CS 411 – Software Engineering Term 1 – 2022/2023

Software Design Specifications

For
GoodReads Application

Version [xx]

CS Year 4, G1

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Date of preparation

This Software Design Specification was prepared and provided as a deliverable for [Course Name, number, term], and it will be used by [name of end user].

This document is based in part on the IEEE Recommended Practice for Software Design Descriptions.

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Revision History

Name	Date	Reason For Changes	Version
All members	Sep 30, 2013	Prepared initial version	0.1
All members	Oct. 30, 2013	Updated section 3	0.2
…			
All members	Nov. 14, 2013	Complete review - Final version	1.0

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1.   Introduction

This document, software design specification (SDS), describes the data, architecture, interfaces, and objects that will be used in designing and developing Goodreads Application by following the IEE recommend practice for software design specifications. SDS will be used for extensions based on this initial draft [1]. In order to meet the requirements of users of the Goodreads application, the software is structured in a way that ensures that it meets these requirements. Goodreads' application supplies a wide variety of books and podcasts for readers and listeners. A main feature of the application is that users can share reviews as a single activity or through communities they create.

1.1 Purpose

The document aims to provide a detailed description of the Goodreads application various aspects. Such as system and user design, system architecture, detailed subsystem design, data design and requirement tractility matrix. This will be represented by an Entity Relationship Diagram. Sequence diagrams.

1.2 Scope

Goodreads application is a software that can be downloaded on mobile and tablets devices via all stores of operating system. It is an interactive social media platform that allows users to interact with other people reviews and follow their activities and join various communities. The experience of the user in the developed application will be improved by providing users with advanced services and sophisticated tools. Users will be able to listen to podcasts and read books rather than just writing reviews. Users will search for books and podcasts and will get the result that matches their preferences using advanced algorithm that conduct the search based on the users' statistics and favorite genres. Users can also download Books and podcasts after subscribing to the premium plan as at shown in **Table 1** and the purchased item will be reached by the user list. Users will have more flexibility when writing their reviews as they will get freer when expressing their feelings and opinions using various media such as videos, voice nots and pictures. Also, users that are interested in linking their account to smart devices such as, Apple watch will be to link the application to the device and able to view their detailed information of their statistics and update their profile and communicatee with their communities' review in the developed Good Reads application.

Plan	Features	Price
Free Plan	•User can write reviews. •Users can link social media accounts to GoodReads accounts. •Can read 3 samples of three different books. •Can listen to 3 samples of three different podcasts. •Users cannot buy books or podcasts	Free

Premium plan	•Users cannot buy books or podcasts. •View detailed statistics. •User can write reviews. •Users can link social media accounts to GoodReads accounts •Can read unlimited different podcasts. •Users can buy books or podcasts. •View detailed statistics.	12$ per month

Table 1 – Application plans

1.3 Definitions, Acronyms, and Abbreviations

Term	Explanation
SDS	software design specification
IEE	Institute of Electrical and Electronics Engineers
User	A person who can interact with the application.
MYSQL	Relational database management system
DBMS	Software to create and manage databases
NetBeans IDE	Open-source integrated development environment for application development
Client-server architecture	Architecture of a computer network in which many clients (remote processors) request and receive service from a centralized server (host computer).
ER	Type of flowchart that illustrates how "entities" such as people, objects or concepts relate to each other within a system
PDL	Procedural language is a type of computer programming language that specifies a series of well-structured steps and procedures
OLTP	Online Transaction Processing is a type of data processing that consists of executing several transactions occurring concurrently
FR	Functional Requirement

Content	In order to clarify the concept more clearly, books and podcasts are combined to form the term "Content".

Table 2

1.4 References

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[Accessed: 25-Oct-2022].

2.   System overview

This project aims to develop a Goodreads application [2] to improve users' experiences. It is an American social cataloging application that allows individuals to search its database of books, annotations, quotes, and reviews. Users can sign up and register books to generate library catalogs and reading lists. The app is designed to help readers discover new books by searching titles or authors, and it supplies curated recommendations from the books you have read and reviewed. The entire functionality of the application will be listed in detail below:

2.1 System Functionality

2.1.1 Language conversion

Users will be able to choose their desirable language via an existing list of languages.

2.1.2 Sign up

All users can create a new account to start their experience and that can be done by signing up by email, Goggle account and Apple account.

2.1.3 Log-in

All users of the application can log through their username and password.

2.1.4 Verification

After logging in, users must authenticate their identity via a verification code sent by email.

2.1.5 User Profile management

Users will be able to view their account that will be displayed via the developed interfaces, they can modify their personal information and connect their social media accounts such as Twitter and Facebook. Also, users can view their statistics on what they have been reading and listing to.

2.1.6 Search and discover

Users will search and discover books and podcasts in different genres, and they will get results that match their personal preferences and statistics using high level algorithms

2.1.7 Reviews

Users in Goodreads application will have better experience in writing and sharing their reviews where they can use various media such as pictures and gifs to experience their thoughts.

2.1.8 User list

Users can create various shelves that hold books and podcasts that they're currently reading and listening to, what they want to read and listen to. Users have the option of customizing their shelves.

2.1.9 Purchasing eBooks

Users can buy an electronic version and read in the application and that by collaborating with Amazon to uses their kindle database that has the collection of all the eBooks.

