LIBRARY MANAGEMENT SYSTEM FOR STANFORD

Course End Project for PG BA - CBAP®

Prepared by
KAROL LILIANA LOPEZ VALERO

Simplilearn Post Graduate Program in Business Analysis
Cohort 2, 2023-2024

LIBRARY MANAGEMENT SYSTEM FOR STANFORD

PROBLEM DEFINITION AND SOLUTION

Context

Stanford University is a private research university in California. The university was founded in 1885 and as of today, 83 Nobel laureates, 28 Turing Award laureates, and 8 Fields Medallists have been affiliated with Stanford as students, alumni, faculty, or staff.

For the benefits of the students Stanford started its own library in 1885. The library at Stanford was housed in one large room capable of accommodating 100 readers. As the university grew to enrol more than 20,000+ students in a given year the library grew as well. Today the library boasts of having more than 4 million books in it.

Change

The library management software that will be created allows you to search for books and know if there are available with just one click, at any time and from anywhere; reserve, borrow, renew, and return books easily and quickly. The system will manage all data efficiently and will also provide the user with immediate and accurate information about any type of book, magazine, or research work, thus saving a lot of time and effort.

Need

Stanford University Library currently has a manual library management system that makes it difficult to maintain, organize countless books (about 4 million items), journals and research papers, and the paper records of loan book made by students.

The main problems observed with this manual library management system are:

- Too much time is wasted managing the library.
- The number of employees and costs required to manage the library is high.
- Calculating loans for books and other materials is a tedious and time-consuming task.
- Difficulty and delay in generating reports on check in/out books.
- Managing the inventory of books present in the library is a complicated task.
- Students can only borrow and return books during library open hours.

Solution

A Library Management Software will be created to automate the main activities carried out in the university library, such as the maintenance and organization of the book inventory, the management of a system that allows rapid search and effective administration of data related to both stocks and the check in/out of any type of book, magazine, or research paper.

A Library Management System (LMS) offers several advantages:

- Reduces operational costs such as labor costs, printing costs.
- Keeps an accurate, complete, and up-to-date records of library data, including detailed information on books, research papers, magazines, both physical and digital, and their availability.
- Optimizes the daily operations of the library staff since the system is cloud-based and almost all library procedures will be automated.
- It is easy to use and improves accessibility and user experience by allowing users to search and access books and any type of library material in a simple way, with availability 24 hours a day, 7 days a week from the comfort of their home.
- Improve student engagement with the library through additional tools such as book reservation, self-check in/out, as well as overdue notification to facilitate timely return of material.
- Reduces costs due to theft or non-return of library material thanks to the tagging of books, which allows the installation of an anti-theft detection system in the library, as well as the installation of book delivery stations/mailboxes.
- Streamlines the generation of diverse and updated reports, which helps the library management to complement the decision-making process based on real and current data.

Stakeholders

ACTOR	What he can do on the Software Created
Student	• Is the end user of the system. Searches for the book, journal, research paper to check its availability, reserve, borrow, renew, or return the books, by himself. Receive notifications for the return of books that the system sent.
Library staff	• They are also end users. They provide information on the current status of inventory and new acquisitions that are received to keep the system updated.
University Library Management	• Provides the information necessary for modelling the database according to the required reports. Receive periodic reports necessary for decision making. Reviews the information received from end users related to issues that arise over time with the system to redirect it to the software developer.
University Administration	• Will be the sponsor the creation and maintenance of this software.
Software developer	• Create the software and performs periodic maintenance on it.

Value

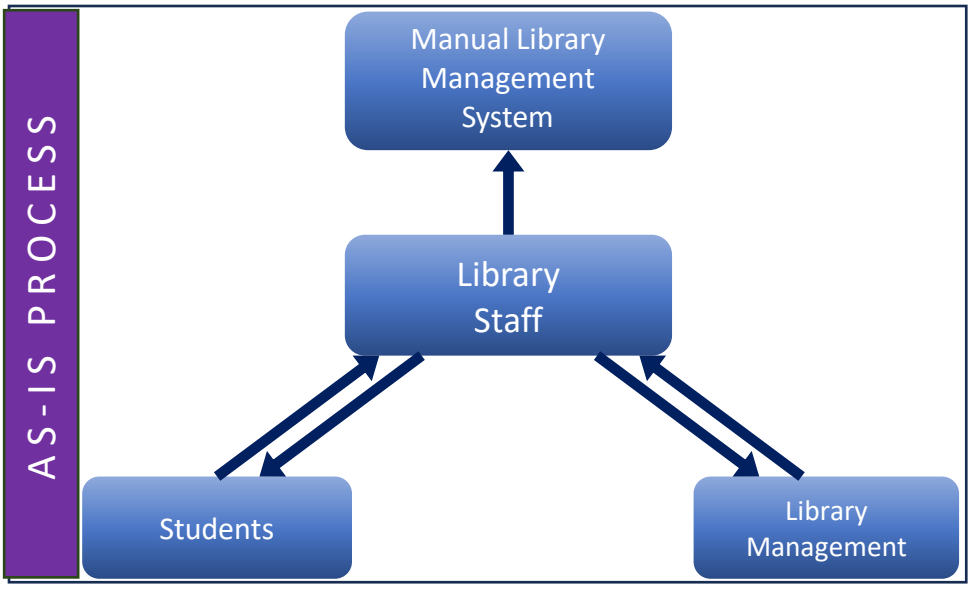
The main potential of a library management system especially for staff is that improves efficiency because this system helps to manage library operations automatically, which increases productivity and therefore reduce overheads.

