Group Project
Online Data Management Storage System

Submitted to:

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Submitted by Group 11:

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Meeting Minutes:

Date	Team members present	Topics discussed	Time	Action items
25-Jan	Everyone	Introduction and brainstorming existing systems	1 hour	Come up with real time existng systems relevant to our project
02-Feb	Everyone	Finalizing on an existing system	45 min	Work on diifferent tasks of our document
04-Feb	Everyone	Integration of all our work and making final changes to the documentation	1.5 hours	Submitting the file on eLearning
23-Feb	Everyone	Discussing about milestone 2	30 mins	Dividing the tasks and individually completing them before review
08-Mar	Everyone	Checking up on the progress on each task	30 mins	Finishing the tasks by next week
16-Mar	Everyone	Integrating all the tasks and formatting the document	1.5 hour	Formatting the document
19-Mar	Everyone	Making final discussions regarding the document	30 mins	Submitting the file on eLearning
23-Mar	Everyone	Discussion about milestone 3	30 mins	Dividing the tasks and individually completing them before review
1-Apr	Everyone	Checking up on the progress on each task	1.5 hrs	Finishing the tasks
2-Apr	Everyone	Integrating all the tasks and formatting the document	1.5 hrs	Submitting the file on eLearning
5-Apr	Everyone	Discussion about milestone 4	30 mins	Dividing the tasks and individually completing them before review
10-Apr	Everyone	Checking up on the progress on each task	1.0 hrs	Checking up on the progress on each task
13-Apr	Everyone	Checking up on the progress on each task	30 mins	Checking up on the progress on each task
19-Apr	Everyone	Checking up on the progress on each task	30 mins	Checking up on the progress on each task
21-Apr	Everyone	Checking up on the progress on each task	1.0 hrs	Checking up on the progress on each task
22-Apr	Everyone	Integrating all the tasks and formatting the document	1.5 hrs	Formatting the document
23-Apr	Everyone	Making final discussions regarding the document	2.5 hrs	Submitting the file on eLearning

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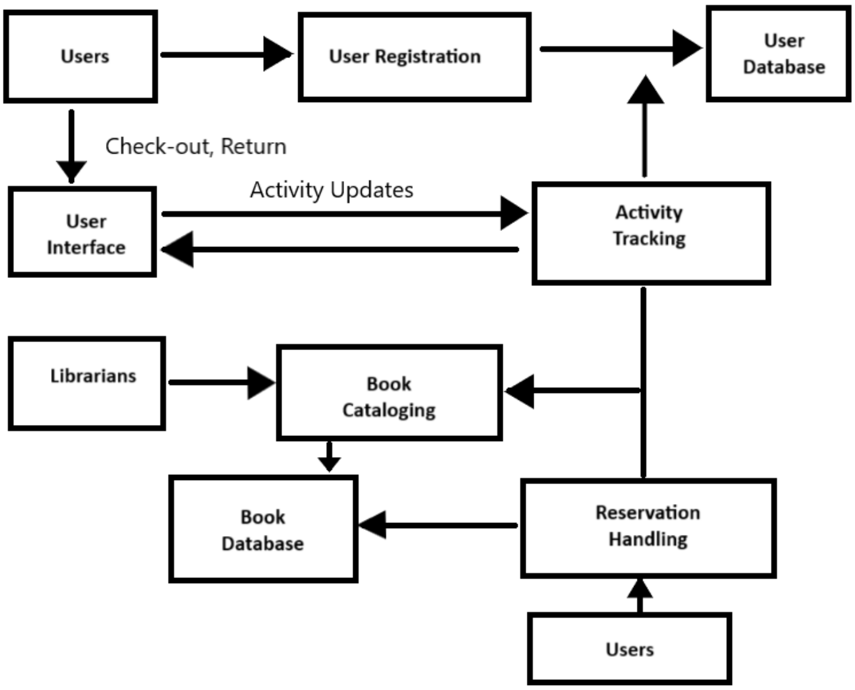

6.4. **Use Case Diagram**

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1. Executive Summary

The company Data Sphere wants to provide a complete library management system for the University of Texas at Dallas as part of this project. Database management systems (DBMS) with strong data storage, retrieval, and management capabilities are the specialty of Data Sphere.

The system attempts to address common problems that businesses encounter when they don't have a centralized data storage solution, like space constraints, accessibility problems, security threats, limits on cooperation, and mobility issues. It will offer a scalable, reliable DBMS made specifically for the needs of the university.

User profile updates, book management, borrowing/returning, reservations, and user authentication are some of the important features. Performance, reliability, security, scalability, usability, and compatibility across browsers are all considered non-functional requirements.

A comprehensive study was carried out, resulting in the construction of behavioral models with use cases, dynamic models with sequence diagrams, and structural models like class diagrams. Extensive design guidelines were developed for the student and librarian user interfaces.

Phases including development, testing, deployment, and ongoing monitoring and support are described in a thorough project plan. Thorough documentation is maintained for responsibilities, risk management, meeting minutes, and feedback assimilation.

With the help of Data Sphere's contemporary DBMS solutions, the system will successfully integrate and optimize library operations, improve user experiences, guarantee data security, and allow the institution to make decisions based on data.

In the future, the system will be able to increase its client base and inventory while automating procedures and cutting expenses to effectively distribute knowledge.

2. Problem Statement

We are surrounded by data everywhere since it is said to be the new oil. In today's digital age, where the amount of data produced and stored is rapidly increasing, an online data storage management system is essential for individuals and organizations to manage their data effectively, efficiently, and securely.

2.1. Problems without an Online Data Management Storage

Without proper data storage and management system, all big or small firms or individuals would feel lost and would face at least one of the below challenges:

- Inadequate storage space: Because of the storage space's limitations, vital information and documents could be lost or older files could need to be removed.
- Accessibility issues: If files are stored on different devices or are not centrally located, people may have trouble getting to them.
- Security issues: If people keep important data on personal devices or external hard drives, there is a possibility of security breaches, theft, or damage.
- Restrictions on collaboration: Teams may find it difficult to work together on projects or documents in the absence of a centralized storage system.
- Limited mobility: Without access to online storage, people could only access their files from a limited number of locations or devices.

2.2. Competitor Analysis

Some of the established players in the domain are:

- Microsoft OneDrive for Business
- Google Drive Enterprise
- Dropbox Business
- Box Enterprise
- Amazon S3
- iCloud for Business
- pCloud Business
- Mega for Business
- Sync.com for Business
- DarwinBox

The same objective is shared by all of these online data management and storage solutions: to make it simple and accessible for users to access data when needed.

