Principles of Software
Engineering
2023
[FAU: CEN 4010]

Milestone 3
Project Proposal
and High-level
description

BiblioTech

Group: Team 13

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Executive Summary

For many years, libraries relied on manual work to complete tasks such as keeping an inventory, checking if a book is being rented with cards on a circulation desk, collecting fines for books that haven't been returned. Library Management Systems provides libraries with tools to manage their resources and streamline their operations. They have revolutionized the way libraries operate, from borrowing and lending to inventory management.

BiblioTech is a comprehensive system that includes features for managing library resources, users, and circulation. One of the benefits of the system is its ability to manage library resources efficiently, helping librarians catalog their resources in a centralized database and making it easier for them to manage their inventory.

One of the advantages of BiblioTech is that it is highly customizable. It can be configured to meet the individual needs of different types of libraries, such as academic, and public. The system can also be customized to include the library's own branding, logos, and colors, giving it a more personalized touch. This strengthens the library's identity in the community.

BiblioTech can be accessed from anywhere with an internet connection. Users can access it from their homes, offices, or any other location. This provides flexibility to the user and allows them to search for materials without having to physically go to the library, saving them time and effort. The system is also designed to be user-friendly, with intuitive search and navigation tools that make it easier for users to find the materials they need and also to reserve materials, renew loans, and receive notices about overdue materials.

Competitive analysis

The analysis of competitors' websites will focus on six main features:

(homepage, design, navigation, search, content, usability) and three additional features (download, trending, and add item). The competitive analysis will utilize a numerical scale (1=bad, 2=poor, 3=fair, 4=good, 5=outstanding) and consists of four websites chosen for their focus on the open source model, books, and accessibility.

	BiblioTech	**Open Library**	**Project Gutenberg**	**Internet Archive**	**Free Library**
Homepage:	5	4	2	2	4
Design:	4	4	1	3	4
Navigation:	5	4	2	4	3
Search:	4	4	4	3	3
Content:	4	5	4	5	1
Usability:	5	3	4	3	3
Download:	5	0	2	4	0
Trending/ Popular Content:	5	4	2	0	2
Add Item:	4	4	3	4	0
Mean:	**4.5**	**3.6**	**2.7**	**3.1**	**2.2**

BiblioTech (4.5)

BiblioTech's homepage is designed with simplicity and visual appeal, featuring striking photos and a prominent search bar that quickly directs users to the desired resources. The site's navigation is consistent and includes a helpful breadcrumb feature that enhances the user experience. The search function is efficient and user-friendly, with autocomplete functionality that speeds up the search process. The site's content emphasizes book availability and user security, ensuring users can access and use the resources with peace of mind. Additionally, BiblioTech offers a range of other useful features, including testimonials, a cart, and a search bar, all of which are seamlessly integrated into the site's design to enhance the user experience. Overall, BiblioTech is a well-designed, user-friendly platform that provides a variety of valuable features to users.

Open Library (3.6) https://openlibrary.org

Open Library features a content-filled homepage with many options for interested readers varying from trending books to sorted books by assorted categories. The search feature and the browsing option offer a lot and are quick to find the best books for a reader. Where the site lacks is on the design side, it has a very monotonous design and color scheme. The great content features are implemented in a very uninteresting way. Even with this, the site is quite user-friendly and offers most of the additional features besides the download option.

Project Gutenberg (3.6) https://www.gutenberg.org

The Project Gutenberg homepage and design is extremely lackluster, it offers a somewhat popping color scheme but overall design and homepage are extremely outdated. It is clear that the page has not been updated in a long time. The page does offer a good pool of content and search/usability features due to the simplicity of its implementation. It also offers all of the additional features, however, they are difficult to use or are not fully implemented like the download feature.

Internet Archive (3.1) https://archive.org

The Internet Archive has many of the same features and issues as the Open Library. IT also has a lacking design with much to desire from the overall look and homepage but it is filled with content. The Internet Archive has a wide variety of content even compared to all of its competitors. At times it can be difficult to use or find features, but it does implement most of the additional features besides being able to see popular/trending titles.

