Software Requirements Specification

for

Library Management System

Version 1.0

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Revision History

Name	Date	Reason for Changes	Version
Initial SRS	24.10.2016	-	1.0

1. Introduction

1.1 Purpose

The purpose of this document is to give a detailed description of the requirements for the Library Management System. It will illustrate the purpose and complete declaration for the development of system. It will also explain system constraints, interface and interactions with other external applications.

1.2 Definitions, Acronyms and Abbreviations

BIS	Book Inventory System, an existing system which keeps records of the available books in the library and their availability
EBS	Expographic Books Service, an existing 3rd-party system which allows ordering books provided by Expographic Book shop.
SIS	Student Information System, an existing system which keeps records of the index number, password and personal information of students

1.3 Intended Audience and Reading Suggestions

This document is primarily intended to be proposed to the library management committee for its approval. It is also intended as a reference for developing the first version of the system for the development team, and for the document writers.

The next chapter, **Overall Description** outlines the functionality and describes the informal requirements of the system. It establishes a context for the third chapter, **Specific Requirements.** This chapter is written primarily for use by development team, and describes the functionality of the product in its technicality. Finally, the last chapter contains Appendixes, Index and the References used in this document.

Both Chapters 2 and 3 describe the software product entirely, but Chapter 2 is intended for the library management committee and Chapter 3 for the development team.

1.4 Product Scope

LMS (Library Management System) is a web based application for the management of a library. Students can register themselves on LMS and are able to borrow available books and request new books to the library through this. Library administration can buy books from Expographic Book Service (EBS) based on the student requests.

The application is connected to the Book Inventory System (BIS), Student Information System (SIS), and Expographic Book Service (EBS). They collectively keep LMS in sync with student and book records, and provide a convenient platform to order new books to the library from Expographic Book Service.

2. Overall Description

2.1 Product Perspective

This product is an extension for the currently existing Book Inventory System, Student Information System and Expographic Book Service. It uses the features of all three systems to create a library management platform available for the students to be able to request books from Expographic, reserve books from the library and check availability of books using a single system. The library administration can use this product to purchase books from Expographic company based on the requests of students.

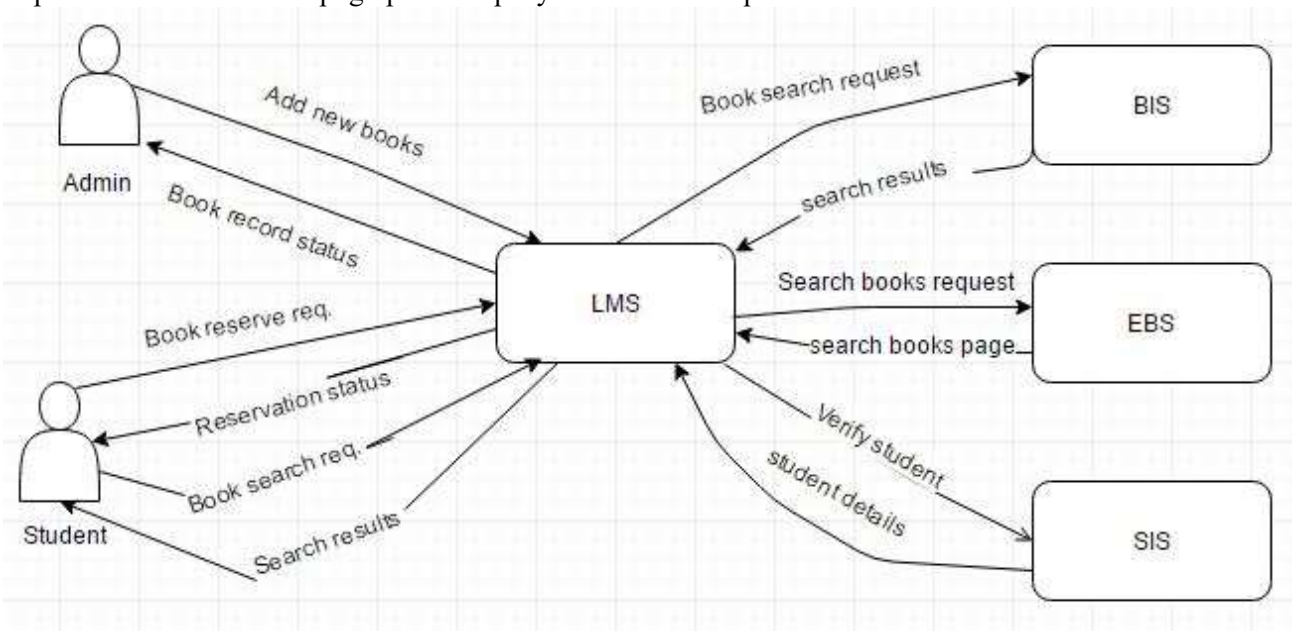


Figure 2-1: Context Diagram for LMS

2.2 Product Functions

- Students can
  - Register with LMS using their student ID
  - Search for library books and check their state (available, requested, reserved), location
  - Reserve books online
  - View borrowed books, return dates and any fines
  - Request new books available in EBS for the library
- Library Admin can
  - Mark books as available or reserved when students take or return books
  - View requested books and order them through EBS
  - Update book inventory system when a new book is purchased
  - View student's details
  - Handle password reset requests
  - Library membership renewal
  - Temporary student profile creation
- LMS can
  - Access BIS, SIS and EBS, and keep them updated with time

2.3 User Classes and Characteristics

There are two types of user classes for this system. Namely, Students and Library Administration.

- Students:
  - The students use LMS to see available books in the library, make book reservations, suggest new books to the library and to view borrowed books, fines, etc. They are restricted from any administrative functions provided for library administration.
- Library administration:
  - The library administration use LMS to lend and retrieve books from the library, monitor student borrowed books and due dates, enforce fines on students, order books from EBS and to update BIS when new books are added to the library. Furthermore, handling password reset requests, library membership renewal and temporary student profile creation are also conducted by the library administration.