2.2.1. Drawbacks of Competitors

Even though they are established in the market, each product or service has its pros and cons. Some of the limitations that the above data management systems are facing and that our product would try to overcome are:

1. Limited sharing and collaboration features

2. Limited syncing

3. No client-side encryption by default

4. Limited platform support

5. Difficult to set up and use for non-technical users

6. Privacy concerns

7. Limited customizations

3. Proposed Solution

Data Sphere is a software development company that specializes in creating Database Management System (DBMS). We provide customized solutions to businesses of all sizes, from small start-ups to large corporations. Our DBMS offers powerful and reliable data storage and retrieval capabilities, allowing businesses to manage their data with ease. We also provide a range of services, including data migration, backup and recovery, and performance tuning using Cloud services. With our expertise in DBMS development, we aim to help businesses improve their operations and drive growth. We primarily focus on enterprise or large-scale institutions.

4. Requirements Definition

Our DBMS is designed to be a powerful tool for businesses, with a range of features that make it a comprehensive solution for managing data.

4.1. Functional Requirements

User Authentication and Authorization

- All users such as faculty, staff, and students must have the ability to log in using their own credentials.
- Certain access privileges are required for different user roles such as student and librarian.

Book Management

- The system should allow librarians to add, amend, and remove books.
- Book searches by title, author, genre, or ISBN ought to be possible for users.
- Every book's availability status (such as available or checked out) ought to be shown by the system.

Borrowing and Returning Books

- Books ought to be available for checkout by users.
- When books are checked out and returned, the system ought to automatically update the availability status of such volumes.
- Users who don't return books promptly should get overdue alerts.

Reservation System

- Current checked-out books ought to be reserved by users.
- When books that are reserved become accessible, the system should alert users.

User Profile Management

- It should be possible for users to edit their profiles, including their password and contact details.

4.2. Non-Functional Requirements

Performance of the system

- The library management system should be able to handle user requests efficiently.
- The search operation in the system should be able to return results within a few seconds, even with a large database.

Security

- The data of the students, faculty, and library personnel must be encrypted during transmission and storage.
- Access to sensitive operations like deleting book records should be restricted to specific users.

Reliability

- The university library system should have backup and recovery mechanisms to prevent loss of personal data of users, staff, and faculty.
- The library management system should be available and accessible most of the time aiming for at least 99.9% uptime, especially during busy periods.

Scalability

- As it is a university library with new students joining each semester, the library database should be scalable to accommodate an increasing number of users and books.

- The performance of the system should not degrade significantly as the database of the library grows.

Usability

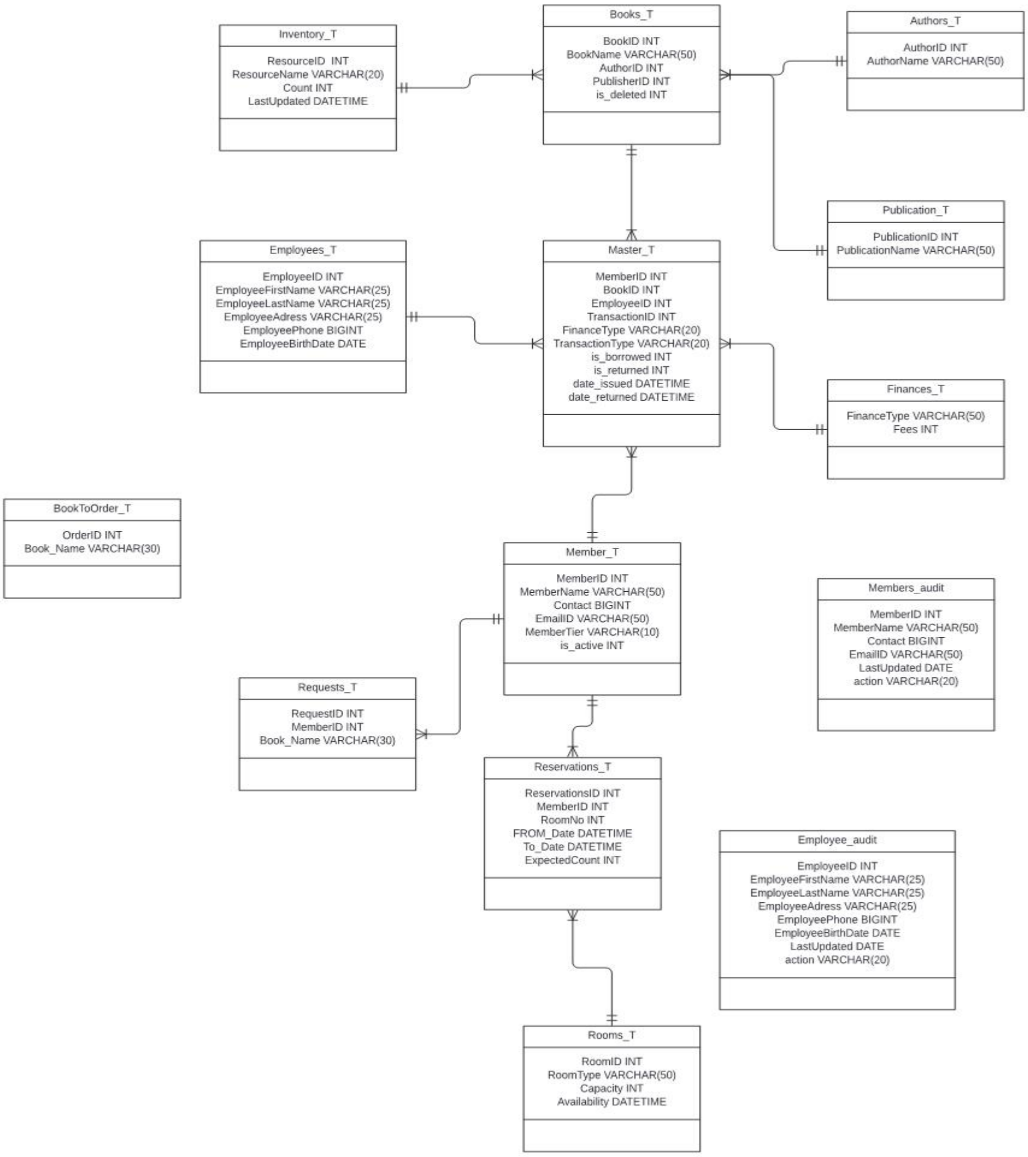
- The user interface of the library system should be easy to navigate and intuitive as the user group is vast with people of ages between 17 and 60.
- Guidelines and tooltips should be provided for all the users to understand the system’s functionalities.