Free Library (2.2) https://www.freelibrary.org

The Free Library homepage is very well put together and appealing with color. It also offers great usability and the ability to search for content and navigate through the site. It is clear though that this site is geared specifically towards education and so it only offers very limited content compared to other options. Due to this site not being as open source as the others, it does not implement the ability to contribute or download content, just the popular feature.

Planned advantages:

BiblioTech is an exceptional platform that encompasses all the desirable features of its competitors. Its vast pool of content, vibrant design, and intuitive navigation make it a standout in the industry. BiblioTech's mission is to identify and address the shortcomings of other online libraries to provide a comprehensive platform that caters to all needs. It goes above and beyond by offering unique features such as content downloading, trending and popular title browsing, and user-generated content with moderation. The platform is meticulously designed to provide an exceptional user experience with a modern front-end and intuitive features.

Data Definition

Name	Meaning	Usage	Comment
User	actor	Use Case scenarios	Adds and access data from database
Resource	data	Use Case Scenarios	What users can access on the website
Borrowing	data	Use Case Scenarios	Let's user know material is borrowed already
Review	service	Site user service	Allows user to rate the book/article
Search	service	Site user service	Allows user to search for specific books/articles
System	platform hardware and services	Use Case scenarios	Front end design, back end supporting services, and database

Data Definition

Name	Meaning	Usage	Comment
Newset	data	Use Case scenarios	Store the newest adding activities
InvalidUser	actor	Use Case Scenarios	A user who is not registered with the system
Login	service	Site user service	Allow users to have the ability to borrow books
Library	service	Site user service	Online library application
Search	service	Site user service	Allow user find location/activities
Catalog	service	Site user service	Organizes and presents resources to the user
Filter	service	Site user service	help user search more clearly by giving specific options
BiblioTech.com	domain Name	Site user service	The BiblioTech data type is a unique identifier for a specific online library application
Server	production server	Use Case scenarios	Online library application infrastructure
HomePage	user Interface	User interface	The first page that a user goes to

Data Definition

Name	Meaning	Usage	Comment
Website	User Interface	User interface	Front end display for user interaction
API (Application Programming Interface)	service	Site user service	Read a book database
Cart	service	site user service	Stores the user's books for checkout

Use Cases

Use Case 1: Book Search and Availability Check

Actors:

- User
- Application

Preconditions:

- User must be logged in to their account.

Primary Flow of Events:

1. User navigates to the search page of the application.
2. User enters the title, author, or keyword of the book they are looking for.
3. Application displays all available books that match the search criteria.
4. User selects a book to view its details.
5. Application displays the book's details, including author, publication date, and ISBN.
6. Application displays the book's availability status.
7. User repeats steps 2-6 as needed to find the desired book.

Alternative Flows (Errors):

1. User is not logged in to their account and is prompted to log in before proceeding.
2. No books match the search criteria and the application displays a message indicating no results were found.
3. User selects the wrong book and needs to go back to the search results.

Use Case 2: Book Checkout

Actors:

- User
- Application

Preconditions:

- User must have an account registered with the online library.
- User must be logged in to their account.
- User must have a book in their cart to checkout.

Primary Flow of Events:

1. User navigates to their cart and clicks the "checkout" button.
2. Application prompts the user to enter their email address to receive a loan confirmation.
3. Application verifies the user's account and confirms the availability of the book.
4. Application shows a loan confirmation.
5. User receives the loan confirmation and checks out the book online.

Alternative Flows (Errors):

1. User does not have a valid account and is prompted to register for one.
2. User does not have any books in their cart and is prompted to add books to their cart before proceeding.
3. User's account is invalid and the availability of the book cannot be verified.
4. Application encounters a technical issue and the loan confirmation is not shown to the user.
5. User encounters a technical issue with checking out the book online.

Use Case 3: Book Return

Actors:

- User
- Application

Preconditions:

- User must have a book checked out from the online library.
- User must be logged in to their account.