2.1.10 Application support system

Users will be provided by chatbot and direct chat with technical support to ensure that all users problems will be solved, and all users are having the intend experience.

2.1.11 Application plans

All users can access the software using free trials that include everything but reading and listening to podcasts unlimitedly. If the user wishes to access the application features a plan is provided to subscribe to.

2.1.12 Setting goals

Users will be able to set various goals that can be conducted through a time chosen by users.

2.1.13 Connecting to smart devices

Users can connect their profiles to smart devices such as Apple Watch to display detailed information about their progress and get their statistics summary.

3. Design Considerations

3.1 Assumptions and Dependencies

Since we are using Java programing language on NetBeans IDE to develop the application, we are assuming that all users have access to an internet connection and the application will be compatible with any operating system. At the server level, we are assuming that the server in which the application will be deployed is installed with MySQL DBMS and Java Database Connectivity. For any features needs we also assume the need for multiple servers.

3.2 General Constraints

3.2.1 End-user environment:

The developed system will be designed to be user friendly since it will be used by audiences with different backgrounds [3].

3.2.2 Hardware environment:

The application will be designed to run on all devices regardless of its operating system.

3.2.3 Security requirements:

-The authentication method in the developed application must include two approaches: 'Message authenticity and entity authenticity. Message authenticity means that one can trace back the data to what its original source was, at some point in the past. Entity authenticity means it ensures the party can identify participants in a protocol, and in particular make sure that the party has actively participated in the protocol at the time' [4].

3.2.4 Verification and validation requirements:

- The application design itself should be analyzed and examined for errors.
-Simulation will be used to verify properties of the system structures and subsystem interaction [5].
-design walk-throughs should be used by the developers to verify the flow and logical structure of the system while design inspection should be performed by the test team.

3.2.5 Performance requirements:

-The average response time must range from less than millisecond for a low latency connection on the same network.

-Probability of data corruption on failure must be less than 2%.

3.2.6 Interface/protocol requirements:

It must be implemented using any tool or software package like java.

4. User Interface Design

4.1 Overview of User Interface

Goodreads application interfaces are developed to be user friendly due to the fact that it will be used by an audience with different backgrounds ranging from those with limited computing experience to programmers and database experts [6]. The interfaces of the application will vary according to the type of user and what they are interested in. The following table shows the system's interfaces from users' perspective Table-1-

User Interface	
- Login	- Users shelfs
-Sign up	-Reviews page
- Verification code dialog	-Chatbot
- Homepage	-Want to read
- Language converter	- Search and discover
- User profile	-Online chat with application support
- User statistics	- Managing user information

4.2   Interface Design Rules

For efficient, user friendly and simple interface operations, Goodreads application will be designed according to The Eight Golden Rules. The rules are written by Ben Schneiderman to help designers to solve problems to improve the useability [7]. Rules are as follows:

4.2.1 Strive for consistency

Goodreads application is going to achieve its consistency by enabling users to navigate through the application easily while keeping the same layout, size of buttons for all interfaces. If an exception is needed, it should be transparent and limited in number, for example, requiring confirmation of a delete command.

4.2.2 Aim for universality

Enhance the transformation of content by considering the needs of diverse users and design. Diverse needs, such as novice-expert differences, age groups, disability types, and technology capabilities, all add to the spectrum of requirements that influence design. The interface design can be enhanced, and perceived system quality improved by adding features for novices, such as explanations and shortcuts.

4.2.3 Offer informative feedback

For every user interaction appropriate feedback must be provided. The response varies according to every situation. When it comes to regular and minor acts, the response can be small, but when it comes to rare and big acts, the response should be much stronger. By visually presenting the items of interest, explicit changes can be demonstrated

4.2.4 Design dialogue to yield closure

It is important to divide action sequences into three groups with a start, middle, and end. Providing users with informative feedback at the end of a set of tasks gives them a sense of success, a sense of relief, and a reminder to be ready for future tasks

4.2.5 Prevent Error

Goodreads application must be designed in a way that reduces error occurrence. If the user makes an error, the designed interface should detect the errors and offer simple instruction recovery.

4.2.6 Permit easy reversal of actions

Actions should be reversible to the extent possible. In addition to relieving anxiety, this feature encourages users to explore unfamiliar options since they know errors can be undone. The units of reversibility may be a single action, a data-entry task, or a complete group of actions, such as entry of a name and address block.

4.2.7 Maintain an internal locus of control

The extent to which actions can be reversed should be considered. Furthermore, since errors can be undone, this feature encourages users to explore unfamiliar options. Reversibility can be achieved through individual actions, data-entry tasks, or complete groups of actions, like entering names and addresses.

4.2.8 Reduce short-term memory load

Goodreads application interface must be simple in design. Due to short-term memory capacity, interfaces must avoid interfaces that force users to memorize and use information from one display on another display.

4.3   Screen Images

This sections below will demonstrate the available interfaces and the functionality for Goodreads user.