Compatibility

- The library system should be compatible with various web browsers as all the users use different operating systems and hardware (e.g. Chrome, Edge, Firefox, Safari).
- Mobile responsiveness is required to support all the users who are accessing the library system from different devices across different states in America and also different countries for international students.

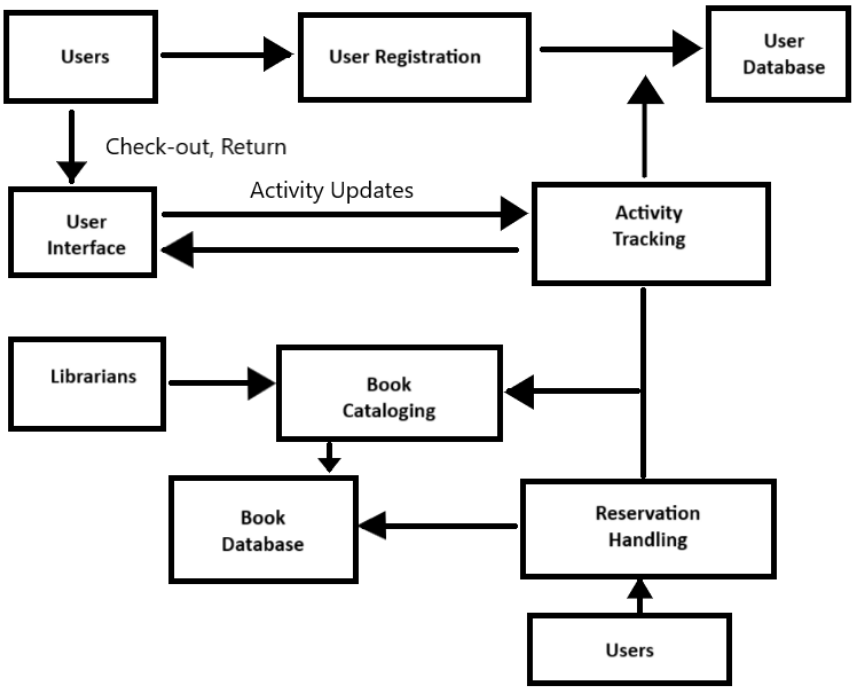
5. Structural Models

5.1. Class Diagram

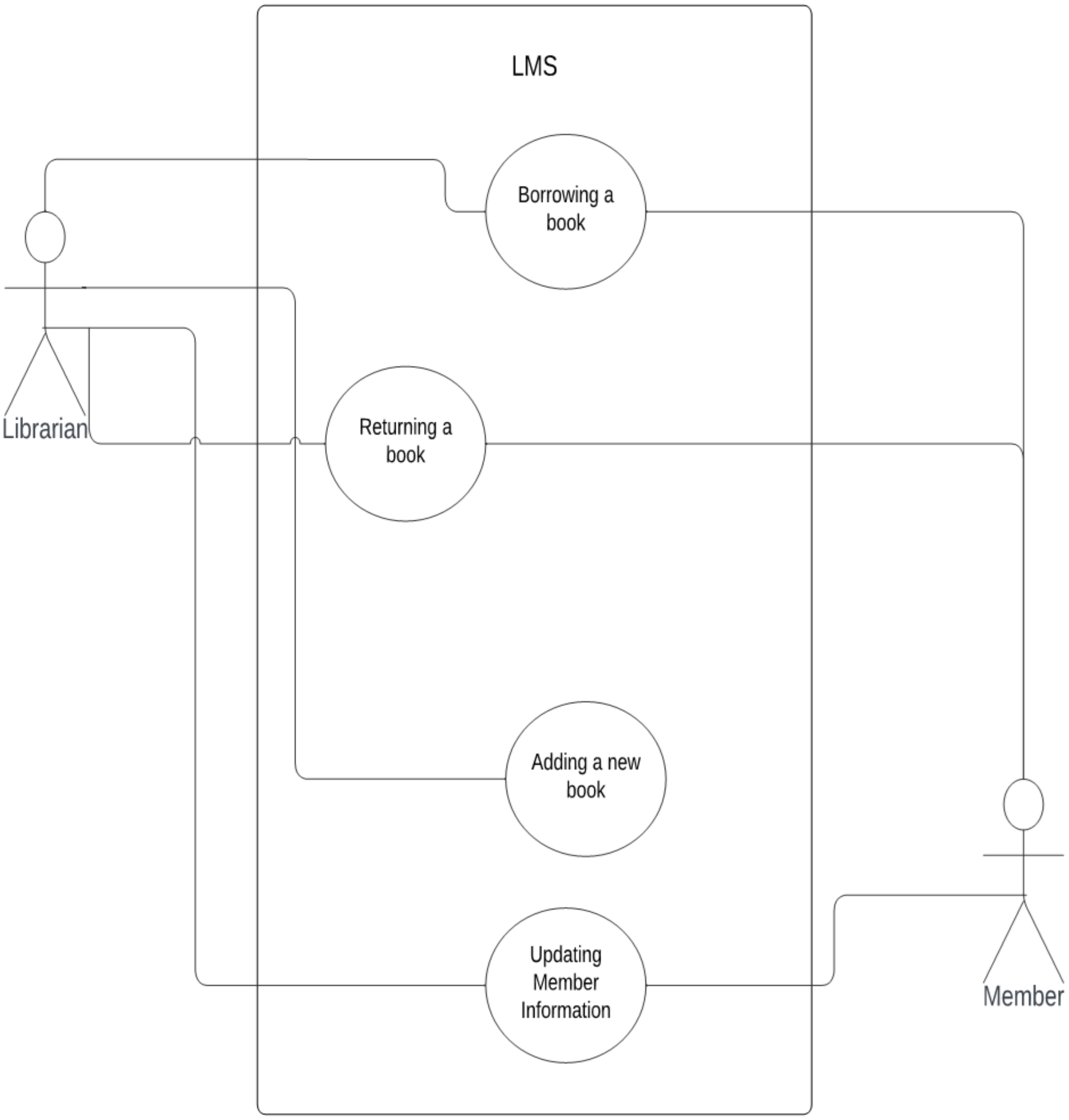


6. Behavioral Model

6.1. Data Flow Diagram



6.2. Use Case Diagram



6.3. Use Case Descriptions

Use Case 1: Borrowing a book

When a member borrows a book, the librarian inserts the data in the master table and checks for member id, employee id, and book id. If all three details are valid it inserts the data into the master table. Else, displays an invalid detail message. In this step, we keep librarian details as well to see who was in charge of the service when the book was borrowed so that we can handle the potential problem related to the book in the future.