Primary Flow of Events:

1. User navigates to their loan history page and selects the book they want to return.
2. User clicks the "return" button.
3. Application prompts the user to enter their email address to confirm the return request.
4. Application updates the book's availability status to "available."

Alternative Flows (Errors):

1. User does not have any books checked out and is prompted to borrow a book before proceeding.
2. User encounters a technical issue with the return button and needs to refresh the page.

Use Case 4: Cart Creation

Actors:

- User
- Application

Preconditions:

- User must be logged in to their account.

Primary Flow of Events:

1. User navigates to the book search page and selects a book they want to borrow.
2. User clicks the "add to cart" button.
3. Application adds the selected book to the user's cart.
4. User repeats steps 1-3 as needed to add more books to the cart.

Alternative Flows (Errors):

1. User encounters a technical issue with the add to cart button and needs to refresh the page.

Use Case 5: Cart Modification

Actors:

- User
- Application

Preconditions:

- User must be logged in to their account. User must have books in their cart. Primary Flow of Events:
- User navigates to their cart page and selects a book they want to remove. User clicks the "remove from cart" button. Application removes the selected book from the user's cart. User repeats steps 1-3 as needed to remove more books from the cart or add books back to the cart as described in Use Case 4.

Alternative Flows (Errors):

1. User does not have any books in their cart and is prompted to add books to their cart before proceeding.
2. User encounters a technical issue with the remove from cart button and needs to refresh the page.

Initial list of functional specs

Non-Member expectation

1. **Creating Account**
   - **1.1** The system shall allow the user to create an account by storing UserID, Password, Date of Birth, First Name, Last name and Phone number. The system shall not allow the User to Create an account if the UserID chosen by the user already exists in the System's Database. Also, the system shall prevent the user from creating an account if the user's chosen password does not match the re-enter password field. The following areas must be filled in for the user to create an account successfully: First Name, Last Name, UserID, Password, Re-enter Password, Phone number, and Date of Birth**.**
     - 1.2 Stimulus/Response Sequence

       i. A user enters a UserID (same as email)
       ii. A user enters a password.
       iii. The user re-enters the password for confirmation.
       iv. User shall enter their First and Last Name.
       v. User shall enter their date of birth.
       vi. The user shall provide their phone number.
       vii. The system shall check if UserID is available.
       viii. The system shall validate the password.
       ix. The system shall store the user's name, date of birth, and phone number.
       x. The system will have a button redirecting the user to the home page.

     - 1.3 Function requirement label

       i. REQ 1.1 Creating Account

2. **Browse the Library**
   - **2.1** Users can browse the online Library by using the search bar tab on the homepage or picking from a popular list

- 2.2 Stimulus/Response Sequence - Popular Picks
  1. User scrolls to the Popular Picks
  2. System shall have a filtered list by popularity for the User
- **2.3** User will browse the system by entering a search by the title of the book, the author of the book or the genre.The system shall prevent the user from deleting books from the list that the user filters out. The user has to hit new search.

- 2.4 Stimulus/Response Sequence - Search
  1. The user enters search criteria(title of book, author or genre) into the search
  2. The system shall supply the user with a list of books by title, author or genre
  3. The system shall have a button that will allow the user to return to the home page
- 2.5 Function requirement label
  1. REQ 2.1 Browse by Popular Picks
  2. REQ 2.3 Browse by Search

3. Cart

- 3.1.
  1. The system has provided a checkout cart. The user can view the books and the author name, remove the selected books.
- 3.2 Stimulus/Response Sequence
  1. The user clicks on the checkout button.
  2. The system shall have a button to allow the user to return to the book catalog.
  3. The system will provide a return date for the book.
- 3.3 Function requirement label
  1. REQ 3.1 views the selected item in the cart.

Members expectations

4. Edit Profile

- 4.1
  1. Users shall be able to edit their profile by providing a name, date of birth, and phone. The system shall store the name, date of birth, and phone when the user clicks the save button. The system shall prevent any changes to the user's profile if

any of the fields are left blank. The user must type the information in a valid format for the system to store the information.