4.3.1 Common Interfaces

The homepage, as shown in **Figure 1**, is the default and first page of Goodreads Application that the visitors see when they open the application. The loading will take seconds to open the application.
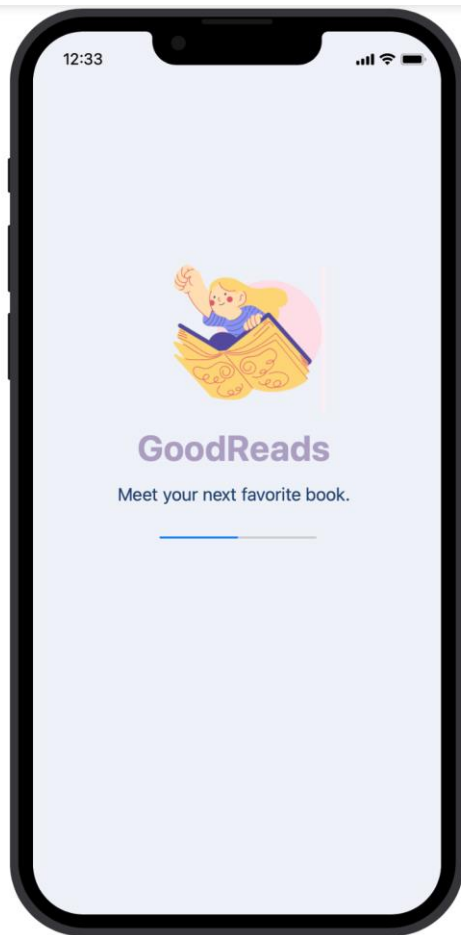
Figure 1

Once the downloading is finished the starting page will pop and it will contain two options that the user is limited to which are "Sign in" and "Sign up. <u>Sign in Option</u>: If the user choses to "Sign in" they will have two options. Either signing in with their email address and password, or signing in with their Facebook account as shown in **Figure 2**.

Figure 2

<u>Sign up Option</u>: If the user choses to "Sign up" they will have two Three options. Either signing up with their Facebook account or signing up with their Email address or signing up with their Twitter account as shown in **Figure 3**. And if the user choses either Twitter or Facebook account, it will log in automatically.
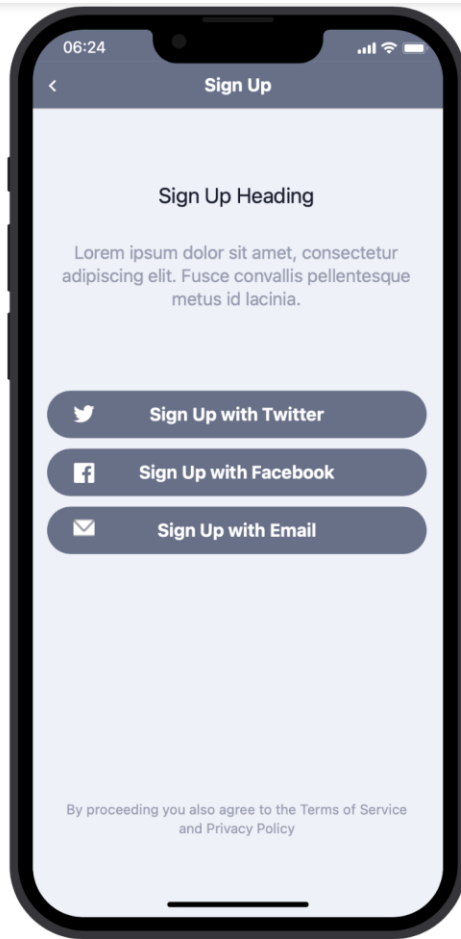
Figure 3

If the user choses "Sign Up with Email" the user should provide unused email address, password, unique username, date of birth and Gender (optional) as shown in **Figure 4**. And by clicking on the "Sign up" option they are agreeing to the Terms of Services and Privacy Policy by Goodreads platform as shown in **Figure 5.**
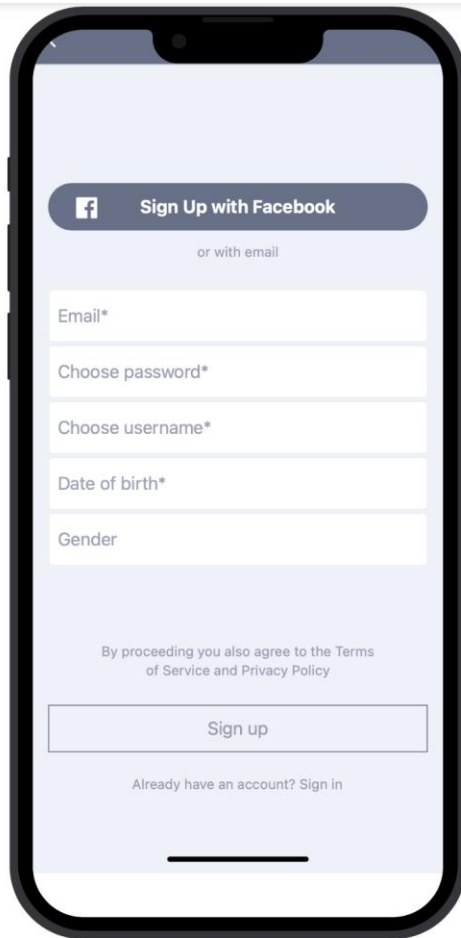
Figure 4
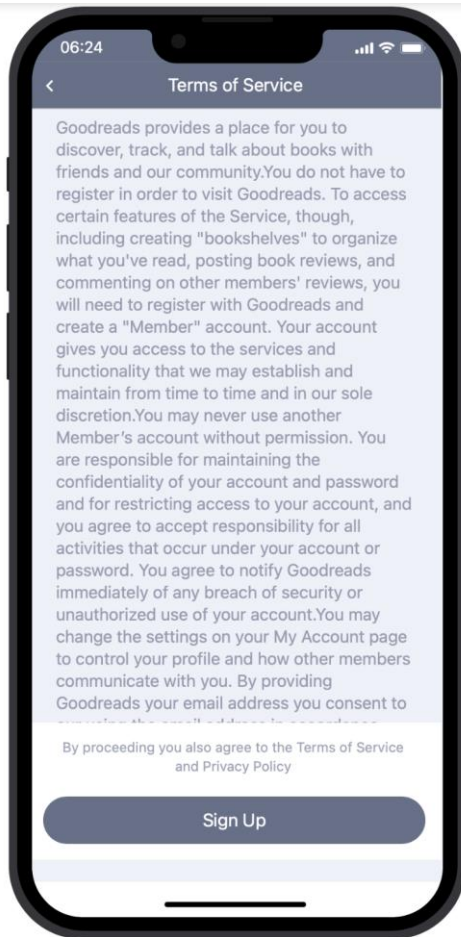
Figure 5