Use Case 2: Returning a book

When a member returns a book, the librarian updates in the master table and checks for the member id and book id in the master table. If the member id and book id exist in the master table then it removes the information of the book from the list of borrowed books and updates the list of returned books with the book's information. It also updates the librarian details who was in charge of the service when the book was returned.

Use Case 3: Adding a new book

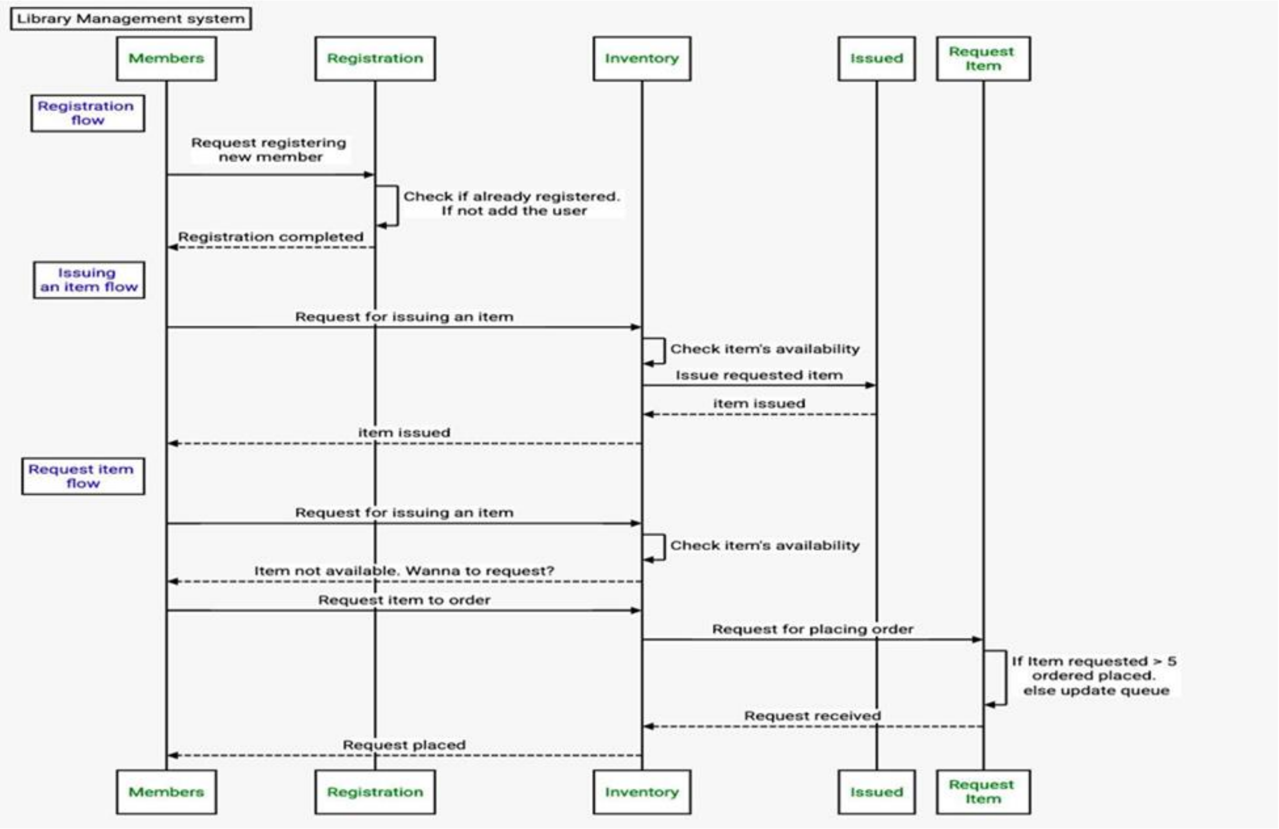
When a new book is added, the librarian updates the book and the inventory table. It checks if the author is a new author or existing author and if the author is new, it adds the details in the author table. Also, it checks if the publisher is new or existing and if the publisher is new, it adds the details to the publisher table. In this method, the library management system can sort out books with author information and publisher information.

Use Case 4: Updating member information

The librarian can update member's info. When a member is deleted, our member table shows the signal that the member is no longer active. And whenever we update member information, the old information is inserted to the member audit table to keep their information just in case we need former information.

7. Dynamic Model

7.1Sequence Diagram

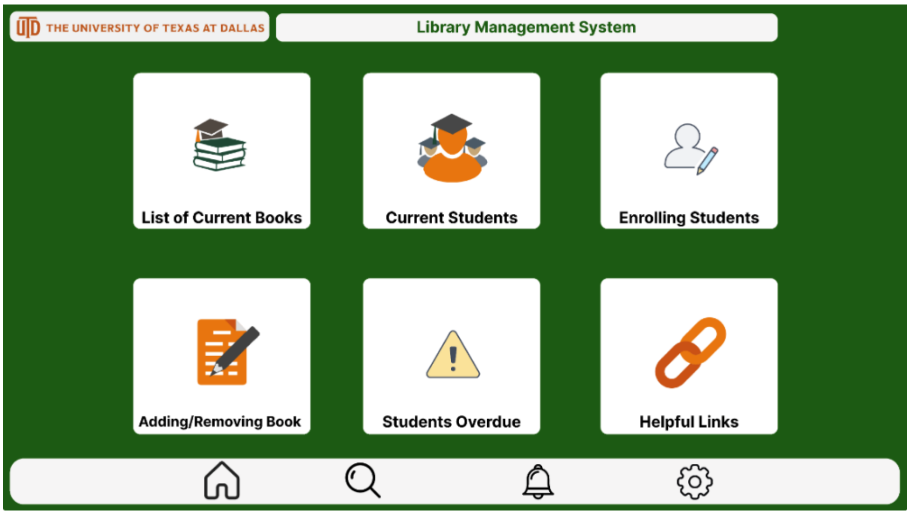


Library Management system
Members
Registration
Inventory
Issued
Request Item
Registration flow
Request registering new member
Check if already registered. If not add the user
Registration completed
Issuing an item flow
Request for issuing an item
Check item's availability
Issue requested item
item issued
item issued
Request item flow
Request for issuing an item
Check item's availability
Item not available. Wanna to request?
Request item to order
Request for placing order
If Item requested > 5 ordered placed. else update queue
Request received
Request placed
Members
Registration
Inventory
Issued
Request Item

