity Relationship
DFD	Data Flow Diagram
UML	Unified Modelling Language
UI	User Interface
JAVA	Programming language used
IDE	Integrated Development Environment

IEEE	Institute of Electrical and Electronics Engineers
SRS	Software Requirements Specification
ISBN	International Standard Book Number
User	Someone who interacts with the application
Admin	Someone who has access to manage and modify databases
Student Info Database	The database which has information of all registered users
Book Info Database	The database which has information of all the books in the library
Interface:	Something used to communicate across different mediums
REQ	Requirement
Info	Information
App	Application

1.5 References

Papers:

- Sarah Geagea, Sheng Zhang, Niclas Sahlin “Software Requirements Specifications for Amazing Lunch Indicator”
- Shiva Prasad “Library Management SRS document”
- Software Requirements Specification for A-Flex Automated Library Management System Version 1. 2 Prepared by A-FLEX Group

Links:

- https://www.onedesk.com/writing-a-software-requirements-specification-document/
- https://bigbuddysociety.net/essays/srs-of-library-management/
- http://www.freestudentprojects.com/studentprojectreport/project-srs/library-management-system-project-srs-document/

1.6 Overview

This Library Management System will have login page from where its user can access. This page will provide login for admin and the students.

To access the library resources students have to register by using their registration number, email address, phone number, and password. After successful registration they will be provided the login facility.

Students can search books by using book ISBN number or by author name or by title of book. After completion of this process students will be provided with book details and status such as whether it is available in the library or not.

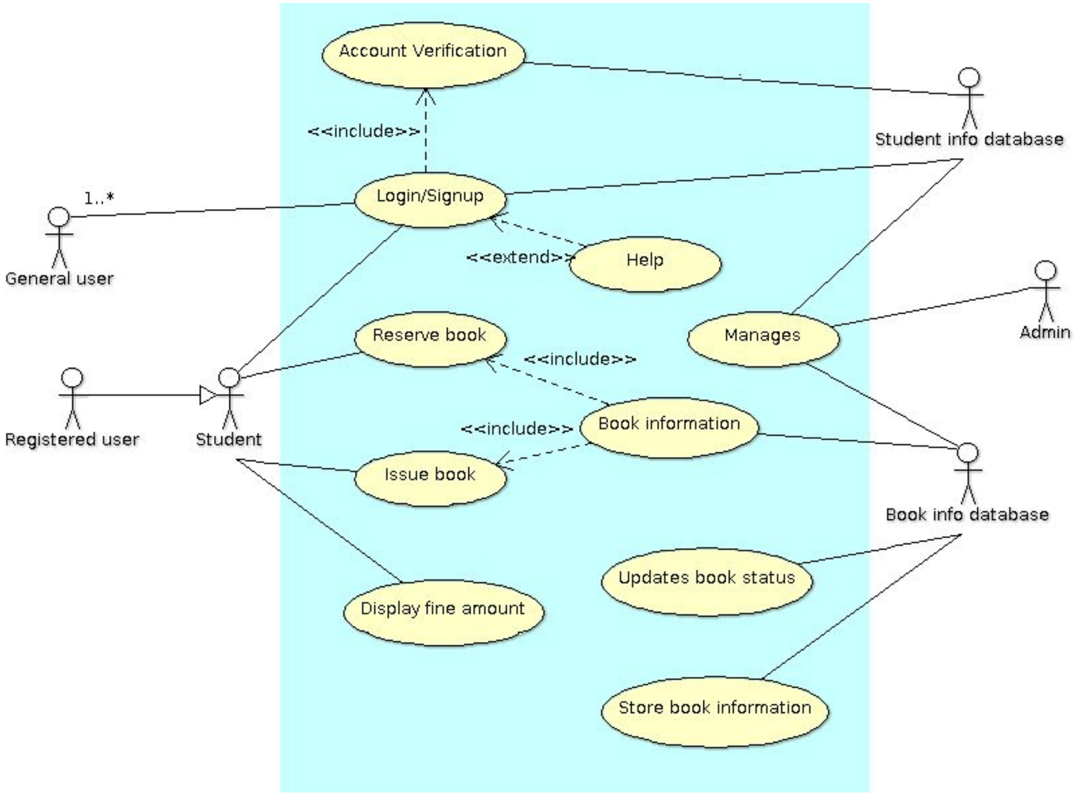
Admin will able to add students, delete students, add books, delete books, manage account details, etc.