And once the user clicks on "Sign Up" an email will be sent to the email provided by the user containing a link to verify the account as shown in **Figure 6**. The button "Open Mail App" will move the user to their email account quicker. Once the verification is done the user has set their account successfully and should log in to access and use the Goodreads application as shown in **Figure 7**.
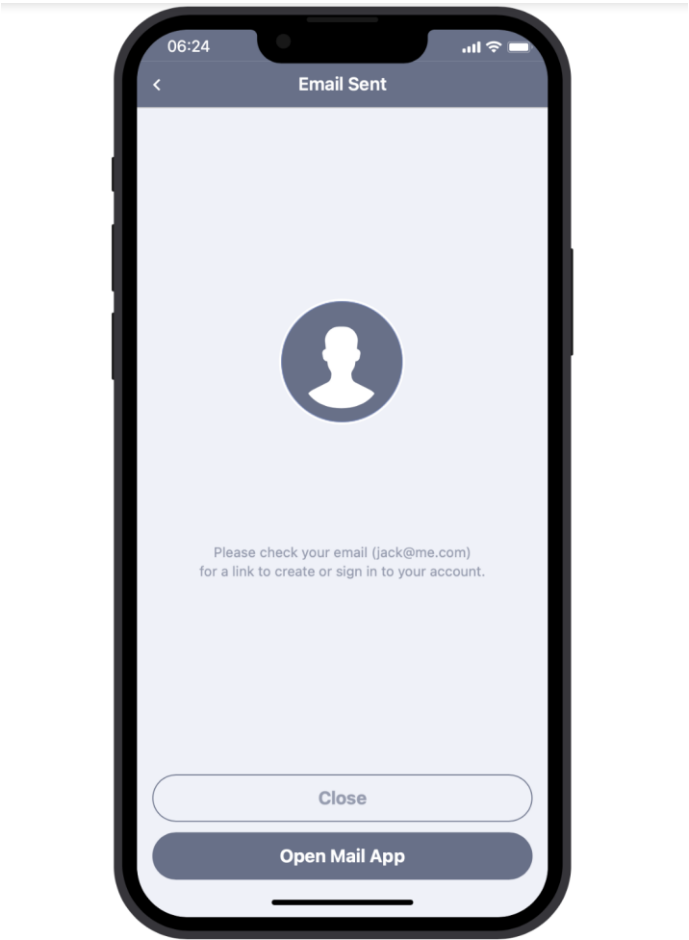
Figure 6
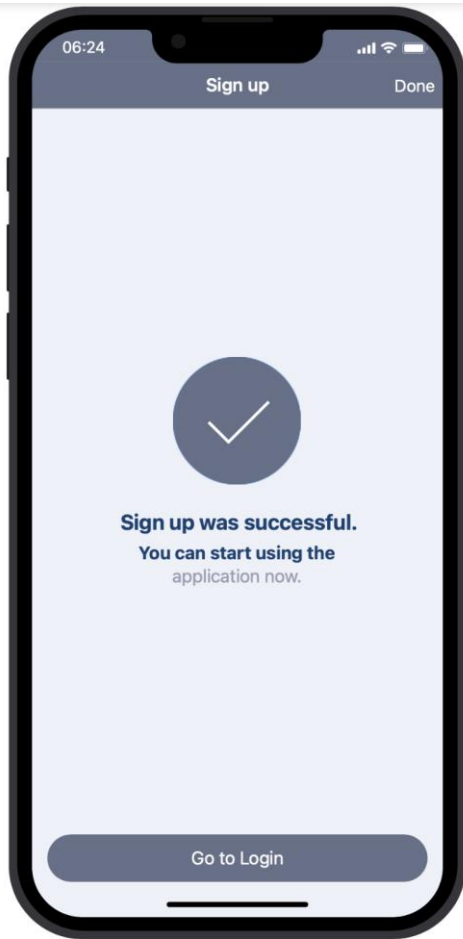
Figure 7