In the case of students, the greatest value they obtain from a library management system is that it improves the academic performance of students and their relationship with the library during their university life since this system contributes to improving the quality of library resources and facilitates access to cutting-edge books or magazines. The above not only means great support for students' academic research but can ultimately contribute to improving the reputation of the institution.

EXISTING SYSTEM

- The manual library management system traditionally maintains its records on paper for activities such as cataloguing, organizing, and maintaining its inventory.

- Librarians often maintain physical catalogues about the library's collection in record books or handwritten cards. This is why inventory management is often time-consuming and can lead to inaccuracies and consequently errors, and also it can be difficult to identify items borrowed and not returned, stolen, or lost, which generates dissatisfaction and frustration among library staff and users.
- This manual system also lacks advanced analysis and reporting tools which limits the ability of library management to make data-driven decisions.
- Usually, these types of systems do not evaluate the user experience.



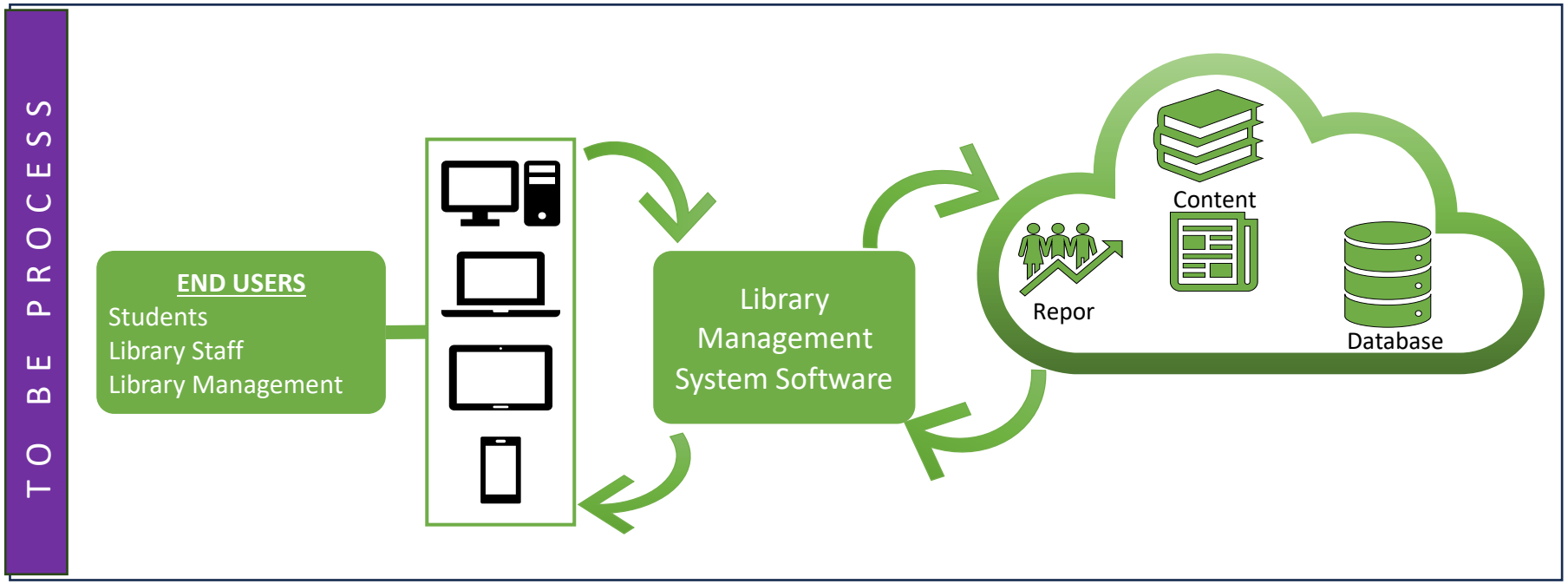
PROPOSED SYSTEM

The library management system software proposed will have the following features:

- **Customizability**. It will have a user-friendly and simplified interface to meet the specific needs.
- **Integrated Management**. It will be available for use on different devices and platforms like Windows and MacOS.
- **24/7 Availability**. As it is a cloud-based system, it can be accessed at any time, even outside of normal library hours and from anywhere.
- **Automated Inventory Management through Book Tagging**. This simplifies the book indexing and cataloguing processes. This system will maintain inventory records of the material available in the library, such as books, magazines, research papers, magazines, and newspapers. This information will allow library staff and management to know with certainty what is in stock, both physically and digitally stored, it will identify obsolete editions of books and students will also receive precise information when searching for the material they need.
- **Data Storage in the Cloud**. This can help the library with its data management process, not only by improving data accuracy but also by streamlining analysis and reporting for effective library management. To do this, all available reading material must have an RFID tag. Its record will be stored in the database. For each reading material, information such as author, name of the book, name of the publisher, edition of the book, date and year of publication, cost of the book, and date of purchase of the book must be recorded. The data will be structured in hierarchical relationships between the entries and will be grouped by various fields and data points, such as book ID, authors, dates, specific keywords, subject and publishers.
- **Self-Return of Books using the Book Drop Box station**. Students can return books on their own at any time, thus reducing wasted time and improving their interaction with the library. These stations will be installed in visible, easily accessible places outside the library and with RFID technology that