- 4.2 Stimulus/Responsive Sequence
  i. The user will navigate to "my account page".
  ii. The user will click on the edit profile button.
  iii. User will input their name and date of birth.
  iv. The user shall click save
  v. The system shall store their name, date of birth, and phone.
  vi. The system shall refresh the user profile with updated information as a confirmation.
  vii. The system will have a button to redirect the user back to the home page at will.
- 4.3 Function requirement label
  i. REQ 4.1 Edit Profile.

5. **Review**
- **5.1** the user will navigate to the review section and be able to write a review on specific books. The system shall prevent the user a text box.

- 5.2 Stimulus/Responsive Sequence
  i. Users will use the browse function to navigate the review section.
  ii. The user will scroll to the review section and write a 150 character review.
  iii. The system shall store the user review.
  iv. The system shall display the latest review stored.
  v. The system will have a more review button below the last review

- 5.3 Function requirement label
  i. REQ 5.1 review

6. **Contact Customer Service**
- **6.1** Users will be allowed to contact via email. User shall type in their name, email, and their query. The system shall store these fields and submit them once the user clicks the send button. The system shall prevent the user from contacting developers directly. The user must submit a ticket, which shall be redirected to the correct personnel.
- 6.2 Stimulus/Responsive Sequence
  i. The user shall navigate to Contact Us in the navigation bar.
  ii. The user shall fill in their Name, Email and type up their query.

iii. The user shall then click the "Send" button underneath the Query box.
iv. The system shall store the information and submit it.
v. The system shall state that the information was sent and thank the user.
vi. The system shall include a button redirecting the user to the Home page

- 6.3 Function requirement label
  i. REQ 5.1 Contact Us

List of non-functional specs

Performance Requirements:

1. *Responsiveness*: The system will also be responsive, operating on various monitor sizes, ranging from 10" netbooks to 24" desktop monitors. It will also be responsive with a wide variety of resolutions, from 1024 x 600 through 1900 x 1200.
2. *Latency:* The system will have a TTFB (Time to First Byte)an average of 800ms to 1800ms.
3. *Storage Utilization*: Storage utilization should be within 75 - 90% of the available storage provided at the time as to not get too close to using all storage and having a technical issue if more storage is needed for an emergency situation.
4. *Robustness*: The time needed to restart after a failure should be under an hour. The percentage of events that cause a failure will be under 0.1%. The probability of the data being corrupted on failure must be below 0.8%.

Security Requirements:

1. *Login/Password System*: Our system will have a login/password system to maintain the list of books that have been checked out. This implementation will also require password confirmation upon creation. We will also ask the user for a phone number and send a verification code; if the user forgets their password, they can retrieve it by providing it.

2. *Encryption*: The website will be encrypted as purchases and exchanges of valuable information.

3. *Access Control*: The ability to edit the front-end and back-end code and databases will be provided to everyone on the development team. The users and visitors will have limited access to the system based on the user interface.

4. *Spam Protection*: The site will ask the user to enter a string of characters

shown on a picture to create an account, thereby preventing bots from spamming the site and creating bogus accounts.

5. *Resource Utilization*: Resources such as the mongoDB database on the Atlas* server will be accessed through the website using the usernames and passwords therein. All-access to the Firebase servers and their resources will be obtained with the usernames and passwords given. The system will utilize HTML, CCS, Bootstrap, and JavaScript as frameworks and will document the proper licenses and/or qualifications of each. Google Book API will be used to retrieve the book information.

Portability Requirements:

1. *Platform Compatibility:* The system will be a web-based app that operates on major browsers, including Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge. Major browsers must be running the current version.

2. *Computer and OS Compatibility*: The system will be operable on the following Operating system OS X and higher, Windows 7 and higher, also any computer which runs a browser that is supported.

Capacity Requirements:

1. The storage for our system will consist of the phpMyAdmin server holding our mySQL databases within an unknown capacity as well holding our files for the actual site.