2. Overall Description

This section gives an overview of the functionality of the product. It describes the informal requirements and is used to establish a context for the technical requirements specification in the next chapter.

2.1 Product Perspective

Use-Case diagram of Library Book Management System

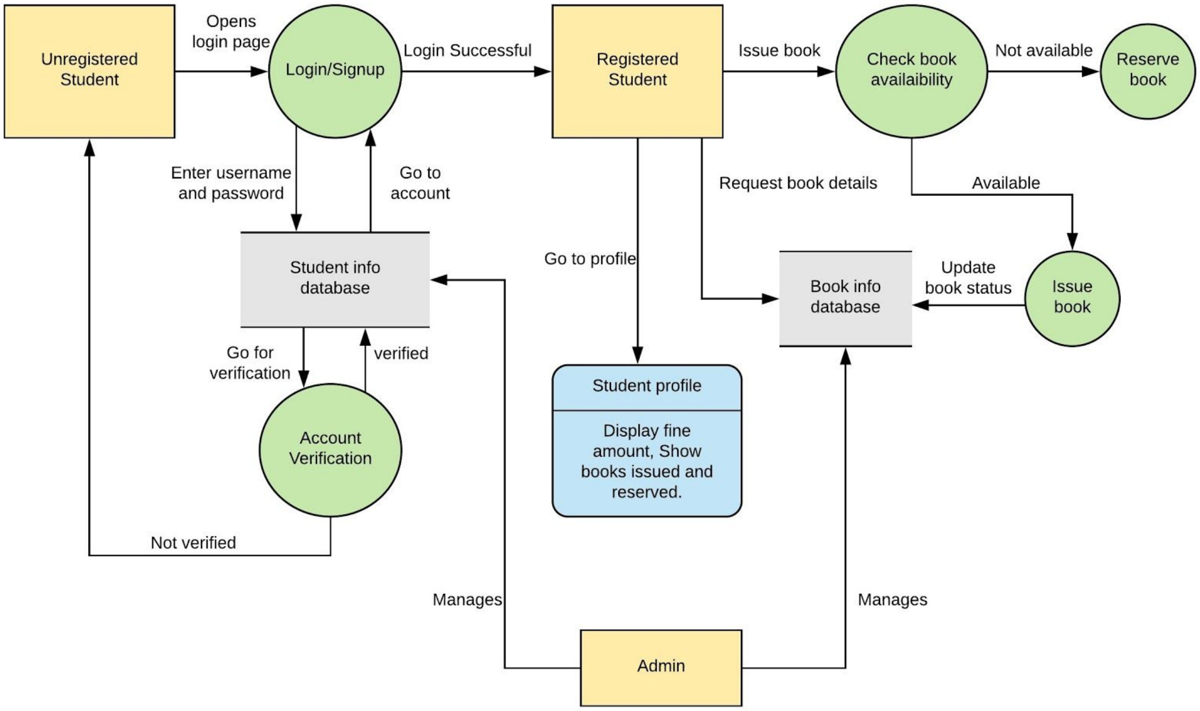


The above use-case diagram shows a basic overview of the project. The context of this product is that it is meant to be used in libraries with a definite number of users i.e. an institute library where only the members of the institute are allowed access. These members or students must make an account of their own. They must login through this account to access the library facilities. This product is a follow-on member of the Management Systems family.

This Library Management System is a package to be used by Libraries to improve the efficiency of Librarians and Users. The Library Management System to be developed benefits greatly the members and the Librarian of institute. The system provides books catalog and information to members and helps them decide on the books to borrow from the library. The Librarian(Admin) can keep the books catalog updated all the time so that the members (students and the professors) get the updated information all the time

2.2 Product Functions

Data Flow diagram of Library Book Management system



This application provides online real time information about the books available in the Library and the user information.