8. Design

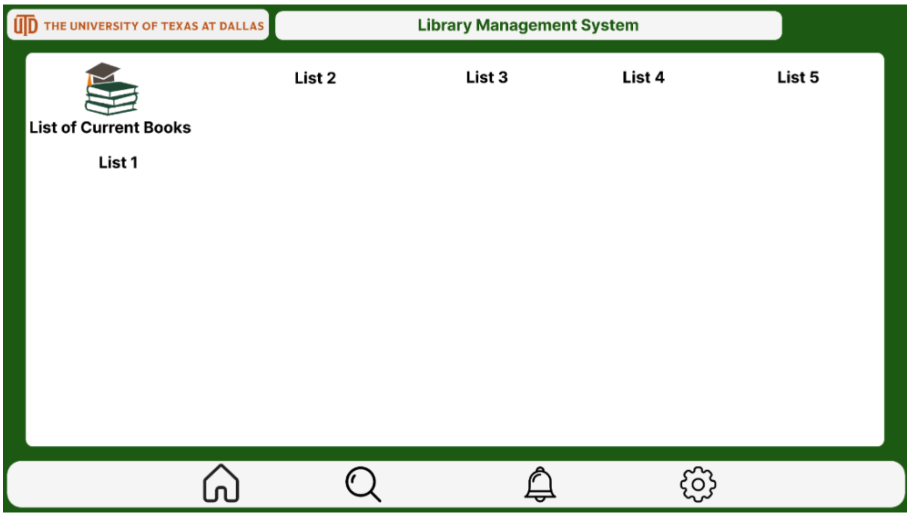
8.1. User Interface Design and Design Specifications (Librarian)

User (Librarian) opens the portal and enters the login details given by the University:



They encounter the home screen. This screen contains all the options for the librarian like the list of the current books in the library, current students enrolled in all the semesters who can use the library system, new student enrollment form (in case the student is not enrolled or to edit the information of the student), a form to add a new book into the system or to remove an existing book from the system, the list of the students who have a overdue fine, and in the end the helpful links for the librarian in case they get lost navigating through the system.

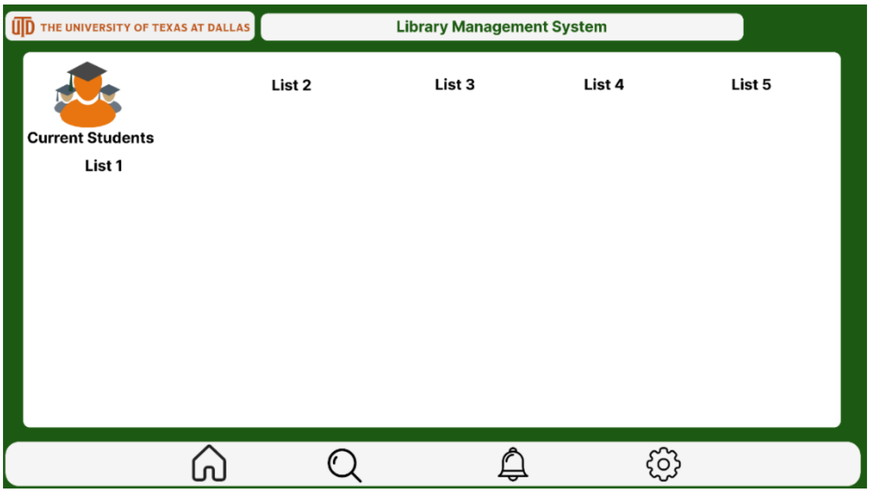
User clicks on the list of current books option:



User clicks on the list of current books options on the home screen to check details of the books, whether they exist in the list or not when a student asks about a specific book. The user can click on the home button to navigate back to the main menu.

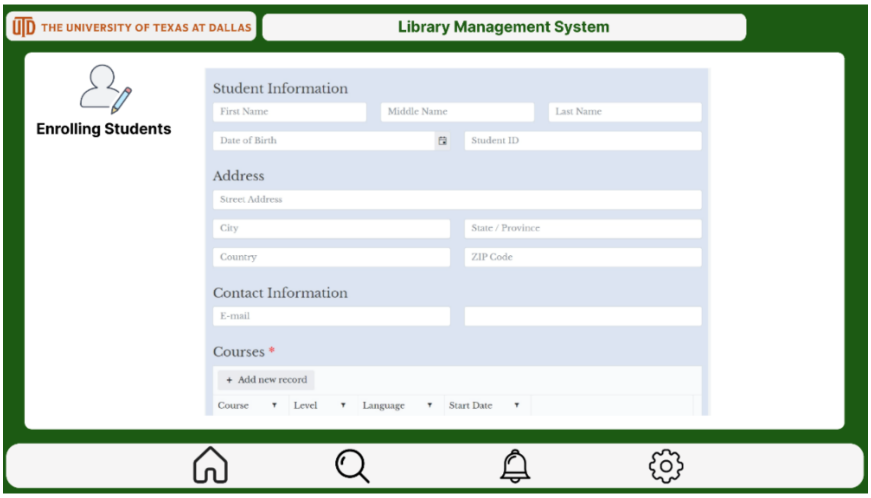
User clicks on the list of current students option:

User clicks on the list of current students option on the home screen to check details of the student whether they are in the library management system or not. The user can click on the home button to navigate back to the main menu.

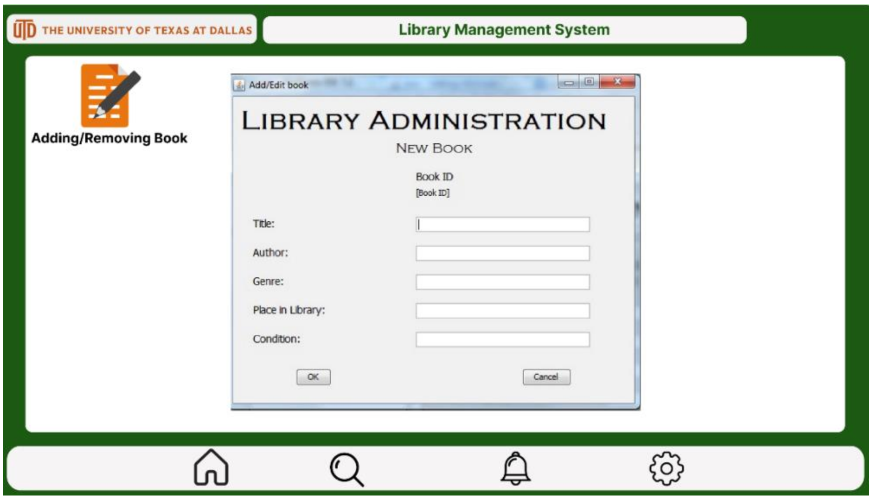


User clicks on the enrolling students option:

User clicks on the enrolling students option on the home screen to update the information of the existing student (address, contact, and mailing info) or to enter the details of a student if they have changed their majors. The user can click on the home button to navigate back to the main menu.