2. The system will have a secondary backup server that will be located wherever the client chooses, this will prevent data loss in case of a fire or other physical destruction of the servers.

Reliability Requirements:

1. *Accessible Times*: Our system should be available for use 24 hours a day, 7 days a week. It will be up and running as long as the phpMyAdmin server is available.
2. *Downtime Impact*: The downtime will be minimal but when it is necessary, a splash page will be used to identify that the system is in maintenance. Downtime impact is expected to be minimal and the scheduled downtime will be announced ahead of time.
3. *Support*: There will be support availability by email that will filter to several assigned developers. They will be responsive within 24 hours.
4. Failure: If the system fails it will be redirected to the backup servers. The development team then will have time to resolve the issue, then the system will revert back to the main server.

High-level system architecture and database organization

1. **DB organization:** Here are the main entities:
    a. User entity: This entity represents the users who are registered on the website.
    b. Book entity: This entity represents the books that are available for purchase on the website.
    c. Purchase entity: This entity represents the purchases made by users on the website.

    The relationships between these entities would be as follows:
    - Each user can make multiple purchases, but each purchase is associated with only one user.
    - Each book can be purchased multiple times, but each purchase is associated with only one book.
    - Each purchase can contain one or more books, but each book can be associated with multiple purchases.

    The database will have the 3 main entities mentioned above, User entity, book entity, and purchase entity. The user entity will have attributes such as name, email address, and password. The book entity will have attributes such as title, author, ISBN number, and price. The book entity will have attributes such as user ID, book ID, purchase date, and purchase price.

2. **FAU Lamp Server**: FAU Lamp Server, shall be hosting our software engineering development project.

3. **Discord**: Discord application is the means that the group shall be communicating with each other for the development of the project during the semester. All communication has to be through the Discord server created for the project.

4. **Bugzilla:** Bugzilla is a bug-tracking system used to track project features, issues, and bugs, the group will use this tool during the semester to track the development process for the final project.

5. **Jira Software**: Jira software will be used to track the progress of the whole team. Individual and group tasks will be assigned along with a due date to keep track of the work.

6. **MongooDB:** MongoDB is a popular NoSQL document-oriented database that stores and retrieves data as documents rather than rows and columns like traditional relational databases. One of the key features of MongoDB is its ability to scale horizontally by distributing data across multiple nodes, which allows for greater flexibility and scalability compared to traditional relational databases. MongoDB also supports replication, which ensures that data is always available even in the event of a node failure.

7. **MySQL Database**: MySQL database is the database that is being used for the data that will be handled for the project.

8. **Search/filter algorithm:** We used the google API search algorithm which works as follows: Google Books API search algorithm works by using a combination of indexing and ranking algorithms to find and retrieve relevant books that match a user's search query.

   When a user submits a search query, the API first analyzes the query to determine the user's intent and context. It then uses this information to retrieve a list of books that match the query, based on their relevance to the user's search terms.

   To do this, the API uses indexing algorithms to crawl through and index the metadata and content of millions of books in the Google Books database. This includes information such as the book's title, author, publisher, publication date, and description, as well as the book's text content in some cases.

   Once the API has generated a list of potential matches, it then uses ranking algorithms to sort and order the results based on their relevance to the user's search query. These ranking algorithms take into account various factors, such as the frequency and location of the user's search terms within the book's metadata and content, the book's popularity and ratings, and other contextual information.

9. **Visual Studio Code (VSC)**: Visual studio code is the IDE that the developers will use to create the code for the website. Languages to be used for the development of the website will be the following
   a. HyperText Mark-up Language (HTML) - will be the language that will allow the browser to display the website
   b. Cascading Style Sheets (CSS) - will be the language used to decorate the web pages
   c. Personal Home Page (PHP) - will be the language used for server-

side functionality for the database and real-time edits in the tables.

d. Javascript - will be the language used for client-side functionality that will be handled for User Interface(UI) needs to make the user experience enjoyable.
e. Bootstrap(Optional) - We still need to decide if we will be using bootstrap or only CSS for decorating the website. Bootstrap will be the framework used for code construction for web pages within the group's project.