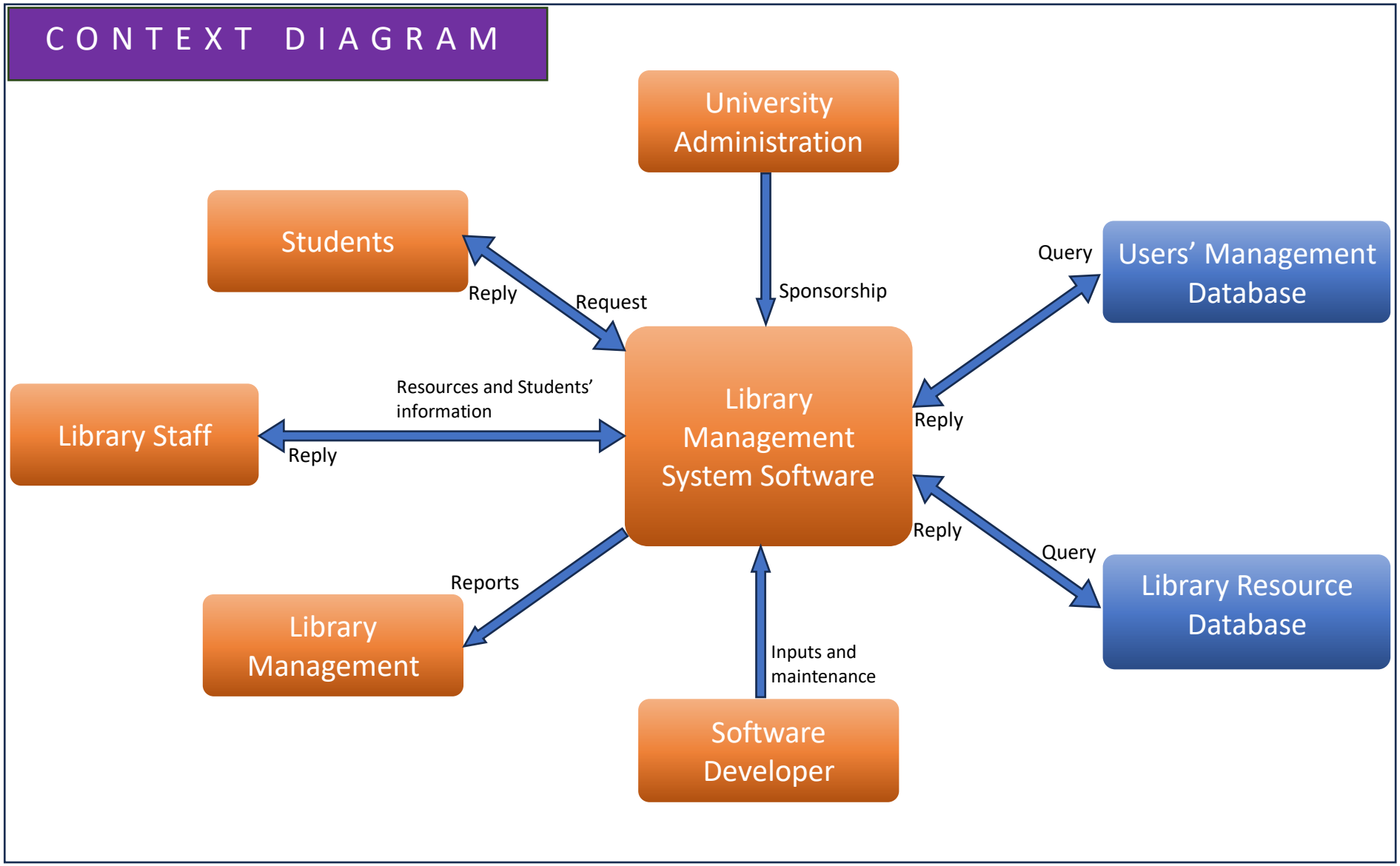
will automatically identify the material that has been deposited, immediately cancel the loan once the student introduces the item in the Book Drop Box and finally, the library staff will place it in its respective shelf.