User clicks on the Adding/Removing book option:



LIBRARY ADMINISTRATION

NEW BOOK

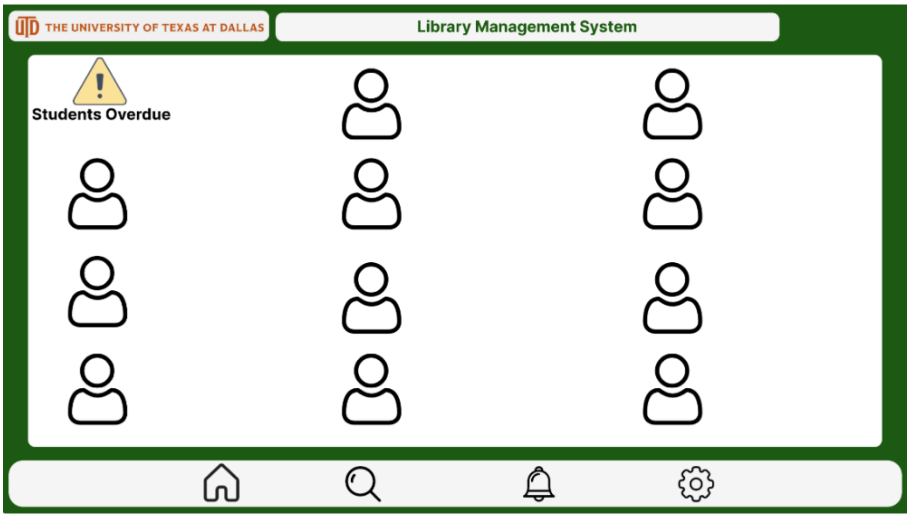
Book ID
[Book ID]

Title:
Author:
Genre:
Place in Library:
Condition:

OK Cancel

User clicks on the Adding/Removing book option on the home screen to enter details of the new book that the library has acquired. They can also use this option to remove a book that the library has considered to remove from their database. The user enters all the required information and updates the book database from this option. The user can click on the home button to navigate to the main menu.

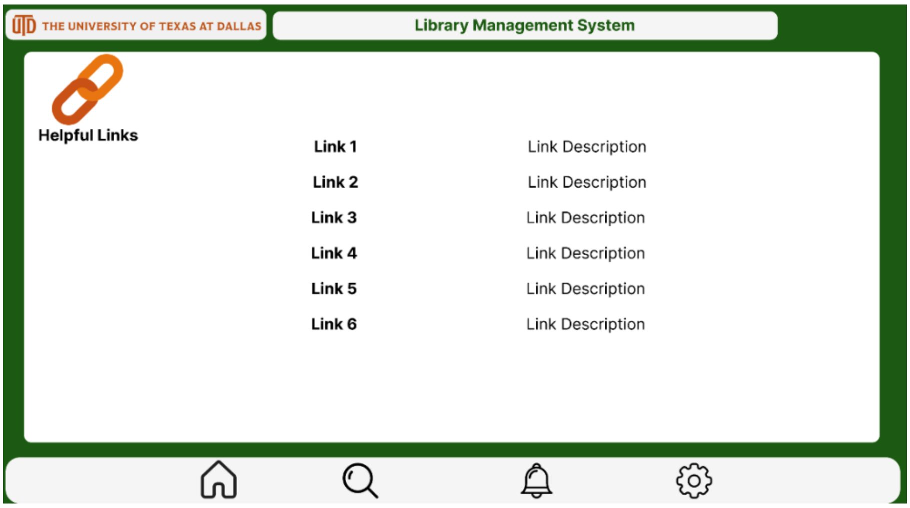
User clicks on the Students Overdue option:



User clicks on the Students Overdue option on the home screen to check the details of the students who have taken a book/books and have not returned them yet. This option can be used to show the students the entire split of the overdue amount. It can also be used to send notifications to the students who are overdue. The user can click on the home button to navigate to the main menu.

User click on the Helpful Links option:

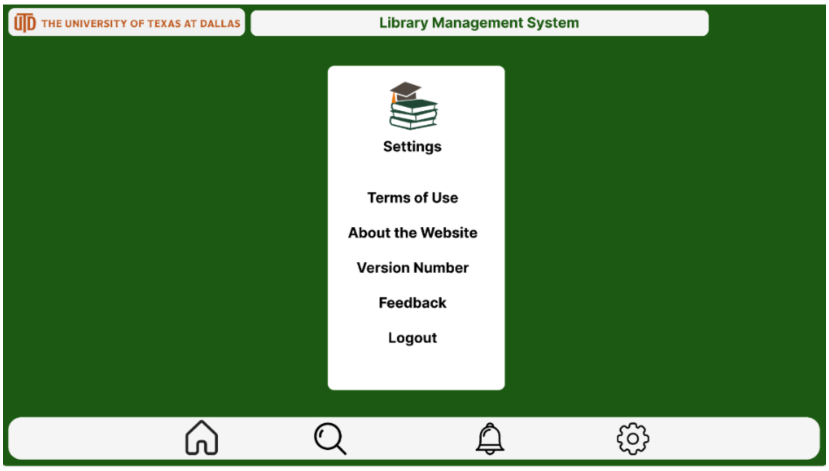
User clicks on the Helpful Links option to check for answers to any doubt that they have about the system. It contains all the FAQs and any other sources for any doubts that the librarian has. The user can click on the home button to navigate to the main menu.