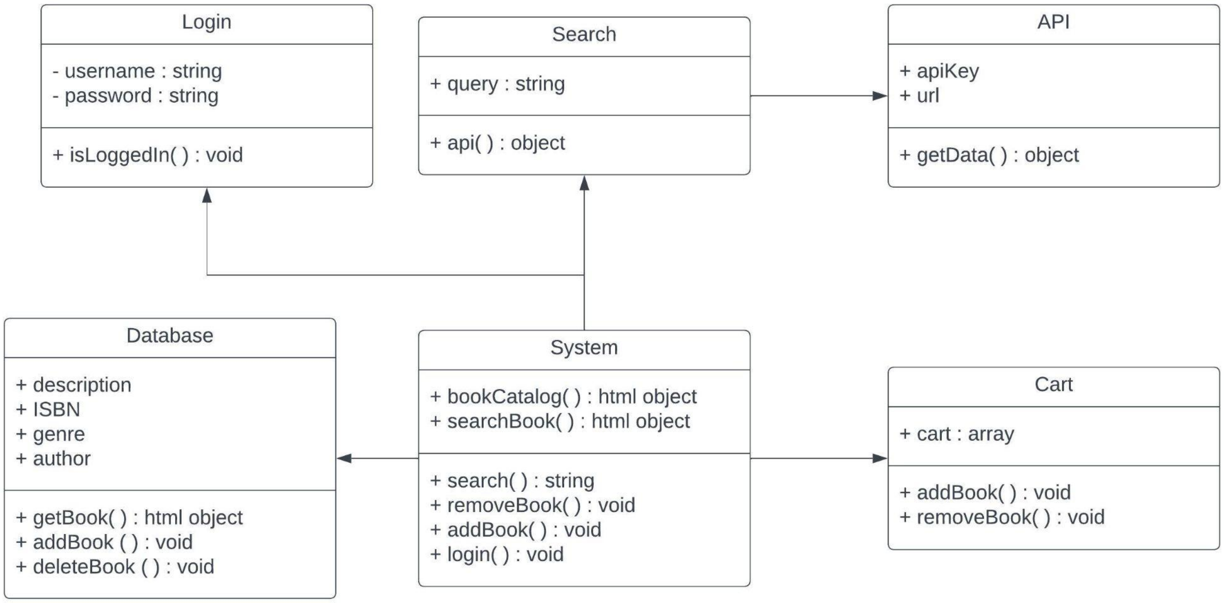
10. **Github**: GitHub is a tool that the developers will be using to work on the code. There will be a main branch managed by the project owner and the scrum master where all the developers will merge their updated code. The updated versions of the code will be merged along with comments to keep it organized.

11. **Browser Compatibility**: The system will be a web-based web app that operates on at least two of all of the major browsers, including Google Chrome, Mozilla Firefox, Safari, Opera, and Internet Explorer. It will have functionality in it that will provide alternatives if the browser does not have JavaScript installed on it.