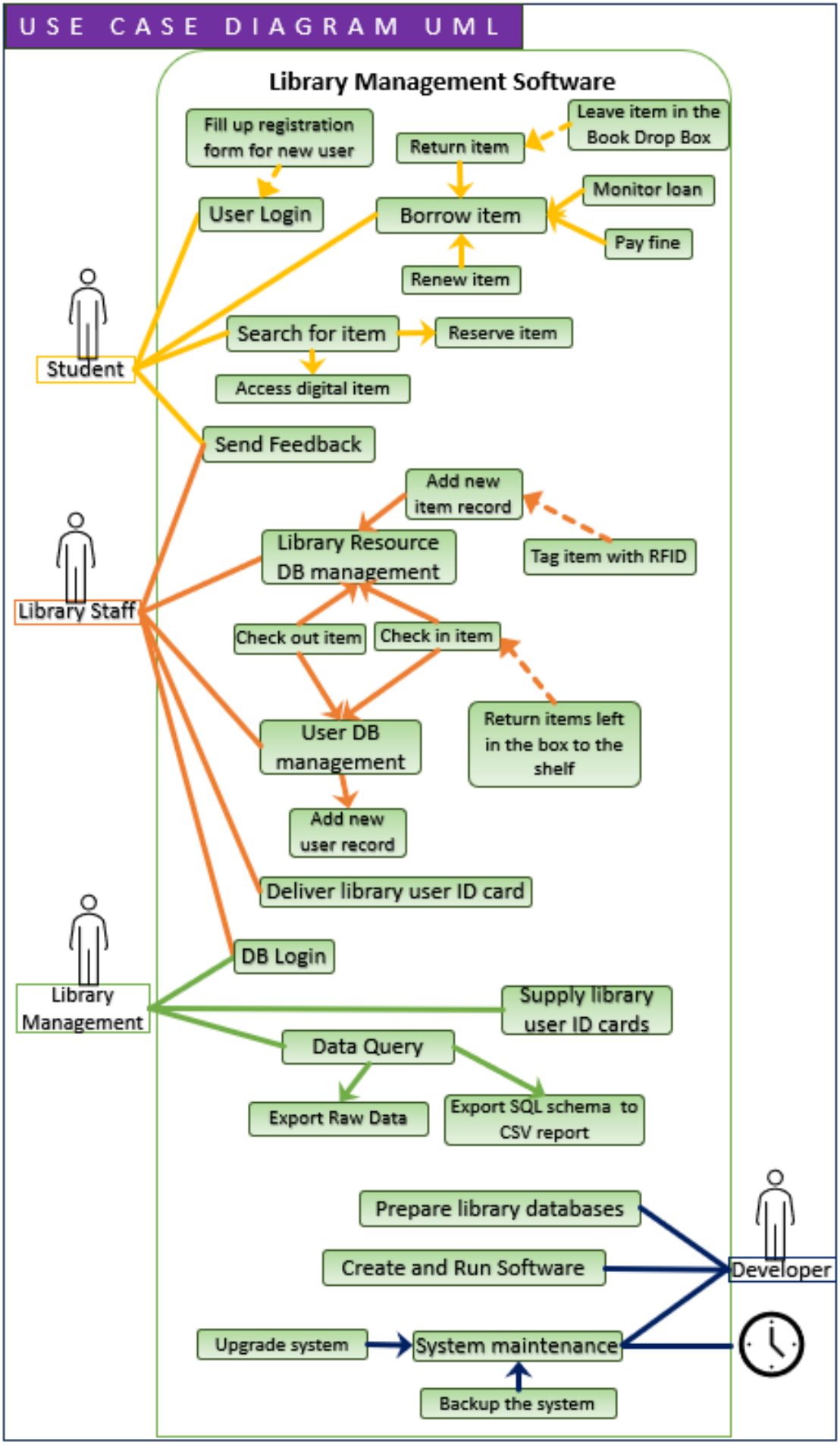
- **Anti-theft detection**. RFID tags will prevent book theft and unauthorized borrowing of library materials. This technology will help improve security and reduce the cost caused by the loss of library materials. When a book with an active RFID tag passes through a security gate, an alarm is triggered. The RFID readers will be placed at the exit door of the library and the RFID reader will track the books up to a range of 2 meters. They will activate the alarm with a loud sound in case someone tries to pass through the door with an unregistered book in the check-out system.
- **Check-out and Check-in Service**.
  - For check out service - When students want a reading material from the library, they will select the material and go to the checkout counter. Library staff will be able to search for this material in the LMS based on search criteria like name of the book or author or will use the RFID reader to capture item's details. The student's name, ID and the current date and time will be tagged along with the material being borrowed, and the due date will be calculated based on the library's lending policies. The item's status will then be updated to "checked out" until it is returned.
  - For check in service - When students want to return the borrowed material directly to the circulation desk, the Library staff will scan it and the system will remove the association with the student's account and update the item's status to "available".
- **Search portal and shelf management**. This feature will allow easy search and quick access to a wide range of resources, including books, journals, research papers, e-books, and e-magazines, particularly beneficial for research and study, with detailed and accurate information on the location of the shelf on which the requested unit is located.
- **Efficient Self-Reservations, Book Loans and Renewal of Borrowed Material**. Students can quickly reserve books or other materials they need much more efficiently, ensuring that the resource they want is available when they visit the library. The system will record the loan date and the return date of the book and will also perform an automatic calculation of the fine based on the library's lending policies in case of delay in returning the items.
- **Loan Tracking and Expiration Notifications**. This feature allows students to keep track of their borrowed books and automates the processes of sending notifications via email when the return date is about to expire or has already expired, to avoid additional charges for late payments and ensures that Library resources are returned safely and in time for others to use. Thus, the system will send automatic emails to students 3 days before the return date to avoid late return of books. For greater effectiveness, all items such as books, journals, research papers, magazines and newspapers will have different return periods. For example, a book can be loaned for a period of 3 weeks but a magazine only for 1 week. Newspapers cannot be loaned for use outside the library, etc.
- **Improve the Overall Experience**. The software will not change much over time and periodic maintenance will be carried out. In addition, automatic data backups and quick updates will be enabled to safeguard the library's database and thus ensure that the system is always up to date.