Functions:

- The main purpose of this project is to reduce the manual work.
- This software is capable of managing Book Issues, Returns, and Calculating/Managing Fine. Generating various Reports for Record-Keeping according to end user requirements
- With this application, the student will be able to search for books in his institute's library from the comfort of his room. The student must first make an account by linking his email id and go through the email verification process.
- The system will provide search facilities to the user, which will be according to book name, author name or ISBN.
- The admin is provided with interfaces to add/delete the books available in the book catalog.
- The portal will provide functionality to manage the system and the database information. It will also provide information about the system, for example show when there is a new update.

2.3 User Classes and Characteristics

We have 4 levels of users:

- **General user module:** This user does not have an account in the student database. The general use can access only the login/signup page on the application. He can also go to the help page to learn how to login/signup. After entering appropriate information and verification of account, the general user becomes a registered user.

- **Registered user module:** This user has an account in the student database, but has not logged in to the account. After entering username and password, the user can log in and become a student user.

- **Student user module:** This user is logged in to his account and can access all the features of the application. This user can access the following features:
  -Can view the different categories of books available in the library
  -Can view the list of books available in each category
  -Can own an account in the library
  -Can view the books issued to him
  -Can put a request for a new book
  -Can view the history of books issued to him previously
  -Can search for a particular book

- **Administration module:** The following are the sub module in the administration module.
  -Can issue a book to the student
  -Can view the different categories of books available in the library
  -Can view the list of books available in each category
  -Add books and their information of the books to the database
  -Edit the information of the existing books.
  -Can check the report of the issued books.
  -Can access all the accounts of the students

2.4 Operating Environment

Software requirements:
The product will be operating in an Android environment. The system will also be linked to the World Wide Web as internet services are need for account verification via email. All major browsers such as Microsoft Internet Explorer, Google Chrome, Mozilla Firefox etc will be supported.

Operating System	-:	Windows
Database	-:	Mongo DB
Language	-:	Java

Web Server -: Apache

Hardware requirements:

The hardware configuration includes a Local Area Network connection for accessing user information. A basic Android OS supporting device is a requirement to access the features of this application. The input will be given through the keypad and the output will be displayed on the screen.

2.5Design and Implementation Constraints

The challenges in developing the product include virtualization of multiple students and isolating student modules so that data inconsistency does not occur. This student information must be stored in a database that is accessible by the Library System.

Security and authentication of user accounts to prevent data theft is also an implementation challenge.

The university information security system must be compatible with the Internet applications. The application server is connected to the institute computer and is running all 24 hours a day.

The product will be developed using Intellij IDEA and Android SDK. The backend database for this application is Mongo DB. The product is accomplished with login facility so that specific function is available to that specific student.

2.6User Documentation

The product will include a user manual. The user manual will include product overview, complete configuration of the used software (such as Mongo DB server), technical details, backup procedure and contact information which will include email address. There will be no online help for the product at this moment.

The product will be compatible with android devices and will support major browsers such as Internet Explorer, Google Chrome, Mozilla Firefox etc. The databases will be created in the Mongo DB and Apache web servers will be used..

2.7Assumptions and Dependencies

Assumptions:

- The users have sufficient knowledge of computers.
- The Institute computer should have Internet connection and Internet server capabilities.
- The users know the English language, as the user interface will be provided in English.
- Database must be accessible to the application.
- Appropriate storage capacity of the system.
- Fast search facility.
- The system should be running 24x7.
- Users must have their correct usernames and passwords.

Dependencies:

- The specific hardware and software due to which the product will run
- On the basis of listing requirements and specification the project will be developed and run
- The admin should have proper understanding of the product
- Data entered in the database should be correct

3. External Interface Requirements

This section contains all of the external interface requirements which include the user interface (UI) along with the software, hardware and communication interface. It gives a detailed description of how the system will appear to the user. It describes the input output functionalities of the application.

3.1 User Interfaces

The software should provide an interactive and good graphical interface for both the user and the administrator. The design and layout should be clear and easily operable.

-> **Welcome Screen**:A welcome screen should appear as soon as the application is opened.