If the user choses a "Podcast" from the items in the bottom section, **Figure 8** will appear and the broadcast will be listed for the user to choose. Once the user chose the podcast it will start playing and the user will have control over the broadcast such as skipping the broadcast to a particular time or move to the next and previous broadcast as well as pausing the broadcast as shown in **Figure 9**.
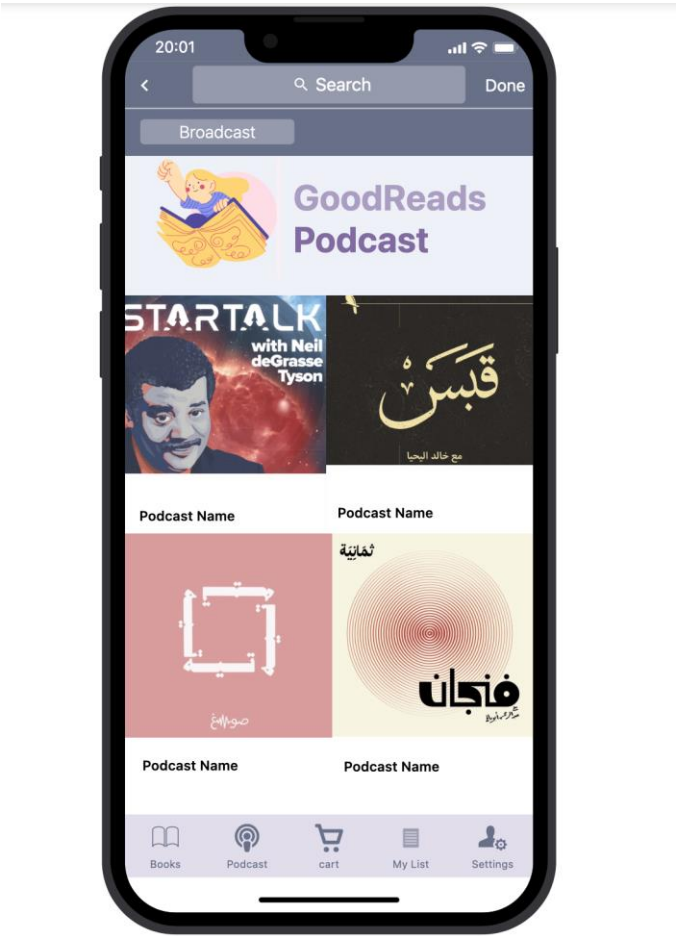
Figure 8

Figure 9

If the user choses Books from "Books section" in the bottom, page of listed books will appear to the user to choose from, some books will be free and some the user will have to purchase as shown in **Figure 10.** Once the user has chosen a book the **Figure 11** will appear listing the price of the book, the author, published date and ratings. The "+" is for adding the book to the "Cart" section at the bottom for purchase.

.
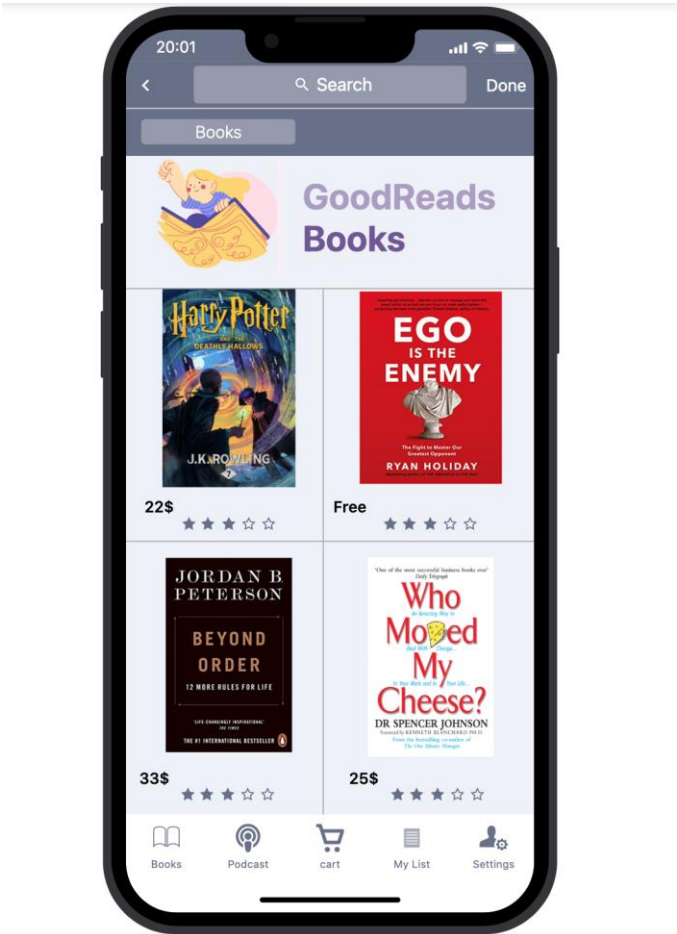
Figure 10
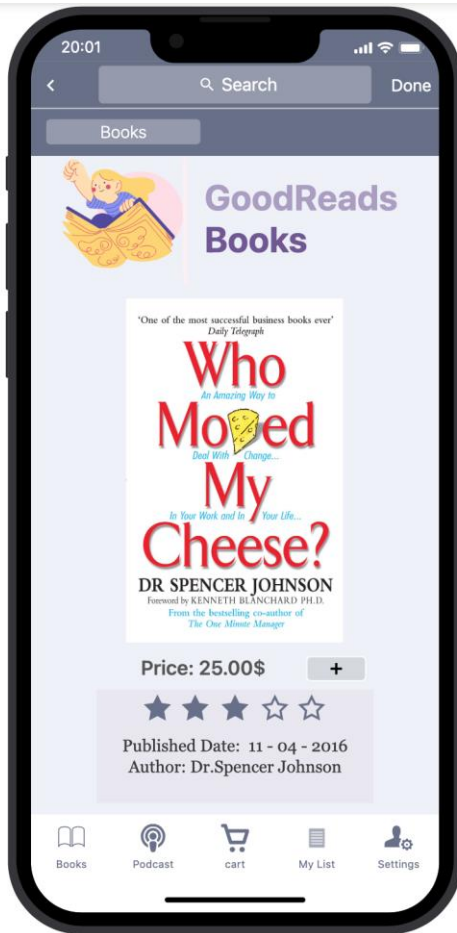
Figure 11