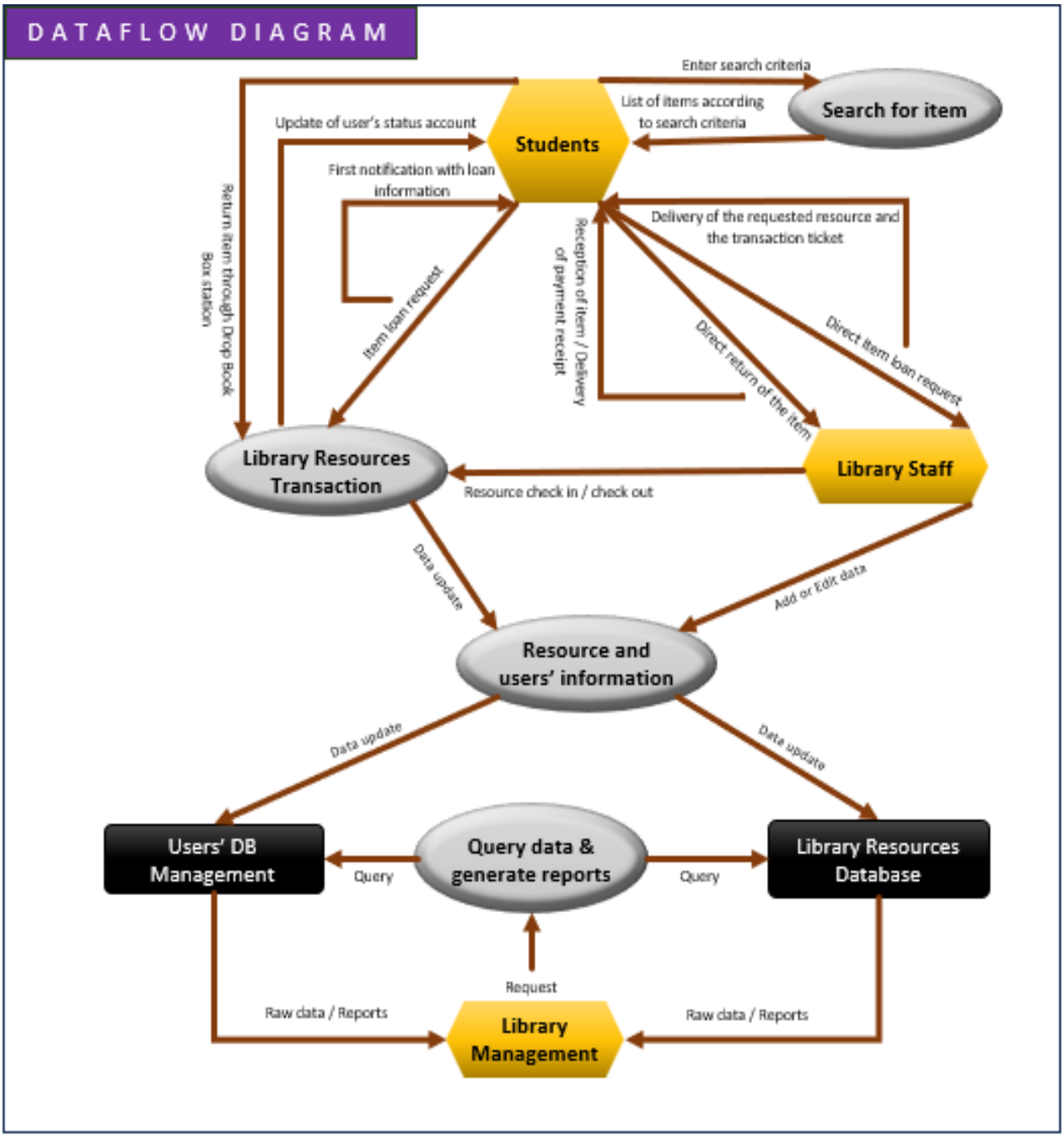


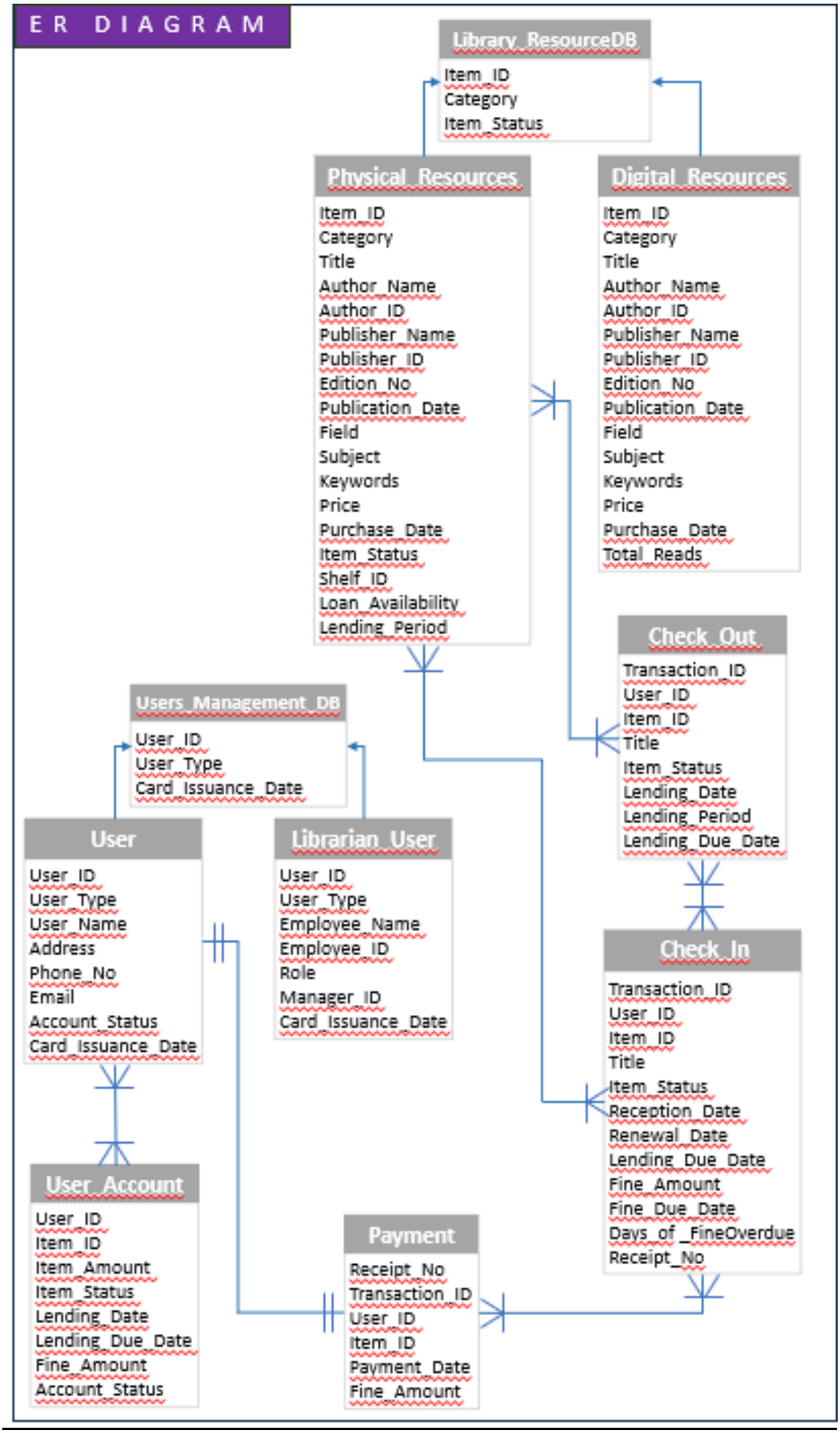
SCOPE

IN SCOPE	OUT OF SCOPE
• Self-Reservations, Book Loans and Renewal of Borrowed Material, ensuring that the resource they want is available when they visit the library. • Loan tracking and expiration notifications. Students will be able to track the status of their account regarding borrowed books, renewed loans and will receive email notifications of transactions made with the library and as a reminder of the return date of the borrowed item. • Self-Return of Books using the Book Drop Box station. Students can return books on their own at any time, thus reducing wasted time and improving their interaction with the library.	• The system does not have bot or chat support. • All features are designed in English and there is multi language support. • Payments of fines can only be made at the library facilities since the system does not have the possibility of online banking transactions. • The system is not collaborative, nor does it interact with other virtual libraries. • It does not have the feature of downloading digital material from the library.


CONTEXT DIAGRAM
University Administration
Students
Reply
Request
Sponsorship
Query
Users' Management Database
Resources and Students' information
Library Staff
Reply
Library Management System Software
Reply
Reply
Query
Library Resource Database
Reports
Library Management
Inputs and maintenance
Software Developer


USE CASE DIAGRAM UML
Library Management Software
Fill up registration form for new user
Leave item in the Book Drop Box
Return item
User Login
Borrow item
Monitor loan
Pay fine
Renew item
Student
Search for item
Reserve item
Access digital item
Send Feedback
Add new item record
Tag item with RFID
Library Resource DB management
Library Staff
Check out item
Check in item
Return items left in the box to the shelf
User DB management
Add new user record
Deliver library user ID card
DB Login
Library Management
Supply library user ID cards
Data Query
Export Raw Data
Export SQL schema to CSV report
Prepare library databases
Create and Run Software
Developer
Upgrade system
System maintenance
Backup the system


DATAFLOW DIAGRAM
Enter search criteria
Search for item
List of items according to search criteria
Students
Update of user's status account
First notification with loan information
Return item through Drop Book Box station
Item loan request
Reception of item / Delivery of payment receipt
Delivery of the requested resource and the transaction ticket
Direct return of the item
Direct item loan request
Library Resources Transaction
Library Staff
Resource check in / check out
Data update
Add or Edit data
Resource and users' information
Data update
Data update
Users' DB Management
Query
Query data & generate reports
Query
Library Resources Database
Request
Raw data / Reports
Raw data / Reports
Library Management