Link 1	Link Description
Link 2	Link Description
Link 3	Link Description
Link 4	Link Description
Link 5	Link Description
Link 6	Link Description

User clicks on the settings option:

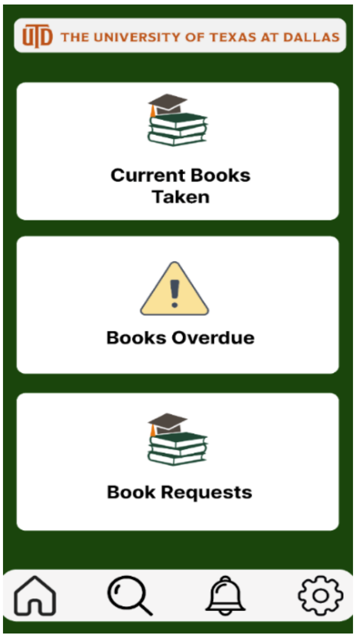
User clicks on the settings option on the navigation bar to go to the settings menu that has the information about the website and a log out option. The user clicks on the home button to navigate to the main menu.



8.2. User Interface Design and Design Specifications (Student)

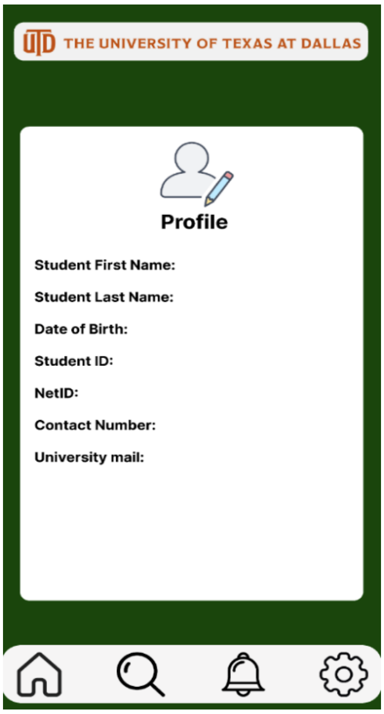
User (Student) opens the app and enters the login details given by the University:

They encounter the home screen. This screen contains all the options for the student like current books taken by the student, books overdue for the student, and any book requests that the student has.



User taps on settings option:

User taps on the settings option to update any information like name, date of birth, students id, net id, contact number, and university email address. The user can tap on the home option to navigate back to the main menu.



Student First Name:

Student Last Name:

Date of Birth:

Student ID:

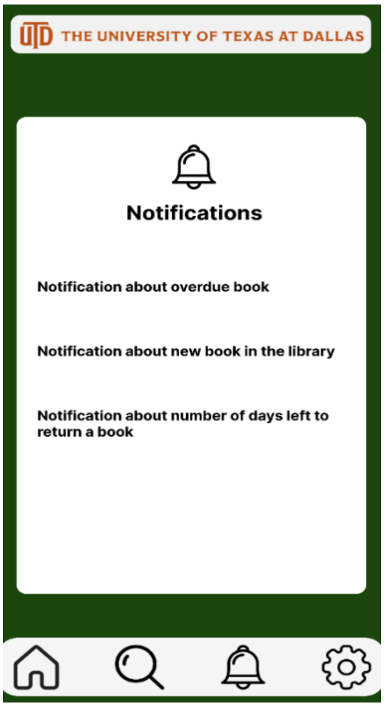
NetID:

Contact Number:

University mail:

User taps on the notifications option:

User taps on the notification option to check for all the notifications regarding new books available at the library, updates on requests that have been submitted, and updates about overdue fines.
The user can tap on the home option to navigate back to the main menu.



THE UNIVERSITY OF TEXAS AT DALLAS

Notifications

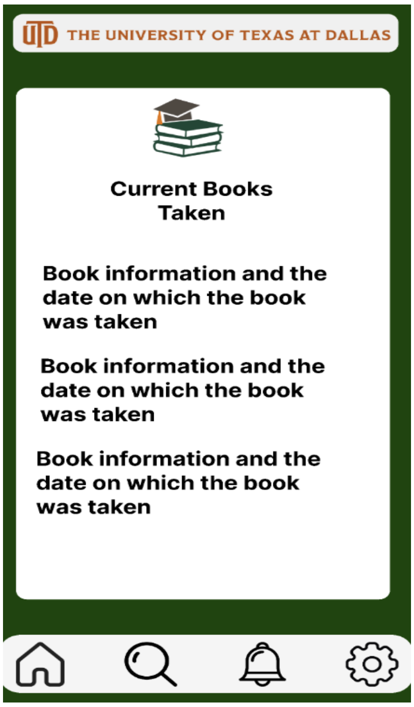
Notification about overdue book

Notification about new book in the library

Notification about number of days left to return a book

User taps on the Current Books Taken option:

User taps on the Current Books Taken option to know all the books that they have taken from the library. The user can tap on the home option to navigate back to the main menu.



THE UNIVERSITY OF TEXAS AT DALLAS

Current Books Taken

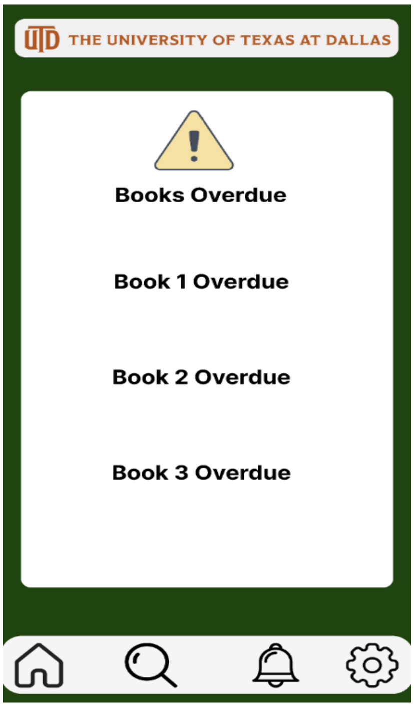
Book information and the date on which the book was taken

Book information and the date on which the book was taken

Book information and the date on which the book was taken

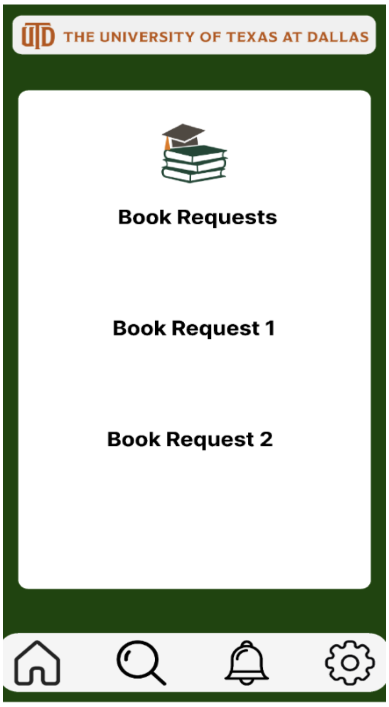
User taps on the Books Overdue option:

User taps on the Books Overdue option to know the amount of money they are overdue and the amount overdue on each book. The user can tap on the home option to navigate back to the main menu.