Any student currently registered in the university and has an index number can register and have access to the system from any location or device. The Library Administration can access LMS only from within the university network to ensure optimal security.

2.4 Operating Environment

OE-1: LMS shall operate with the following Web browsers: Microsoft Edge, Google Chrome, Mozilla Firefox, Opera
OE-2*:* LMS shall permit library administrator user access from the university Intranet and, student user access through Internet connection

2.5 Design and Implementation Constraints

CS-1: LMS shall use the existing student information system
CS-2: LMS shall use the existing Book inventory system
CS-3: The system shall use MySQL for its database
CS-4: All HTML code shall adhere to the HTML 5.0 standard

2.6 User Documentation

For user documentation and information, please refer **Section 3: External Interfaces**

2.7 Assumptions and Dependencies

AS-1: 24/7 availability and operation is required from LMS by the end-users
AS-2: End-users will have a proper understanding of the purpose and functionality of LMS
AS-3: The Book Information System and Student Information System will have enough bandwidth to integrate and interact with LMS

DE-1: Student authorization in LMS depends on information in Student Information System (SIS)
DE-2: Searching for books and their reservation depend on Book Inventory System (BIS). Updates to book information should be stored in BIS and retrieved on demand.
DE-3: New book suggestion and Ordering depends on users accessing Expographic Books Service through LMS.
DE-4: LMS directly depends on BIS, SIS and EBS, and its operational performance is tied with the efficiency and bandwidth of these systems.

3. External Interface Requirements

3.1 User Interfaces

This section describes the logical characteristics of each interface between the software product and the users. This includes sample screen images, screen layout constraints, standard buttons and functions that will appear screens.

3.1.1 Between LMS and Student

3.1.1.1 Interface I: Sign-In Page

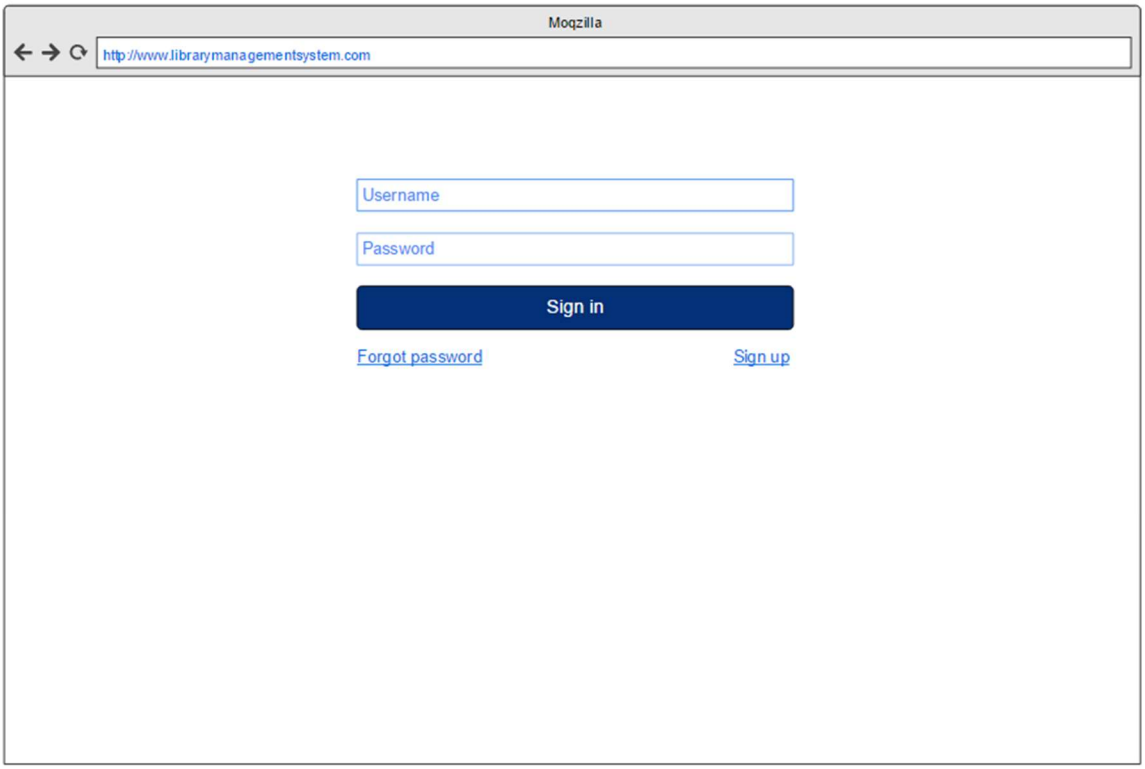


Figure 3-1 Sign in page

A user of the LMS should the sign-in page when opening a new session of the application in a web browser. If the user is not registered in LMS, the user has to select on Sign Up button to create a new LMS account. Then the user will be redirected to Sign Up (Figure 3-2 Sign Up page) for registration. Otherwise, the user can enter his or her username and password, and click on Sign In to go to the Home page.

If the user has forgotten the password, the Forgot Password button should be clicked. Then a message will be sent to the relevant person regarding the situation and the user will be sent a recovery password which can be used to sign in.

3.1.1.2 Interface II: Sign-Up Page

If the user is not registered, he/she can sign up with LMS by clicking on “Sign Up” link in the bottom of the Sign-In page (Figure 3-1 Sign in page). This directs the user to “Sign Up” page. When signing up, the user is required to enter the Admission Number and Password. If the admission number is recognized by LMS

through SIS, any missing information will be filled in the UI. After validating entered information by communicating with the SIS.

If the student successfully signed up, he/she should see the login page when the LMS is opened (Figure 3-1 Sign in page). If the entered data is invalid, an error message will be shown to the user in the space above the Confirm button.