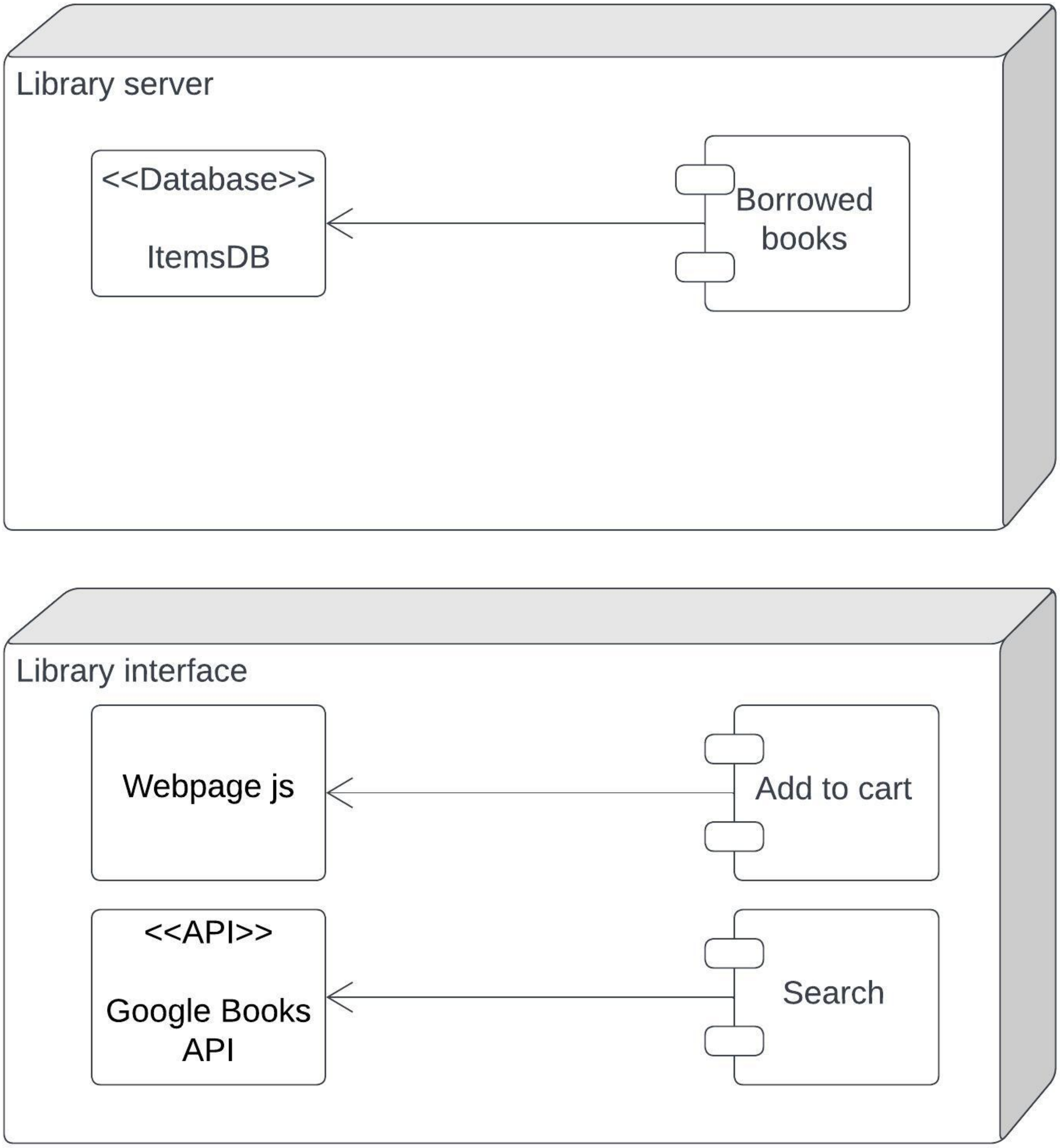
12. **API (Google Books API):**
    a. Google Books API: This API provides access to the Google Books database, which includes information on millions of books. With this API, developers can build a website that can search for books by title, author, ISBN, and other criteria, and retrieve information such as book descriptions, reviews, and ratings.
13. **Express:** Express is a framework in node JS. Express is a popular web framework for Node.js that is used to build web applications and APIs. Developers will use its set of features and tools to help create the website.