The "Cart" section will contain the books added by the user with their prices and quantity as shown in the **Figure 12** below. If the user wishes to complete their order, they should click the button "Pay" which will move them to the payment page to choose the payment method and complete their payment information as shown in **Figure 13.**
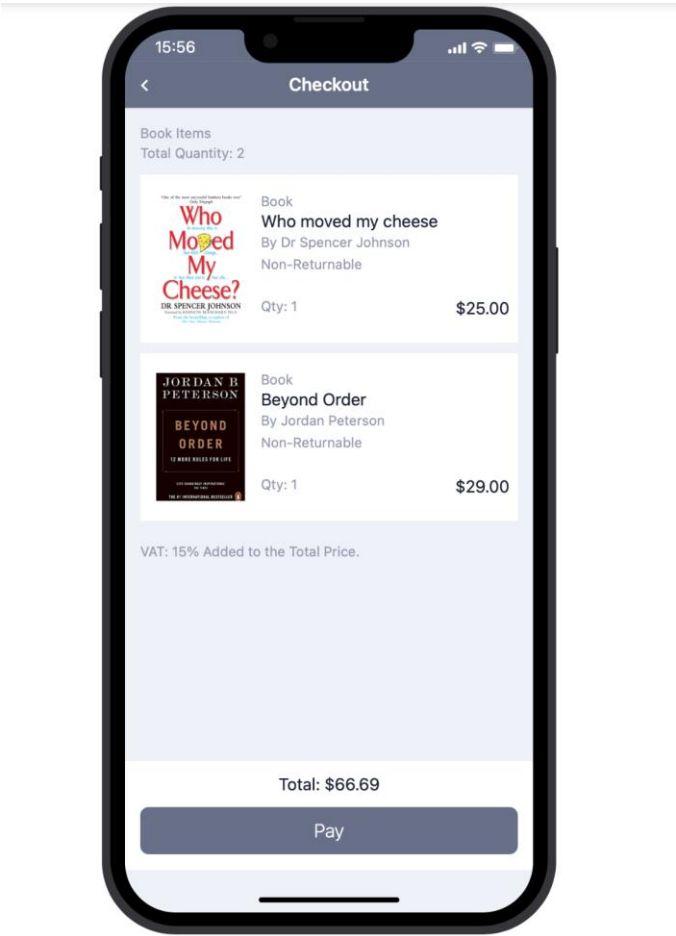
Figure 12

Figure 13

Once the payment was successful as shown in **Figure 14** below. the books will be available for the user to read in "My List" section as shown in **Figure 15.**

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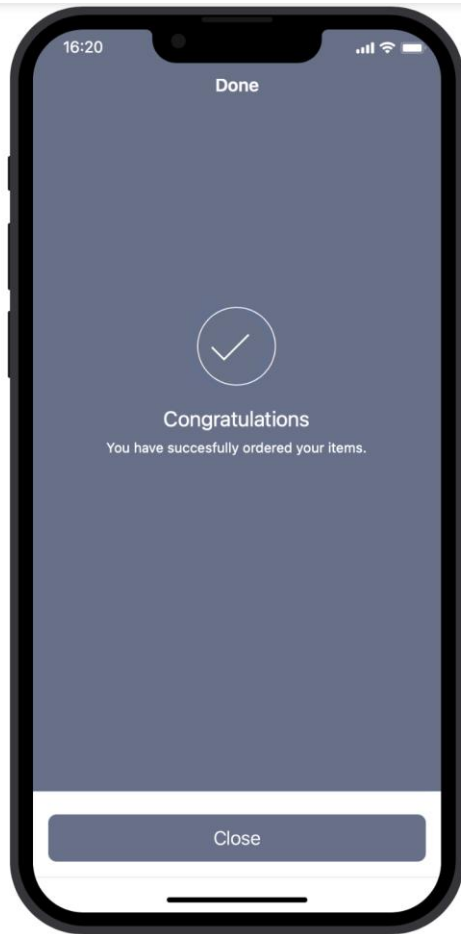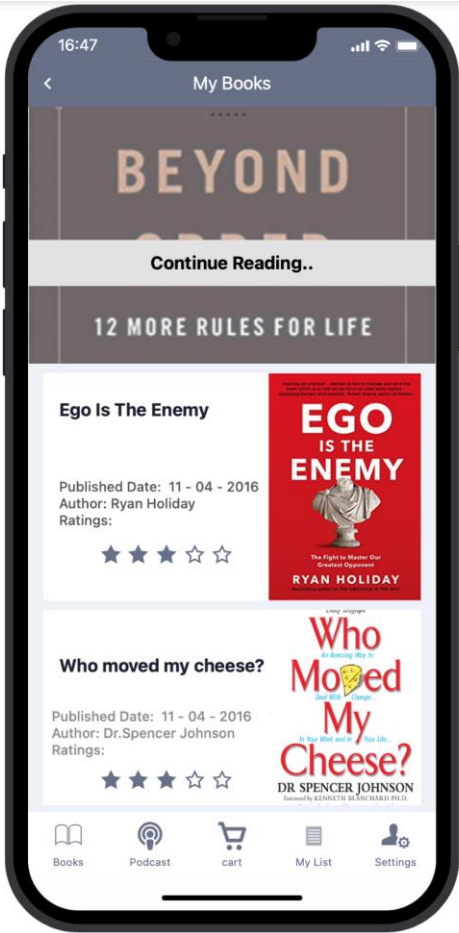
Figure 14