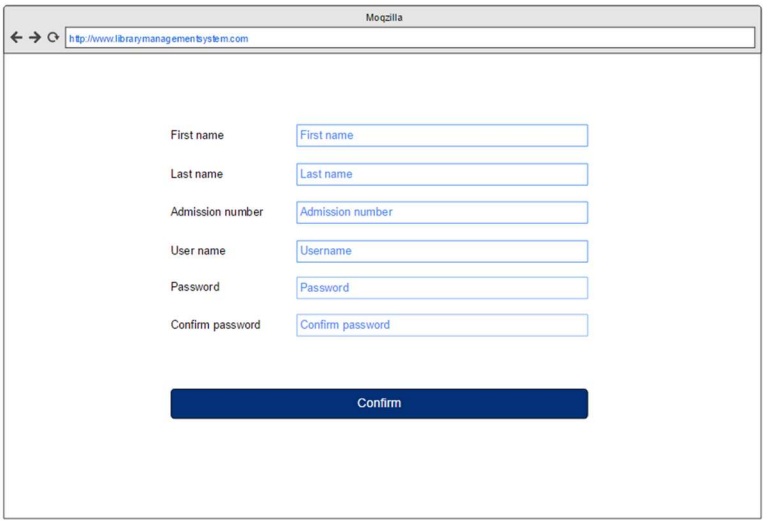


Figure 3-2 Sign Up page

3.1.1.3 Interface III - Home Page

Once the new username and password is entered and authenticated through the Sign-In page (Figure 3-1 Sign in page). The user is presented with the Homepage (Figure 3-3 Home page). Initially, it shows the most recently arrived books. In order to conduct a search, the user chooses the keyword such as name, author, ISBN, publisher, journal etc. from the search drop down box and enter data of the book which he/she wish to find out. New arrivals section will be replaced by the search results ().

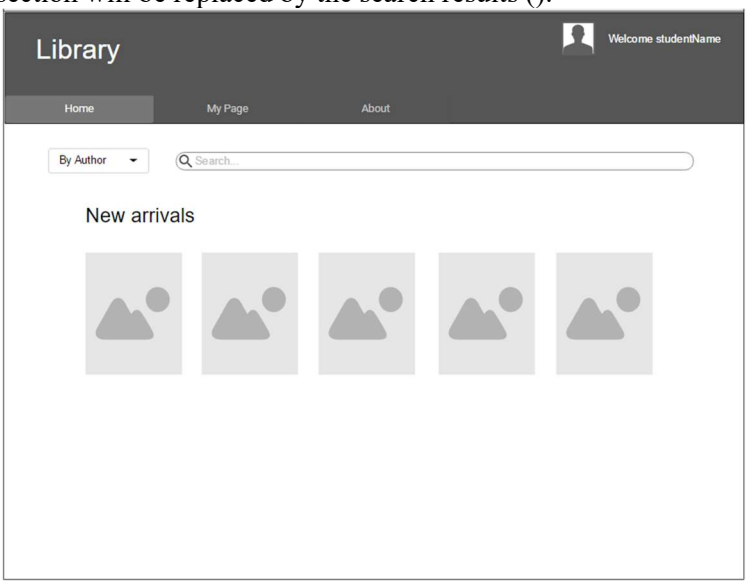


Figure 3-3 Home page

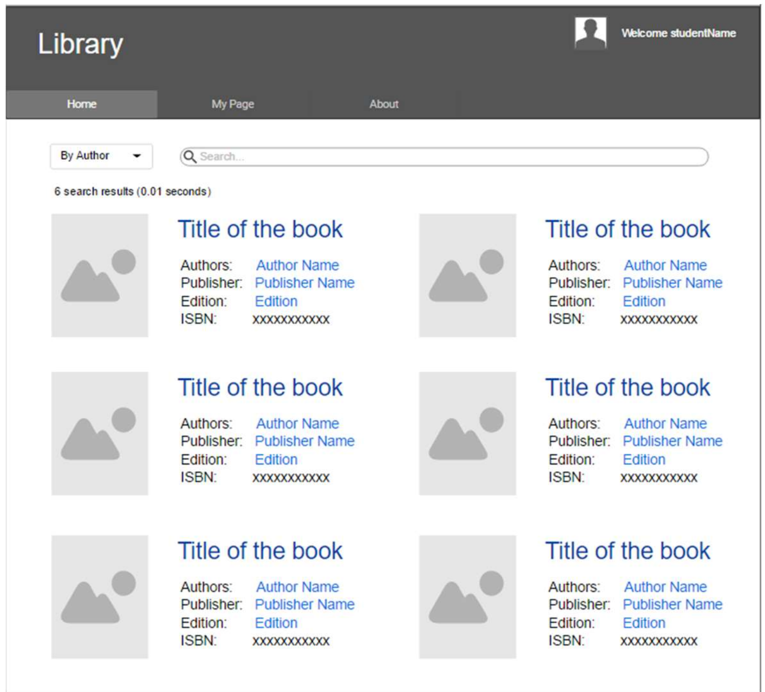


Figure 3-4 Search Results page

By clicking on a particular search result, user can view a full detail of the selected book as shown in Figure 3.1.1(v).