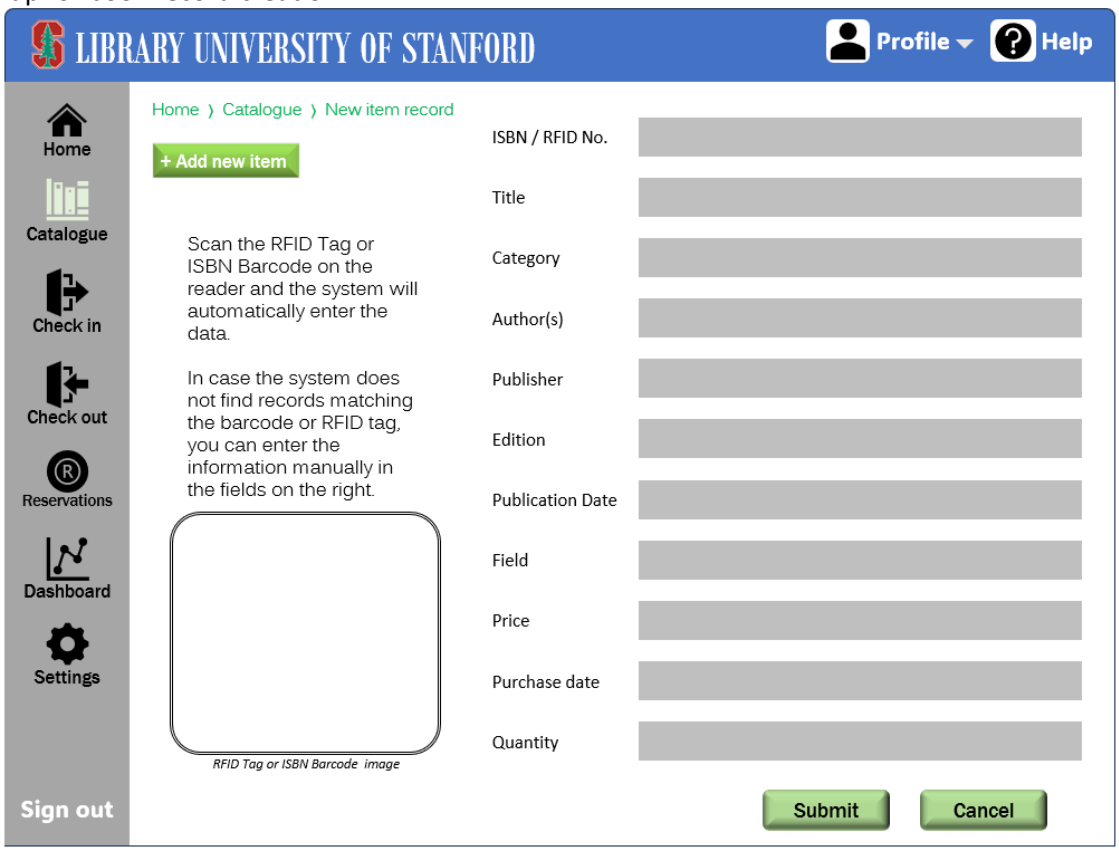

ER DIAGRAM
Library_ResourceDB
Item_ID
Category
Item_Status
Physical_Resources
Item_ID
Category
Title
Author_Name
Author_ID
Publisher_Name
Publisher_ID
Edition_No
Publication_Date
Field
Subject
Keywords
Price
Purchase_Date
Item_Status
Shelf_ID
Loan_Availability
Lending_Period
Digital_Resources
Item_ID
Category
Title
Author_Name
Author_ID
Publisher_Name
Publisher_ID
Edition_No
Publication_Date
Field
Subject
Keywords
Price
Purchase_Date
Total_Reads
Check_Out
Transaction_ID
User_ID
Item_ID
Title
Item_Status
Lending_Date
Lending_Period
Lending_Due_Date
Users_Management_DB
User_ID
User_Type
Card_Issuance_Date
User
User_ID
User_Type
User_Name
Address
Phone_No
Email
Account_Status
Card_Issuance_Date
Librarian_User
User_ID
User_Type
Employee_Name
Employee_ID
Role
Manager_ID
Card_Issuance_Date
Check_In
Transaction_ID
User_ID
Item_ID
Title
Item_Status
Reception_Date
Renewal_Date
Lending_Due_Date
Fine_Amount
Fine_Due_Date
Days_of_FineOverdue
Receipt_No
User_Account
User_ID
Item_ID
Item_Amount
Item_Status
Lending_Date
Lending_Due_Date
Fine_Amount
Account_Status
Payment
Receipt_No
Transaction_ID
User_ID
Item_ID
Payment_Date
Fine_Amount