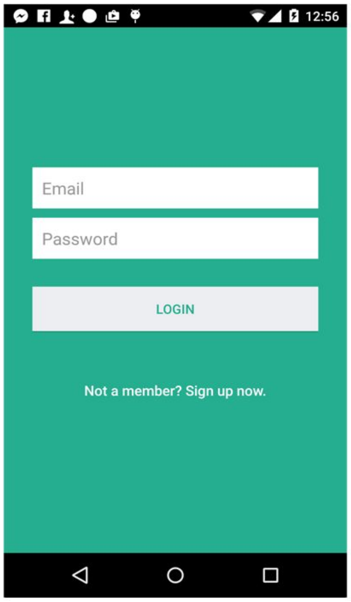
-> **Login Interface:** The user of the mobile application should see the log-in page upon clicking on the welcome screen .
If the user is a first time user of the application and has not registered, he/she should be able to do that by clicking on the signup button .Upon clicking which the user is directed to a window where he could enter the details for registration. The user will become a registered user as soon as he/she verifies the email-id.
If the user is a regular user of the application he/she can click on the login button where after he/she is directed to the login window. The user should enter the username and password upon whose verification a successfully logged in message would be displayed. The user will be then directed to his profile page.

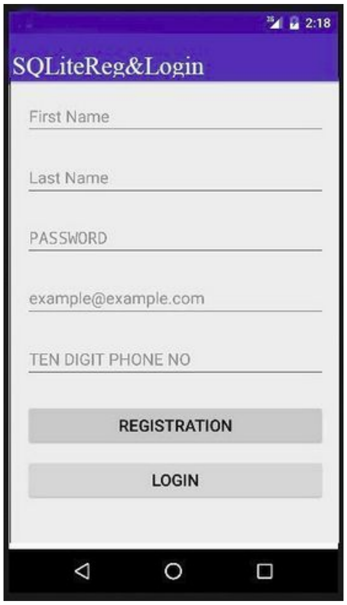
->**Edit**:The profile page should contain all the details of the user like name, registration no, email-id, books issued, total fine etc with an edit option. The edit option could be used by the user to edit only the personal details of the user. The administrator however can use the edit option to edit other details like fine, books issued etc.

->**Prompts**:In each and every window there will be alert, confirm etc message box for displaying messages.

->**Search**: The user can enter the book name, author name, publication name any of these or all of these to find a particular book in the database. If the book is present , book details along with position in the library is displayed. If the book is not present a prompt stating book currently out of stock will appear.

->**Bookmark**:The user can bookmark the books which are not present and these will be shown in the user profile window.





Sample Login Window **Sample Signup Window**

3.2 Hardware Interfaces

An android phone or tablet to get access to the application.

The input will be given through the keypad and the output will be displayed on the screen.

The listed specs say :

1. 64-bit distribution capable of running 32-bit applications
2. 3 GB RAM minimum, 8 GB RAM recommended; plus 1 GB for the Android Emulator
3. 2 GB of available disk space minimum, 4 GB Recommended (500 MB for IDE + 1.5 GB for Android SDK and emulator system image)
4. 1280 x 800 minimum screen resolution

The information will be sent and received using TCP/IP or using the HTTP protocol.

3.3 Software Interfaces

Software interfaces provide access to computer resources (such as memory, CPU, storage, etc.) of the underlying computer system; direct access (i.e. not through well designed interfaces) to such resources by software can have major ramifications—sometimes disastrous ones—for functionality and stability.

In the Library Management application, a firewall will be used with the server to prevent unauthorized access to the system. This interface will prevent direct access to the database. The tools, libraries, operating system that will be used are:

Operating System	-:	Windows 10
Database	-:	Mongo DB
Language	-:	Java
Web Server	-:	Apache
IDE	-:	Intellij Idea
App Dev. Frameworks	-:	Android SDK
App Server	-:	Apache Tomcat
Testing	-:	Selenium

3.3 Communication Interfaces

The Online Library System will be connected to the World Wide Web. The communication protocols that will be used are TCP/IP or HTTP protocol. A push protocol will be used to push notifications onto the Android phones. A pull protocol will be used to synchronize all the changes made by the student in the application like profile change , issuing books etc. SSL (Secure Sockets Layer) a standard security protocol for establishing encrypted links. The usage of *SSL* technology ensures that all data transmitted remains encrypted.

4. Functional Requirements

A functional requirement defines a function of a system or its component. A function is described as a set of inputs, the behavior, and outputs.