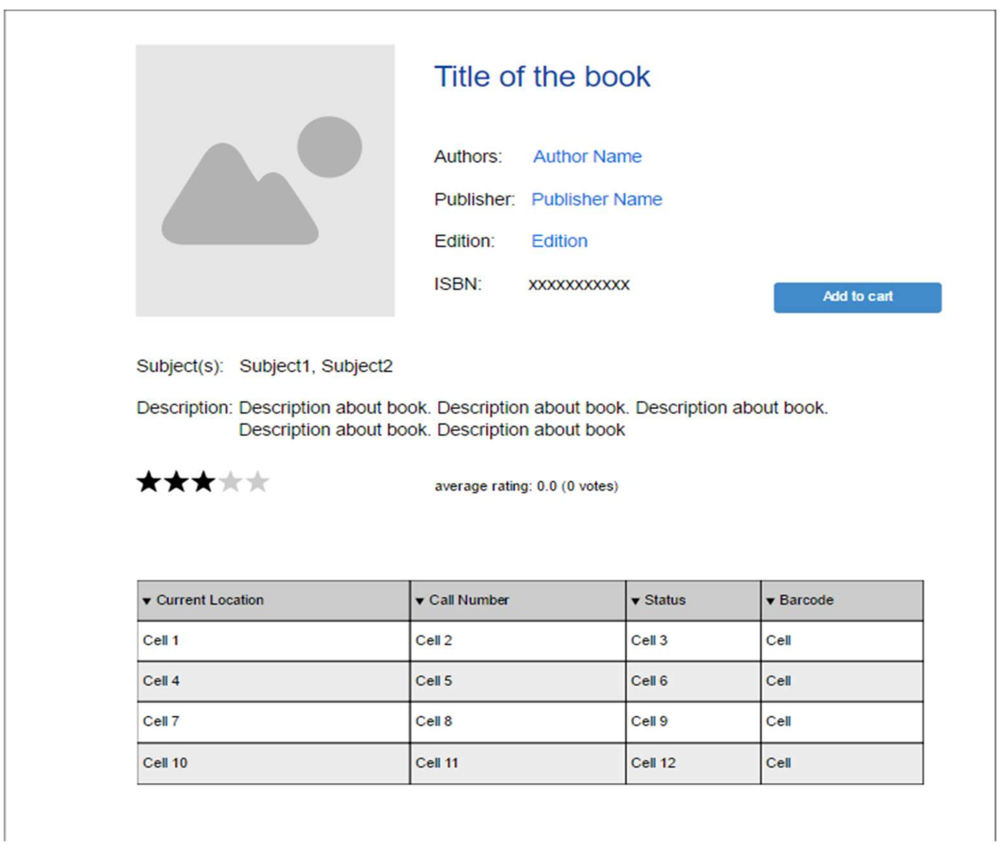


Figure 3-5 Detailed view of a selected book

Here, description of the book along with the current location of the book in the library, availability, barcode and call number of the book is provided.

By clicking on the "Add to cart" button, in the Detailed view, (see Figure 3.1.1(v)*)* the user can reserve the book temporarily for himself/herself. This reservation would result in changing the availability of the book to the other users.

3.1.1.4 Interface IV - My Page (Student)

By clicking "My Page" tab on the navigation bar, user will be directed to the page shown in Figure 3.1.1(vi).

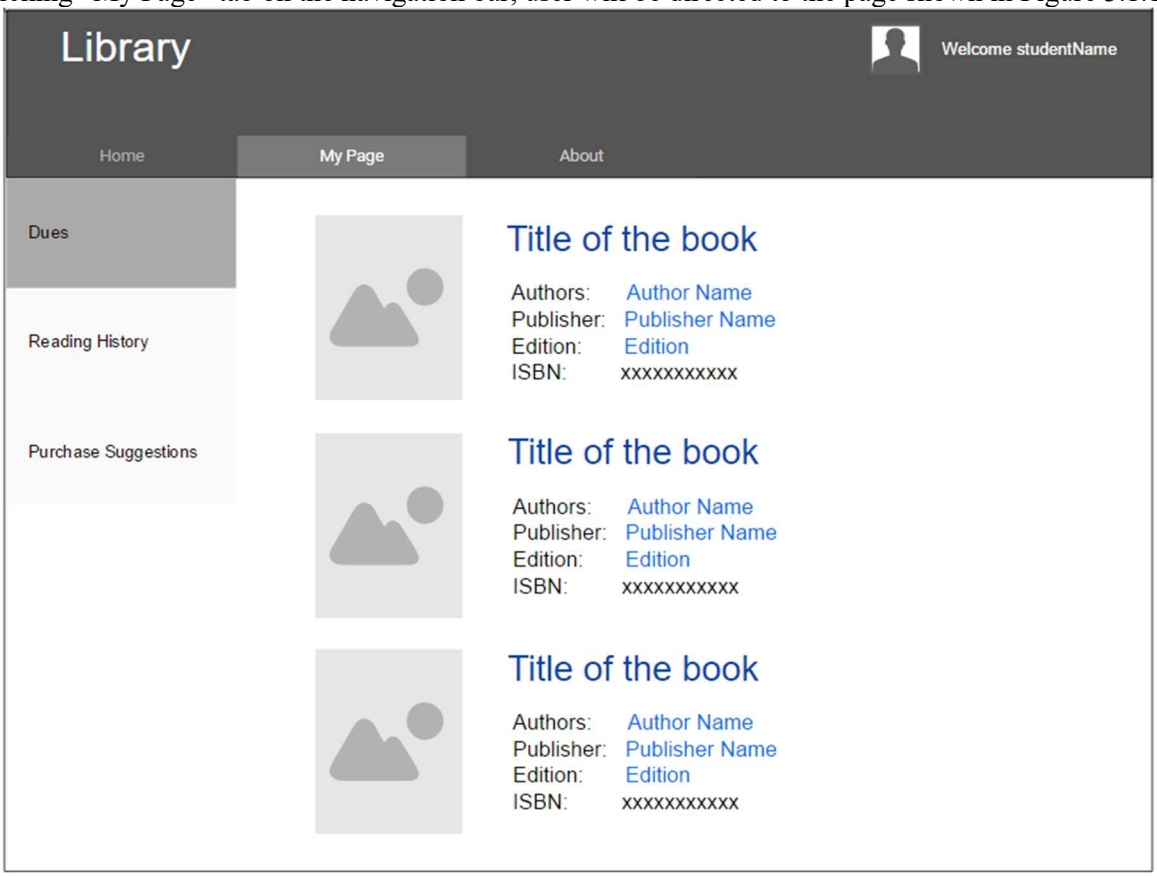


Figure 3.1.1(vi): My Page (Student's)

Here, user can see his Reading History, Summary of Due Books along with Fines and Purchase Suggestions. Purchase suggestion section contains the information about the books which are suggested by the student user as well as an option to add new purchase suggestion.
In Reading History section, detailed view of the books will be displayed as shown in the Figure 3.1.1(vi).