High-Level UML diagrams

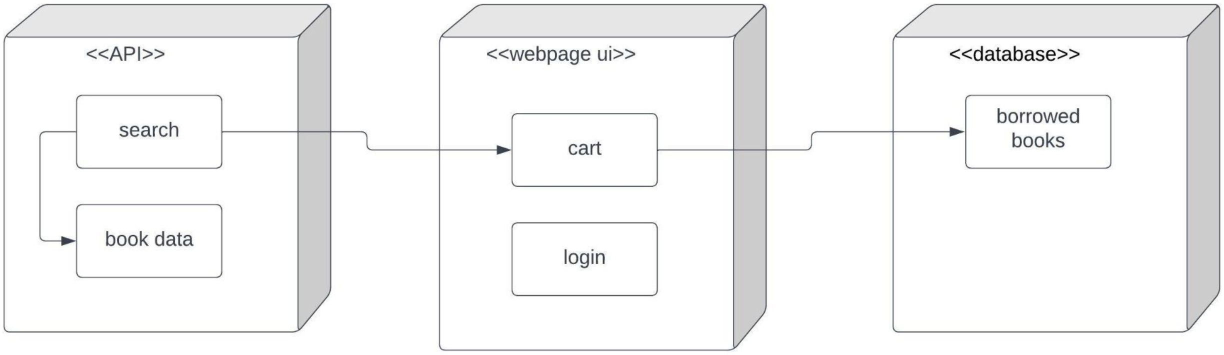
1) Class diagram



2) Component diagram



3) Deployment diagram



Identify actual key risks for your project at this time

1) **Skills risks**
   a) The development team may not have the required skills or experience to build certain features of the website, which may lead to delays or quality issues.
      i) The tasks for each milestone will be set with enough anticipation so that each team member will have enough time to develop the task at hand. The tasks will also be assigned based on each team member's skills and availability.
2) **Schedule risks**
   a) The project may face schedule risks due to unforeseen delays in development, testing, and deployment. There is also a risk of underestimating the amount of time required to complete each phase of the project, which may lead to delays in delivery.
      i) The schedule for delivery and task completion is already set. We broke down the work and assigned it based on each team member's skill and time availability. By doing this we prevent any schedule risks and in the case one is present, other team members will be able to help.
3) **Technical risks**
   a) One of the key technical risks is building a robust and secure login system. The website must ensure that users' login credentials are secure and not vulnerable to hacking or data breaches.
      i) We might implement strong password policies such as requiring users to create complex passwords, limiting the number of login attempts, and requiring users to change their password periodically. We are not sure if we will take this approach yet.
4) **Teamwork risks**
   a) As the project involves multiple team members working together, there is a risk of communication breakdown and conflicts between team members as well as sickness. Which may impact the project's progress.
      i) As mentioned before, we already have a schedule and divided the tasks ahead of time. In the case of sickness,

we will have other team members working on that task in the case. Each team member will be held accountable for the assigned tasks. In the scenario of team members not working or communicating, we will contact the professor and let her know about the ongoing situation.

5) Legal/content risks

a) The project may face legal and content risks, such as copyright infringement or violating privacy laws. The team must ensure that the content on the website is original and does not infringe on any copyright laws and that the website complies with all applicable privacy laws and regulations

   i) The only legal/content risk we might face is the information displayed by google API. There will not be any issues as long as we comply with their term of service which are the following

      (1) Prohibited Uses: The terms of service prohibit developers from using Google APIs to create any illegal or harmful applications, or for any malicious or deceptive purposes.

      (2) Compliance with Applicable Laws: Developers must comply with all applicable laws and regulations when using Google APIs.

      (3) Ownership and Intellectual Property: Google retains ownership of all intellectual property related to the APIs, and developers must not modify, reverse engineer, or copy any part of the APIs without permission from Google.

      (4) Attribution: Developers must provide proper attribution to Google when using their APIs, and must include any required notices or branding as specified in the terms of service.

      (5) Data Privacy and Security: Developers must ensure that they comply with all applicable data privacy and security laws when using Google APIs, and must take appropriate measures to protect user data.

      (6) Liability and Indemnification: Developers are responsible for any liability that may arise from

their use of the APIs, and must indemnify Google for any damages or losses incurred as a result of their use of the APIs.

Team Roles

Scrum Master:

- Jamar Andrade

Product Owner:

- Bruno De Nadai Mundim

Front End Developers:

- Juan Hernandez
- Dominic Wilson

Back End Developers

- Jamar Andrade
- Grant Fairfield

Vertical Prototype

Youtube video link (set to unlisted): https://youtu.be/3WbCMUal0cQ