4.1 User Class 1- General User

4.1.1 Description and Priority

Users can register themselves on the application and become registered user from general user by selecting the signup option and then entering all their details on the signup window. The email-id verification is the final step in this process. The details such as password should be according to some constraints and all the details entered should be valid.

4.1.2 Stimulus/Response Sequences

STIMULUS: The user will click on the signup option.
RESPONSE: The user will be directed to a signup window.

STIMULUS: The user will fill all the details on the signup window.
RESPONSE: All the details would be checked for validity and if some error is found a message would be displayed.A mail on email-id for verification will be sent.

STIMULUS: The user verifies the mail-id by going to his mail account.
RESPONSE: The user becomes a registered user and his details are successfully saved and stored in the database. All the accesses for a normal registered user are now given to this user.

4.1.3 Functional Requirements

❏ **REQ 1**: User Log in/Sign Up Window:
If the user is a first time user of the application and has not registered, he/she should be able to do that by clicking on the signup button.

❏ **REQ 2**: Registration Window:
The user can enter his/her details which include name, registration number, mobile no, email-id etc.

❏ **REQ 3:** Help Screen:
User can click on the help button which will display prompts to assist the user in filling the details on the signup window if he/she faces any problem .

❏ **REQ 4**: Email-id verification:
To verify the details entered by the user a verification mail would be sent to the user.

❏ **REQ 5**:Logged in popup:
A message saying email-id verified and the user is logged in would be displayed.

❏ **REQ 6**:Error message:
If the user enters any details which do not match the predefined format an error message displaying “please enter valid details should be displayed”. Eg if the user enters email-id which is already stored in the database an error should occur.

❏ **REQ 7**: Password Strength:
The password set by the user should contain 1 Upper case alphabet, 1 character, 1 number and should be more than 6 characters long. If the password set does not satisfy any of these a message displaying “ reset a stronger password” should be displayed.

4.2 User Class 2- Registered User

4.2.1 Description and Priority

A registered user can log in to his/her account by correctly entering the username and password with which he registered. In case he/she has any doubts regarding the filling of details he can refer to the help prompt. In case user forgets the password he can click on the forgot password which would automatically send a mail to the email-id associated with the registered username to reset the password.

4.2.2 Stimulus/Response Sequences

STIMULUS: The user clicks on the login button.
RESPONSE: The user will be redirected to a login window.

STIMULUS: The user enters the username and password.
RESPONSE: The password and username are sent for authentication where their correctness is checked for in the database. If they match then the user is successfully logged in. If not then an error message is displayed.

STIMULUS: The user clicks on forgot password button.
RESPONSE: A mail to corresponding id of the username stored in the database is sent to
Reset the password.

STIMULUS: The user clicks on the help button.
RESPONSE:A prompt appears displaying how the information is supposed to be filled.

4.2.3 Functional Requirements

❏ **REQ1:** User Log in
If the user is a regular user of the application he/she can click on the login button where after he/she is directed to the login window.

❏ **REQ 2**: Login Window:
The user will have to enter the username and password in this window upon whose verification he will be directed to the profile window.

❏ **REQ 3:** Help Screen
User can click on the help button which will display prompts to assist the user in filling the details on the login window if he/she faces any problem .

❏ **REQ 4:** Forgot Password button:
If the user forgets his/her password he can click on this button . Upon doing this a mail to reset the password will be sent to the email-id for the particular username which would be stored in the database. The user can then reset the password and use the account

Again.

- **REQ 5**:Error Message:
  If the password and the username entered by the user do not match with that stored in the database an error message displaying "Incorrect username or password " will be displayed.

4.3 User Class 3- Student

4.3.1 Description and Priority

The student can edit profile, search for books and also bookmark books if they are not available. The student can issue the books if they are available.The notification button will alert the user regarding the availability of bookmarked books, fine status etc. The logout button will be used to terminate the current session.

4.3.2 Stimulus/Response Sequences

STIMULUS: : The student clicks on the edit profile button.
RESPONSE: The system gives permission to edit only certain information.

STIMULUS: The student after editing the information clicks on the edit button.
RESPONSE: The edited information is updated in the database and on the user profile window.

STIMULUS: The student searches for a particular book under a particular field like under author name or under book name.
RESPONSE: An algorithm matches the keywords with all the book present in the book information database. If the book is present it's details are displayed else an error message is displayed.