Figure 15

4.3.2 User Interfaces

4.4 Screen Objects and Actions

Number	Object	Type	Action
		Common Interface	
1.	Sign in – Sign up	Button	If new user, Sign up
			If already user, Sign in
2.	Books icon	Button	Move to Book's interface.
3.	Podcast icon	Button	Move to Podcast's interface
4.	Cart icon	Button	interface where items wanted will be.
5.	My Books	Button	Interface where purchased, reading books are.
6.	Settings	Button	Interface where user edit their profile.
7.	"+" icon	Button	Where the user can add book to cart if it was on price.
			Where user can add book to My Books if it was free.
8.	Verification link	Dialog	An email containing link connected via Goodreads.
9.	Previous	Button	Move to previous interface.

10.			Move to pervious Podcast.
11.	Next	Button	Move to next. Podcast.
12.	Sign-out	Button	The user logged out from the account.
13.	Quantity	Text Field	User should write the quantity.
14.	Search	Text Field	Search for Books.
15.			Search for Podcasts.
16.	Ratings	Dialog	Change the rating statue.
17.	Close	Button	Close the current page.
Other Interface			
1.	Previous	Button	Move to previous podcast
2.	Next	Button	Move to next Podcast
3.	Pause	Button	Pause the podcast
4.	Go Back	Button	Go back to previous interface

Table 3

4.5   Other Interfaces

This section will represent a customized interface for different distributed system which is Apple watch as shown in **Figure 16** below.

Figure 16

5. System Architecture

We provide an overview of the Goodreads platform without getting into too much detail. It has two users, the customer and the client. There are some common features and interfaces between these platforms, such as the homepage, sign-up, login, password retrieval, and verification steps. It is also imperative to note that Goodreads has distinct features. **Figure 17** illustrates the Goodreads system architecture for each user.
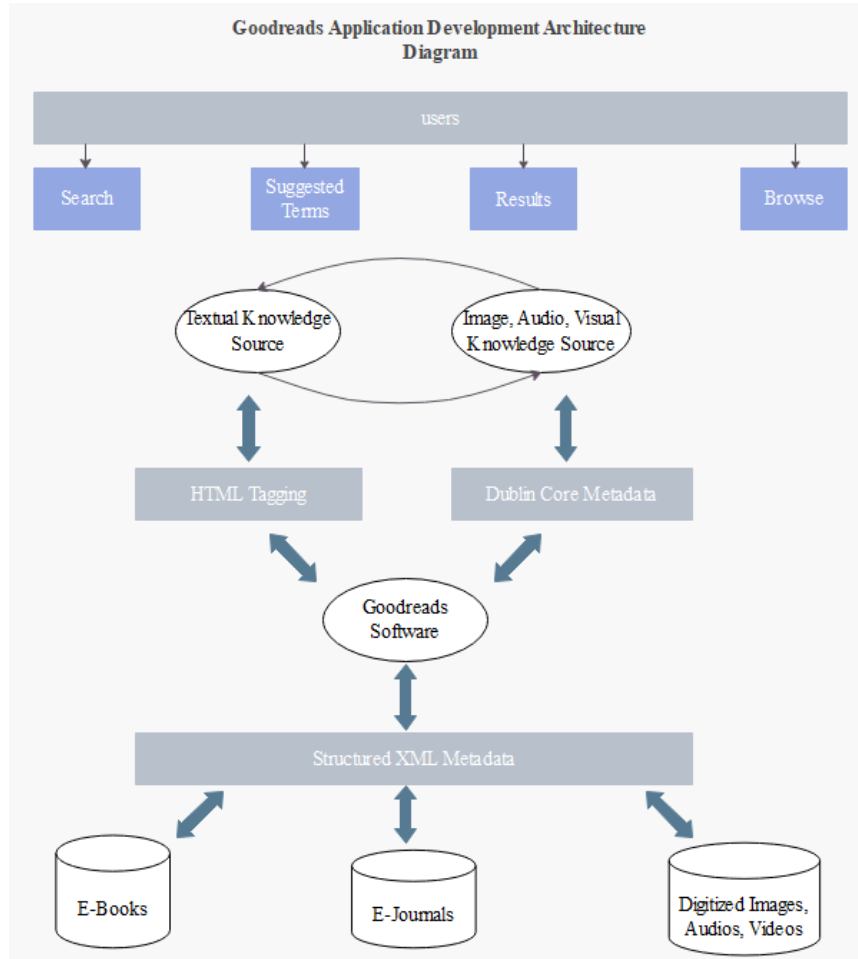
Figure 17