By clicking "About" tab on the navigation bar, user will be directed to a page where it shows general details about the library such as brief description of the library, opening and closing hours and contact details of some staff members including library administrator.

3.1.2 Between LMS and Library Admin

3.1.2.1 Interface V - My Page (Administrator)

If the user is an admin, clicking on the "My Page" tab will direct to the page shown in Figure 3.1.1(vii).
Here, user can see pending suggestions from students

Add/Update section direct to the page where admin can add details of a new book or update details of an existing book
In Manage Users section admin can manage student and can get the summary of existing users.

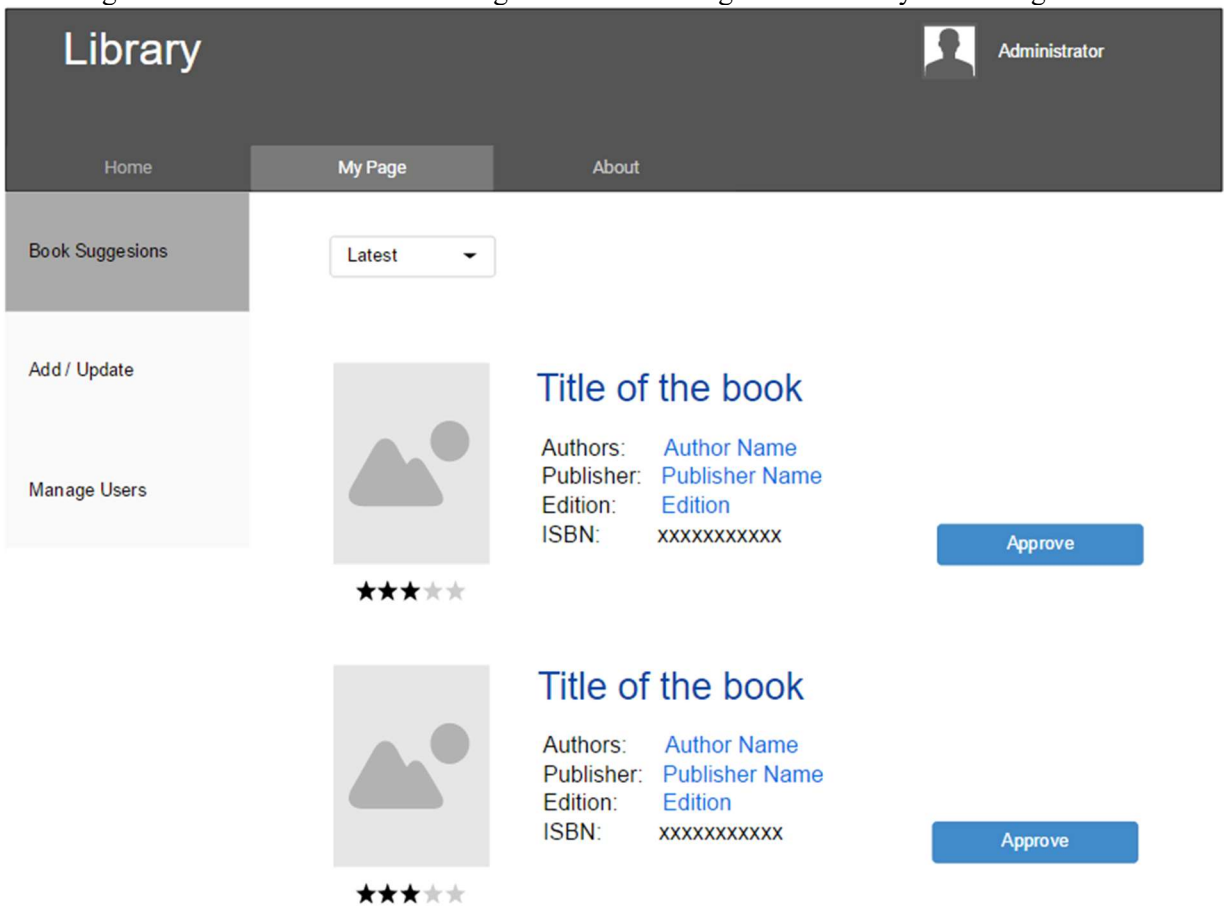


Figure 3.1.1(vii): My Page (Admin's)

3.2 Hardware Interfaces

Since the application is web-base, it does not have any direct hardware interfaces.

3.3 Software Interfaces

SI-1: Between LMS and Book Inventory System

SIR 1.1: Search a book

Input message: search parameter (book name, author etc.)
Output message: Details of the book (name, author, publisher, editor, ISBN etc.), Number of total books, State (Available, Unavailable)
Format: ASCII

SIR 1.2: Add new book details

Input message: Details of the book (name, author, publisher, editor, ISBN etc.), Number of books

Output message: New book recorded
Format: ASCII
Description: When admin purchased a suggested book by students, the details of that book is need to be added to the BIS. In that function, input and output values would be as above.