STIMULUS: The student bookmarks a book.
RESPONSE: The bookmarked book is stored separately and an algorithm checks daily for the count of the bookmarked book in the book database and as soon as the count becomes one a notification is sent to all those who bookmarked the book.

STIMULUS: The student issues the book.
RESPONSE: The count of the book is decreased by one in the book database and a request to the admin to issue the book to a particular user is sent.

STIMULUS: The student clicks the logout button.
RESPONSE: The system takes all access permissions from the student.

4.3.3 Functional Requirements

❏ **REQ1**: Edit profile button:
The student can select the edit profile option from the menu which would take him to the profile window.

❏ **REQ 2:**Profile window:
The user can choose to just view it or make changes to the details which he is given access to like his name, email-id, username, password etc. However he cannot change details like fine amount, books issued etc.

❏ **REQ 3:** Saving changes:
After making the necessary changes the user should click on the save changes button which should update the student information database with the new details.

❏ **REQ 4:** Limited Access:
The user should not be any case allowed to make changes the details whose access is given only to the administrator like fine details etc.

❏ **REQ 5**: Search Menu:
The user should be able to search for any book of his choice by going to the search menu which would redirect to the search window.

❏ **REQ 6**: Search Window:
The search window should have detailed search options like search for a book by author name/ book name/ publications or any of these or all of these.

❏ **REQ 7:** Error Message:
If the book queried for by the student is not present in the database a message displaying "No search results match your query" should be displayed.

❏ **REQ 8:** Book Details:
If the details of the book requested by the user are present in the book information database then these should be displayed.

❏ **REQ 9:** Bookmark:
If the book requested by the student is currently unavailable then a bookmark option should be provided upon clicking which the book name is stored under the bookmarked books. This list will be checked each day against the book information database and as Soon as the book count increases by 1, a notification will be sent to all those people who bookmarked this book.

❏ **REQ 10**: Notification button:
A button which would display all the important notifications like if the book bookmarked

by the student becomes available or if the fine date is approaching etc.

❏ **REQ 11**: Issue Book:
If the book count searched by the student is greater than one then student can click on the issue button which would decrease the book count in the database by one and the book details will be updated under the books issued column on the user profile. The student can go and collect the book from the library anytime.

❏ **REQ 12**: Logout button:
The student can terminate the session by clicking this button and to access the system again he/she will have to again go through the login window.

4.4 User Class 4- Administrator

4.4.1 Description and Priority

The administrator after logging in to the system can edit some features of the profile like books issued, total fine details or if there are any changes like a user wants to withdraw or is leaving the college and this is app is of no use anymore. The admin can also access personal details of the user in some special cases like inability of the student to access the profile due to some system error. Also the admin should keep updating the book database .

4.4.2 Stimulus/Response Sequences

STIMULUS: The administrator enters his username and password.
RESPONSE: The system verifies the details and gives full access to the system.

STIMULUS: The administrator edits fine info etc in user profile.
RESPONSE: The system gives permission to edit any information and updates the database. But keeps control on user's personal information.

STIMULUS: The administrator adds information of new arrivals
RESPONSE: The added information is properly updated in the database with the key value pair where key being the name of the book or the author name etc and the value being the complete book details.

STIMULUS: The administrator clicks the logout button.
RESPONSE: The system takes all access permissions from the admin.

4.4.3 Functional Requirements

- ❏ **REQ 1:** Admin login
  The admin will have a login username and password using which he can access the full System.

- ❏ **REQ2:** Edit profile button:
  The administrator can select the edit profile option from the menu which would take him to the profile window.

- ❏ **REQ 3**: Edit profile window:
  The administrator will have access to all the registered student details but he is not allowed to change the personal details of the user.It could be used in special cases where there is some issue that the user cannot access his profile. The other details like fine , books issued will be taken care of by the admin.

- ❏ **REQ 4:** Add book info to the database:
  On arrival of new books admin should update the book info database by storing the books according to their name, author name or publisher.

- ❏ **REQ 5**: Logout button
  The admin will be logged out of the system upon clicking this button and will have to login again to access the system as admin.