User taps on the Book Requests option:

User taps on the Book Requests option to submit requests for books that they want to read for their course work and to get an update about the books if they are available in the library or have been loaned out to students. The user can tap on the home option to navigate back to the main menu.



9. Testing

9.1. Test Cases

Book Borrowing Test Case:

- Description: This test case ensures that the system accurately records the process of a book being borrowed by a student or faculty member.
- Testing Approach:
  1. Simulate a user logging into the system.
  2. Select a book from the catalog and proceed to check it out.
  3. Verify that the book's status changes to "checked out" and is no longer available on the shelf.
  4. Verify that the due date is correctly set based on the user's status (student/faculty) and the library's borrowing policies.

Book Return Test Case:

- Description: This test case validates the functionality of the system in processing the return of a book by a user.
- Testing Approach:
  1. Simulate a user logging into the system.
  2. Navigate to the "return book" section.
  3. Input the book details and confirm the return.
  4. Verify that the book's status changes back to "available" for checkout.
  5. Check if any overdue fines are correctly calculated and applied, if applicable.

Catalog Search Test Case:

- Description: This test case ensures that the search functionality of the catalog works as expected, allowing users to find books efficiently.
- Testing Approach:
  1. Input various search queries, including book title, author name, and subject.
  2. Verify that the search results are accurate and relevant to the query.
  3. Test the system's handling of partial queries and misspelled words to ensure robustness.
  4. Check the performance of the search function with a large catalog to ensure it remains responsive.

9.2. Testing Feedback

Users found the testing process to be quite intuitive and straightforward. The steps outlined in the test case were easy to follow, and the user was able to complete them without encountering any major issues. However, the user did notice a couple of areas where improvements could be made:

1. User Interface Clarity: While logging into the system and selecting a book from the catalog was relatively straightforward, they found that the user interface could be more intuitive. Clearer labeling or guidance prompts could help users navigate through the process more smoothly, especially if they are not familiar with the system.
2. Due Date Confirmation: Although the system correctly set the due date based on the user status (student/faculty) and the library's borrowing policies, a confirmation message or notification displaying the due date before finalizing the borrowing process. This would provide reassurance that the due date is accurate and allow for any necessary adjustments before proceeding.

10. Implementation Plan

10.1. Project Plan

Phase	Tasks	Duration	Responsible Team	Resources Required
Development	Gathering of Requirements and Analysis	2 weeks	Business Analyst	Interview with Stakeholders and Interviews
	Design and Architecture	3 weeks	System Architect	Modeling using UML and documentation
	Coding on SQL	4 weeks	Development Team	Creating database system using SQL
	Review and Testing of the code	2 weeks	Development Team	Tools required to test the code and testing framework
	Integration and system testing	2 weeks	Quality Assurance	Testing environments and the tools required to test
Testing	User acceptance testing (UAT)	3 weeks	Quality Assurance Team, Clients	Test cases and feedback given by users
	Performance testing	1 week	Quality Assurance Team	Performance metrics and testing tools
	Security testing	1 week	Security Team	Security testing tools and protocols
Rollout	Planning and preparation for Deployment	1 week	Project Manager	Deployment plan excluding rollback strategy
	Production deployment	1 week	DevOps Team	Deployment tools, monitoring tools
	Monitoring and support	Ongoing	Support Team	Support to client with Monitoring tools

10.2. Change to the plan based on Feedback

Upon feedback received from the stakeholders of the Eugene McDermott library and the students at the University of Texas at Dallas, we at DataSphere have taken a decision to increase the duration of the "User Acceptance Testing" task from 2 week to 3 weeks, which might make our solution bug-free and this in turn may result in less burden on the support team towards the end of the Rollout phase.

11. What the Future Upholds?

Increased automation: In the future, online data storage management systems are probably going to get more automated. This can involve scheduling automatic backups, organizing files, or even labelling files with keywords for quick access.

Cloud-based storage: In the future, cloud-based storage is probably going to become even more common. This will increase scalability and cost-effectiveness for enterprises as well as give users more freedom to access data from any location.

Artificial intelligence: Online data storage and management systems are likely to use artificial intelligence (AI) more frequently. This might include tools like predictive analytics, customized suggestions for file organization, and even AI-powered assistants that can make it simple and quick for users to find and retrieve the files they require.

Data security is becoming increasingly important, and online data storage management systems will continue to give security tools like encryption and multi-factor authentication top priority. In addition, the security of online data storage systems will be improved using blockchain technology.

Integration with other systems: Systems for managing online data storage are likely to be more integrated with other systems, such as software for managing projects and communication tools. Businesses will be able to collaborate more effectively and streamline procedures as a result.

Our company provides an advanced Online Database Management System (DBMS) solution tailored for businesses of all sizes. Our system boasts scalability, security, and versatility, offering a variety of features to simplify data management for businesses.

Considering the growing urgency for individuals to stay informed across various fields and the surge in internet usage during the pandemic, our system is crafted to facilitate continuous learning and exploration for everyone. Leveraging digital technology, we've designed this system for user-friendliness, streamlined procedures, and cost-effectiveness. With a strong commitment to knowledge dissemination and a vision to revolutionize library management systems, we aim to support both members and non-members in overcoming daily challenges and emerging stronger. Our platform provides easy access to a wide array of resources, including books, journals, newspapers, and publications.

The pandemic has underscored the power and convenience of online services, and even as the world begins to transition out of it, the demand for remote access to goods and knowledge remains high. Through our research, we've observed a significant increase in the demand for books, prompting us to devise strategies beyond online ebooks. We now offer a reserve-and-delivery service for members, recognizing the preference for physical books despite limited shelf space at home. This service allows customers to reserve books online and have them delivered, addressing both their desires and practical constraints.

Our next objective is to expand our inventory to 1,000,000 units and double our customer base. To achieve this goal, we're implementing cost-saving measures. By optimizing our database structure, we anticipate reducing associated costs by nearly 50%, building on our existing 30% cost reduction. Additionally, we plan to automate tasks such as packaging, transactions, and late fee notifications once the database expansion is complete. These incremental improvements propel our mission to empower individuals worldwide, ushering in a new era of library management systems.