SIR 1.3: Update book availability
Input message: Book ID, Number of books borrowed/received
Output message: Details of the book (author, publisher, editor, ISBN etc.), Number of total books and the Status of the book
Format: ASCII

SI-2: Between LMS and Student Information System

SIR 2.1: Authenticate student for Sign Up process.
Input message: Student ID
Output message: Student ID is valid/ not valid
Format: ASCII

SIR 2.2: View student details
Input message: Student ID
Output message: Student name, address, email, telephone etc.
Format: ASCII

SI-3: Between LMS and Expographic Books Service

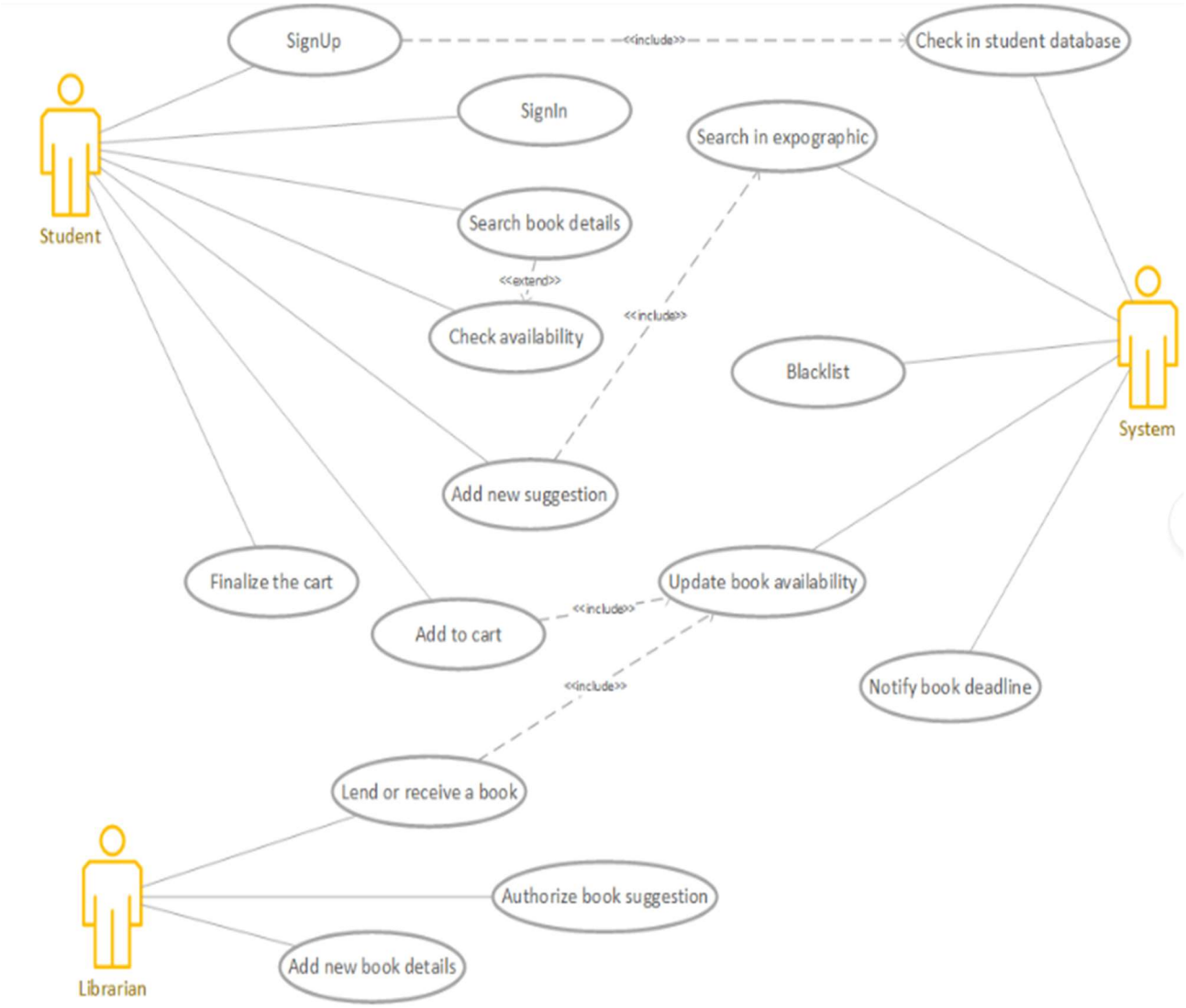
SIR 3.1: Search in Expographic Books Service
Input message: Book/part of the name of a book
Output message: Details of books that have names including the input message
Format: ASCII

3.4 Communications Interfaces

CIR-1: When a student suggests to buy a new book, the library admin shall be notified by sending **an email**.
CIR-2: *When a due date is close, the system will automatically notify the book title and the due date by sending **an email** to the student.*

4. Functional Requirement

This section outlines the use cases for each of the user classes separately. The use cases are separated according to the actor who triggers the use case, as shown in the use case diagram below.



4.1 Student Use Cases

4.1.1 Sign Up for LMS

Summary:	The students can sign themselves up for LMS with their student ID.
Basic Course of Events:	1. View the login page 2. Click on Sign up button 3. Enter student id number as username 4. Provide password 5. Verify username and password (UC 3.2.2.1) 6. Create new account for the student in LMS
Alternative Paths:	(none)
Exception Paths:	5.a If username could not be verified or passwords do not match, show an error message 5.b Join on 3 5.a If user already has existing account, inform to sign in instead 5.b Join on 1
Extension Points:	(none)
Trigger(s):	Click on sign up button
Assumptions:	A record of the student exists in SIS
Preconditions:	Student has a valid index number
Postconditions:	Show the login page
Related Business Rules:	BR-1, BR-2

4.1.2 Sign in to LMS

Summary:	Students can sign in to the LMS with their student id and password.
Basic Course of Events:	1. View the login page. 2. Enter username and password. 3. Click on login button. 4. System verifies the provided details. 5. Sign in the student if the details are valid.
Alternative Paths:	(none)
Exception Paths:	4.a If the username exists and password doesn't match, system informs the user to enter a different password by clearing the current password field. 4.b Join on 1 4.a If the username doesn't exist, system informs user to enter a valid username by clearing both username and password fields. 4.b Join on 1
Extension Points:	(none)
Trigger(s):	Click on login button
Assumptions:	Student has signed up in the LMS
Preconditions:	Student is not signed in
Postconditions:	Show home page.
Related Business Rules:	BR-1