5. Other Non-Functional Requirements

5.1 Performance Requirements

- ❏ **REQ 1:** Fast and Accurate
  The performance should be fast and accurate. Several students, with categorically different book needs would be using the system. Slow speed would be a major drawback of the application.

- ❏ REQ 2: Prevent loss of information
  The application should handle expected and unexpected errors in such a way that loss of information and long downtime period is prevented.

- ❏ **REQ 3**: Ability to handle big data
  The system should be able to handle large amount of data. Thus it should accommodate large amount of books and users without any fault.

- ❏ **REQ4:** Robustness
  This software is not breakdown suddenly in any disaster like power failure.

- ❏ **REQ 5:** Time Constrained
  The timeline of this software must be in our mind.

- ❏ **REQ 6:** Risk Analysis
  The risk factor must be taken at initial step for better performance of the software.

5.2 Safety Requirements

- ❏ **REQ 1:** Virus Safety
  The database may get crashed at any time due to due to virus or operating system failure. Therefore, it is required to take the database backup.

- ❏ **REQ 2**: Safety of other applications
  The application will not affect any data stored on the device nor will it affect any other applications.

5.3 Security Requirements

- ❏ **REQ 1:** Secured Database
  The system will use a secure database for both student and book information. This will ensure that no other external entity other than the admin can modify the databases.

- ❏ **REQ 2:** Access Constraints
  The system will have different types of users and every user has access constraints. Student users can just read information but they cannot edit or modify anything other than their personal information.

- ❏ **REQ 3:** Proper Authentication
  Proper user authentication should be provided. No one should be able to hack into user's accounts.

5.4 Software Quality Attributes

- ❏ **REQ 1:** Development Constraints
  The development of the system will be constrained by the availability of required software such as web servers, database and development tools.

❏ **REQ 2:** User Friendly
The quality of the database should be maintained in such a way so that it can be very user-friendly to all the users of the database.

❏ **REQ 3:** Compatibility
The users should be able to easily download and install the system.

❏ **REQ 4:** Correctness
The system should update itself frequently so as to maintain the correctness of the databases. The results of the function are pure and accurate.

❏ **REQ 5:** Flexible and Adaptable
The system should be flexible to changes made in later stages. If additional features are to be added, the system must adapt easily. The operation may be flexible and reports can be presented in many ways.

❏ **REQ 6:** Easy to Maintain
The system should not demand repeated fixes and upgradations. Low maintenance is preferred. After the deployment of the project if any error occurs then it can be easily maintained by the software developer.

❏ **REQ 7:** Reusability
The data and record that are saved in the database can be reused if needed.

❏ **REQ 8:** Robustness-
If there is any error in any window or module then it does not affect the remaining part of the software.

❏ **REQ 9:** Testability
The software will be tested at every Alpha Testing, Beta Testing, Acceptance Testing

❏ **REQ 10:** Productivity
This software will produce every desired result with accurately.

❏ **REQ 11:** Timelines
The time limit is very important. It will save much time and provide fast accessing.

❏ **REQ 12:** Cost effectiveness
This software is less in cost and bearable by any

5.5 Business Rules

A business rule is anything that captures and implements business policies and practices. A rule can enforce business policy, make a decision, or infer new data from existing data. This includes the rules and regulations that the system users should abide by. This includes the cost of the project and the discount offers provided. The user should avoid illegal rules and protocols. Neither admin nor user should cross the rules and regulations.