NON-FUNCTIONAL REQUIREMENTS

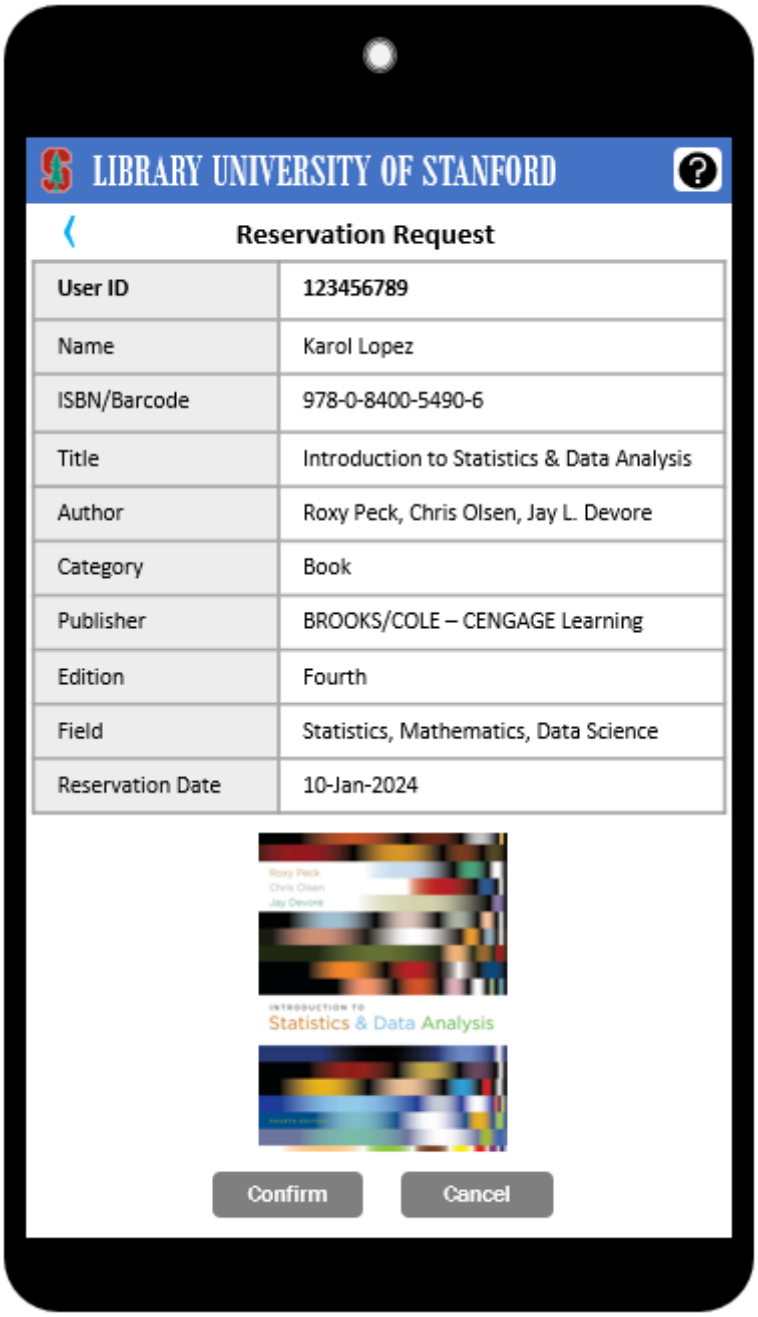
FUNCTIONAL REQUIREMENTS	NON-FUNCTIONAL REQUIREMENTS
• **Self-Reservations, Book Loans and Renewal of Borrowed Material.** Students can quickly reserve books or other materials they need much more efficiently, ensuring that the resource they want is available when they visit the library. • **Search portal and shelf management**: The search will be very easy and fast, allowing access to a wide variety of resources, including books, journals, research papers, e-books, and e-magazines, and indicating the exact shelf where the user can find the requested material. • **Reporting and Analytics.** Streamlines the generation of diverse and updated reports, which helps the library management to complement the decision-making process based on real and current data.	• **Availability:** As it is a cloud-based system, it can be accessed 24 hours x 7 days, even outside of normal library hours and from anywhere. • **Compatibility:** LMS can be used on any Windows and MacOS run computers. • **Scalability:** Auto scheduled tasks like emails and database maintenance. • **Performance:** Data should be stored in cloud • **Security**: It will be RFID ready (NCIP 2.0 HTTP server available). RFID tags will prevent book theft and unauthorized borrowing of library materials. This technology will help improve security and reduce the cost caused by the loss of library materials. Additionally, only authorized staff will have access to the database management. • **Maintainability:** The software will be created and maintained in Java, which facilitates periodical change over time and very little maintenance to be done on the code. • **Usability:** It will have a user-friendly and simplified interface to meet the specific needs.

WIREFRAMES

Mock up for book record creation.



Mock up for Reservation item request.



FINAL RECOMMENDATIONS

Implementation Planning: Plan the implementation of the solution. This could involve developing a project plan, identifying resources, and defining a timeline.

Change Management: Plan and manage the changes that will occur due to the automation. This could involve training staff, communicating changes to library users, and managing any resistance to change.

Solution Evaluation: Evaluate the designed solution against the requirements to ensure it meets the needs of the stakeholders. This could involve prototyping and user testing.

Review and Evaluation: After the solution is implemented, review its effectiveness, and evaluate whether it meets the project objectives. This could involve gathering feedback from stakeholders and monitoring system performance.