4.1.3 Search for Books

Summary:	Students can search books by title, author, section, ISBN etc. And shows the related search results.
Basic Course of Events:	1. Selects the way you search (by title, author, section, ISBN etc.) 2. Type the keyword want to search 3. Click on search button 4. Verifies the provided details 5. Search for keyword in BIS
Alternative Paths:	(none)
Exception Paths:	4.a If user selects ISBN field and types characters and attempt to search, system shows an error message and clears the search field. 4.b Join on 2
Extension Points:	5.a If single book is selected, show its details (UC 3.2.1.4)
Trigger(s):	Click on search button
Assumptions:	BIS has correct book details
Preconditions:	User must logged in
Postconditions:	Shows the search results page.
Related Business Rules:	BR-3

4.1.4 View Book Details

Summary:	Once user searches and finds a matching book through LMS, he can click on it and see whether the book is available, reserved or borrowed, and if so the expected return date.
Basic Course of Events:	1. Selects (clicks on) a specific book from search results 2. System requests book availability details from BIS 3. System shows book availability details to user
Alternative Paths:	(none)
Exception Paths:	(none)
Extension Points:	3.a If the book is available, user can add it to cart (UC 3.2.1.5)
Trigger(s):	Selects a specific book from search results
Assumptions:	Book Inventory system has correct book details
Preconditions:	User must have logged in.
Postconditions:	Shows the book availability with other details of the book.
Related Business Rules:	BR-3

4.1.5 Add to Cart

Summary:	When a student searches and finds a book he needs, he can add the book to the cart. Then the book will be temporarily shown as reserved to other users. Up to two books can be added to the cart
Basic Course of Events:	1. Search for a book 2. Select required book 3. Click on add to cart 4. Verify if student is not blacklisted 5. Add to cart
Alternative Paths:	4.a If student is blacklisted, show error message that user is blacklisted 4.b Return to 1
Exception Paths:	5.a If the cart already has maximum allowed number of books (2), then show an error message saying the maximum number of books has been added to cart. 5.b Return to 1
Extension Points:	5.a Temporarily make added book reserved in BIS (UC 3.2.2.2)
Trigger(s):	Click on Add to Cart button in UI
Assumptions:	(none)
Preconditions:	Student is in search page
Postconditions:	Return to search page
Related Business Rules:	BR-3

4.1.6 Finalize the Cart

Summary:	When student has books in his cart, he can finalize the cart. Then the selected books will be marked as reserved in the book inventory system.
Basic Course of Events:	1. Student Add books to the cart 2. Student Proceed to finalize 3. Student Reviews the cart 4. Student Confirm the finalize
Alternative Paths:	3.a Student opts to make changes before confirming 3.b Return to page 1
Exception Paths:	(none)
Extension Points:	4.a Mark book as reserved in BIS (UC 3.2.2.2)
Trigger(s):	Click on Finalize button on UI
Assumptions:	Student is not blacklisted
Preconditions:	Student has books in his cart
Postconditions:	Go to Search Page
Related Business Rules:	BR-3, BR-4

4.1.7 Add New Book Suggestion

Summary:	When student requires a book that is not currently available in the library, he adds a new book suggestion through the system for the library admin to see.
Basic Course of Events:	1. Student search for book 2. No book results found in library 3. Student opens new book suggestion 4. Enter suggested book information 5. Confirm new book suggestion 6. Send notification to admin about the suggestion
Alternative Paths:	4.a Book not found in Expographic book service 4.b Mark suggestion as not available in EBS 4.c Join on 6
Exception Paths:	(none)
Extension Points:	(none)
Trigger(s):	Student opens new book suggestion
Assumptions:	Student is already logged in
Preconditions:	Student finds no matching book in library
Postconditions:	Go to search page
Related Business Rules:	BR-5

4.2 System Use Cases

4.2.1 Verify Student Information through SIS

Summary:	When user enters information, LMS sends them to the Student Information System, and it in return sends the matching student information. Then both information are compared and verified.
Basic Course of Events:	1.The system gets the user input 2.Send the user input to the Student Information System (SIS). 3.System requests matching information from SIS 4.The system compares the data with user input 5.The system validates the user input.
Alternative Paths:	5.a If user account already exists, system informs the user 5.b Join in 1
Exception Paths:	4.a If the verification fails the user is asked to enter the details again. 4.b Join on 1
Extension Points:	(none)
Trigger(s):	System requests information through SIS
Assumptions:	Information of all students are available in the SIS
Preconditions:	The inputs are not empty
Postconditions:	Student information is verified
Related Business Rules:	BR-2

4.2.2 Update Book Availability in BIS

:	Once a book is added to the cart or a book is borrowed, that book availability should be updated in the Book inventory System.
Basic Course of Events:	1. Student adds a book to cart or borrows a book 2. System receives new book availability update request 2. System requests the BIS to update the availability of the particular book Summary 3. Update status is notified by the BIS to LMS.
Alternative Paths:	1.a Library Admin adds a new book to the system. 1.b Join on 2
Exception Paths:	3.a If update was not successful, notify user of the situation, and ask whether to retry 3.b If user selects retry, Join on 2 else Join on 1
Extension Points:	3.a Finalize the cart (UC 3.2.1.6)
Trigger(s):	1. Student adds a book to the cart 2. A student borrows a book
Assumptions:	Book Inventory system has records of all books in the library
Preconditions:	1. Student is not blacklisted 2. In case of library admin adding a book, the library admin should give permission for a book to be borrowed.
Postconditions:	The specific details of the book is updated in the database and go to previous page.
Related Business Rules:	BR-3

4.2.3 Get Available Books from EBS

Summary:	System requests the list of available books from the Expographic book service
Basic Course of Events:	1. A student requests to suggest a new book to the library. 2. User types an ISBN, Book name, Author, etc. 3. System pass this information to Expographic book service. 4. Expographic book service returns matching book results
Alternative Paths:	(none)
Exception Paths:	4.a If no matching books found in Expographic book service, notify book suggestion process of it
Extension Points:	(none)
Trigger(s):	The user requests to add a new suggestion
Assumptions:	The user inputs valid search parameters. Expographic book service is working properly.
Preconditions:	Search button is clicked by the user / a text is input by the user
Postconditions:	Search result of books is displayed to the user
Related Business Rules:	BR-6