Appendix A: Glossary

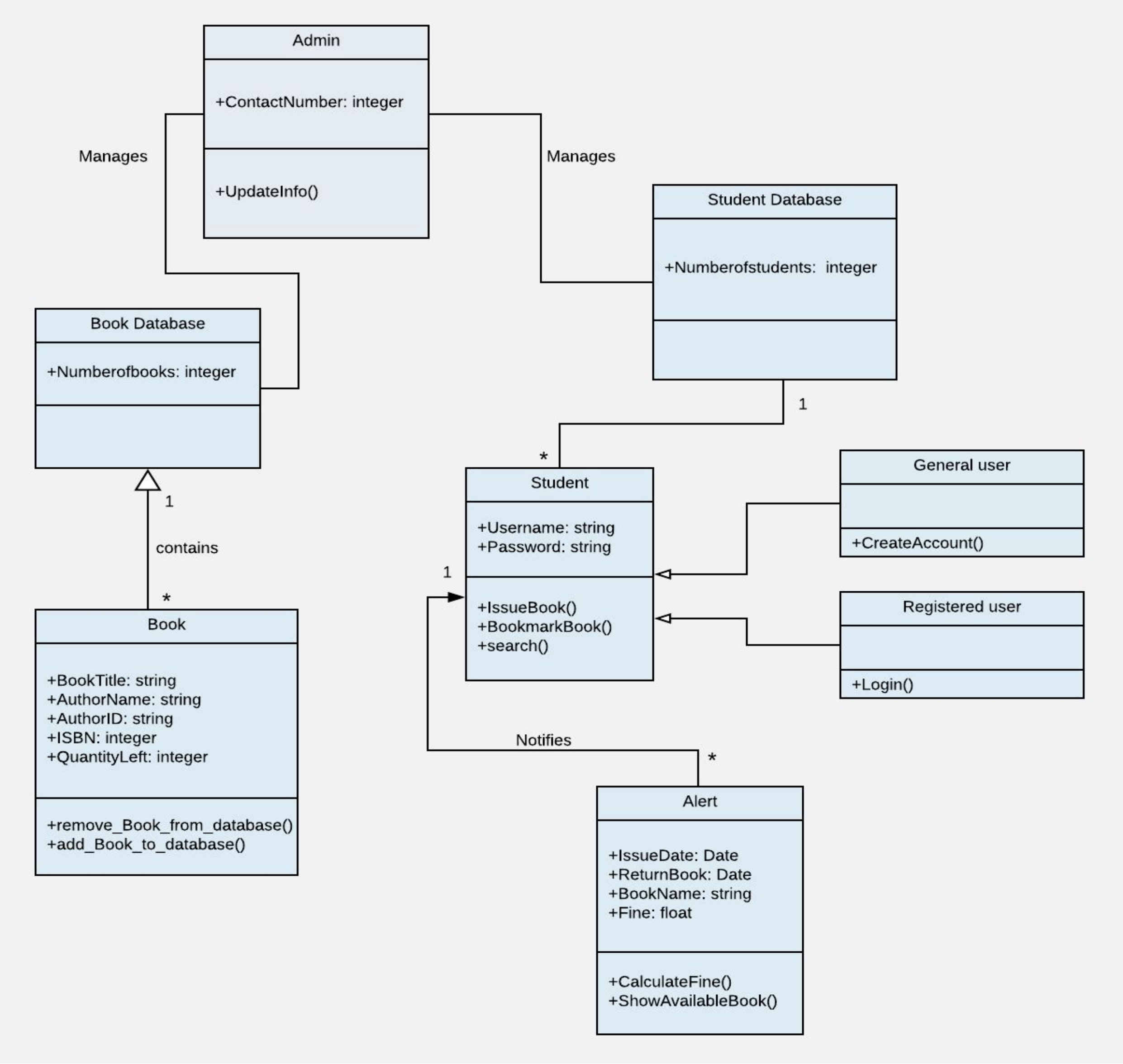
The following are the list of conventions and acronyms used in the document and the project as well:

- Administrator: A login id representing a user with user administrator privileges to the software
- User: A general login id assigned to most users
- Layer: Represents a section of the project
- Use case: A broad level diagram of the project showing a basic overview
- Class diagram: It is a type of static structure diagram that describes the structure of a system by showing the system's cases, their attributes, and the relationships between the classes
- Interface: Something used to communicate across different mediums

Appendix B: Analysis Models

Classes and objects

A class is a user defined type or data structure declared with keyword class that has data and functions (also called methods) as its members whose access is governed by the three access Specifiers private, protected or public (by default access to members of a class is private).
In this diagram there are certain classes which are related to other classes for their working. There are various kinds of relationships between classes like generalization, aggregation and normal association.The relationships are depicted using a role name and multiplicities.Here the classes are admin, student database, book, student, alert etc.



Appendix C: To Be Determined List

This To Be Determined (TBD) list serves to collect all currently outstanding decisions, choices, and unresolved requirements, including questions the development team may need to ask . Presently there are no remaining TBDs. All TBDs have been tracked to their closure.