4.3 Library Admin Use Cases

4.3.1 Blacklist Student from Borrowing Books

Summary:	System keep track of the due dates and about the fines to be paid. System will automatically block a user from borrowing books when the fines limit reached.
Basic Course of Events:	1. Get the fines of the user 2. Check for the fines limit 3. Change user state to blacklisted
Alternative Paths:	3.a If user has any reserved books when blacklisted, remove them from the cart and show as available
Exception Paths:	(none)
Extension Points:	(none)
Trigger(s):	Fines limit reached (due date has been exceeded beyond the threshold)
Assumptions:	System time is accurately set
Preconditions:	Fines is updated
Postconditions:	Notify user of the blacklisted and the fines amount and prompt to take action
Related Business Rules:	BR-4

4.3.2 Notify Deadlines and Status to Borrowed User

Summary:	When a due date is close, notify the borrowed user of the books and remaining time to return them to avoid being fined.
Basic Course of Events:	1. System check for the due dates of the books 2. Check for the remaining time 3. Notify user about the remaining time
Alternative Paths:	2.a If due date has been passed, calculate the fines and add to the borrower. 2.b Notify library admin of the due date and fines. 2.c Join on 3
Exception Paths:	3.a If due date is passed and the borrower is already blacklisted, notify the library admin of the situation
Extension Points:	(none)
Trigger(s):	Remaining time to the due date reach the limit
Assumptions:	System time is accurately set
Preconditions:	Student has books in the cart
Postconditions:	Notification to the user is generated
Related Business Rules:	BR-7

4.3.3 Add New Book to Library

Summary:	When a new book was purchased / received then Library Admin need to add its details to the book inventory database.
Basic Course of Events:	1. Select add a new book 2. Enter the book details 3. Confirm the data 4. Add book to the book inventory system 5. Mark book as a new arrival
Alternative Paths:	(none)
Exception Paths:	(none)
Extension Points:	(none)
Trigger(s):	Library Admin clicks on the add new book button on the UI
Assumptions:	Library Admin will use LMS to add book to library before adding it externally to the Book Information System
Preconditions:	A new book is available
Postconditions:	Notify Library Admin of the update status Show book as new arrival in the home page
Related Business Rules:	BR-8

4.3.4 Record Borrow / Return of a Book

Summary:	When a student physically borrows/returns a book from/to the library, the book inventory system will be updated with the new book status and expected available date if any.
Basic Course of Events:	1. Student borrows/returns a book from/to the library 2. Library admin opens student's cart 3. Mark the books as borrowed/returned. 4. Update book inventory system with new book status and expected availability date
Alternative Paths:	(none)
Exception Paths:	3.a When a blacklisted student directly requests to borrow book, terminate borrow request and notify library admin that the student is blacklisted 3.b Join on 2
Extension Points:	4.a Print a receipt for return of book
Trigger(s):	Library admin marking books as borrowed/returned in student cart
Assumptions:	The same book recorded in LMS will be borrowed or returned
Preconditions:	Student should be registered in LMS
Postconditions:	Go to home page
Related Business Rules:	BR-4, BR-9

4.3.5 Authorize Purchase of Suggested Books

Summary:	When students have suggested books for the library, the library admin can review the requests and authorize purchasing the book from Expographic book service
Basic Course of Events:	1. Student submits a book suggestion 2. Library Admin is notified of the suggestion 3. Library admin chooses to authorize book purchase or dismiss it for the moment
Alternative Paths:	1.a If the book suggestion is not an available book in Expographic book service, library admin is still notified of the suggestion but since it is out of the scope of the LMS no follow-up is conducted.
Exception Paths:	(none)
Extension Points:	3.a Send an email to Expographic books service
Trigger(s):	Open received notification and choose an authorization action
Assumptions:	Library admin will have the actual authority to authorize the action
Preconditions:	Library admin should log into the system
Postconditions:	Notify library admin that action has been taken
Related Business Rules:	BR-8

5. Other Nonfunctional Requirements

5.1 Performance Requirements

PRF.R-1: 95% of the book search requests shall be responded in less than 5 seconds.
PRF.R-2: Students shall be directed immediately to Expographic website whenever requested.
PRF.R-3: Support at least 250 of concurrent access at any given instance.
PRF.R-4: LMS shall handle expected and unexpected errors to prevent loss of information

5.2 Safety Requirements

SAF.R-1: Database backup
SAF.R-2: Proper transactions to database are needed in case of unexpected interruptions (i.e. Power failure, network issues)

5.3 Security Requirements

SEC.R-1: Inaccessibility of the sensitive information or resources such as passwords and student information - Data encryption
SEC.R-2: Secured database
SEC.R-3: Encrypted messages in log-in communication between LMS and the server.
SEC.R-4: Admin will be the only user who make changes to the database.
SEC.R-5: Student users can only read information and not allowed to edit/ modify any data.
SEC.R-6: Different access layers are provided with different constraints. (Student users & Library admin)

5.4 Software Quality Attributes

SQA.R-1: Availability:
98.63% of the time, system will be available. (Expected down time of the system 5x24 hours per year)
SQA.R-2: Reliability:
More than 98% of the times, the system gives the correct results on a search.

5.5 Business Rules

BR-1	User should use the index number / password to sign up and sign in to LMS
BR-2	LMS users should be registered users in the SIS
BR-3	Only books that exist in the BIS will be shown in the LMS inventory
BR-4	Students who have due fines cannot reserve or borrow further books until it's settled
BR-5	When a book is not available in the library, students can request it via LMS.
BR-6	EBS provides a list of books that are available for sale by their company
BR-7	Students should be notified at least 3 days prior to being fined or blacklisted
BR-8	Library Admin can authorize ordering books from EBS if suggested by students, and add new arrivals to the library
BR-9	Lending and receiving books is authorized only via library admin

Appendix A: Table of figures

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