5.1 Architectural Design Approach

Client-server architecture is the appropriate design approach for Goodreads. Goodreads application will be a collection of disparate systems and resources connected over a network. These systems and resources are integrated into a single interface through a network, so it is critical to manage the flow of information through system components [8]. Users of a particular community may see these resources as one system even though they reside on different systems and in different databases. For contemporary search and retrospective information retrieval, the middleware must provide interoperability of information.

5.2 Architectural Design

This figure illustrates how the client server connects to the servers, where multiple users (clients) may visit the web server in order to discover new books, search titles or authors, as well as access the picture, video, and catalog servers.
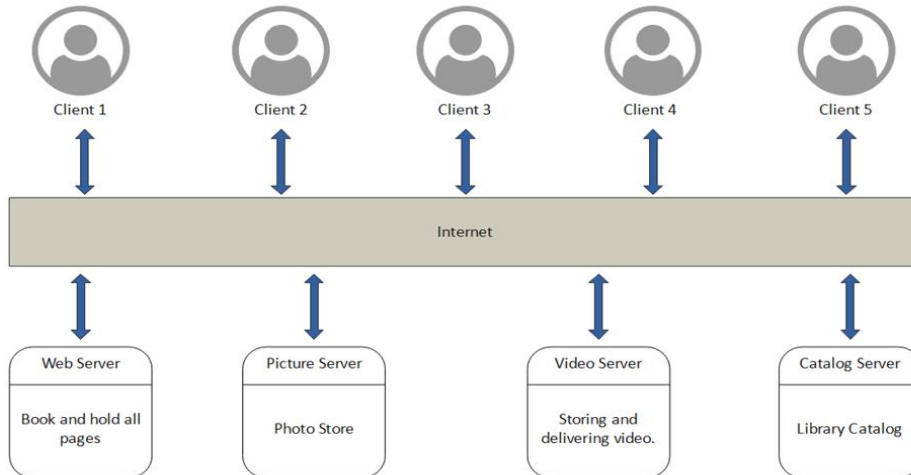
Figure 18

5.3 Subsystem Architecture

The purpose of this section is to describe the functions of the platform and how the data will be stored in the database.

5.3.1 Users of the system:

Figure 19 below shows how the platform can be used by different types of users.
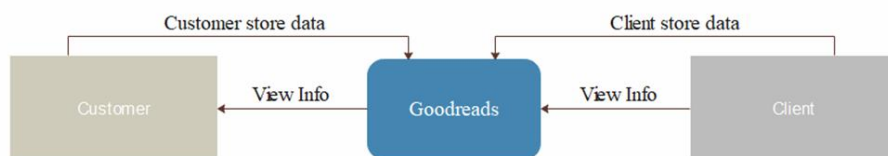
Figure 19

5.3.2 Users Subsystem

All users can register, log in, and reset their password in case they forget it as there are only five attempts per account for security reasons, shown in **Figure 20** below.
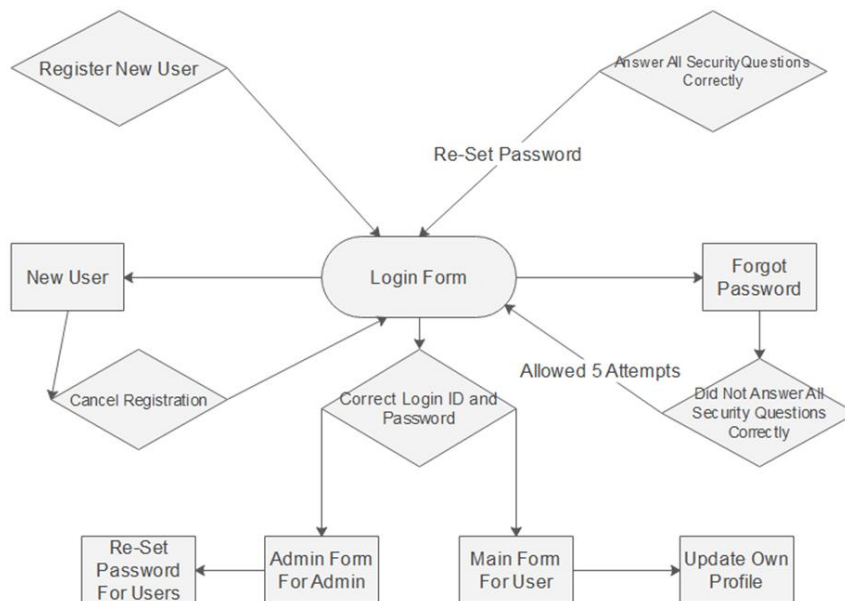
Figure 20

5.3.3 Client subsystem

The data flow diagram in the **Figure 21** below represents the client subsystem [9]. In addition to viewing customer information, the client can also store information. For customer information, it can be used for different purposes, including address for delivery, phone numbers for communications, and credit card information. Any updates to store information need to be viewed by the client.
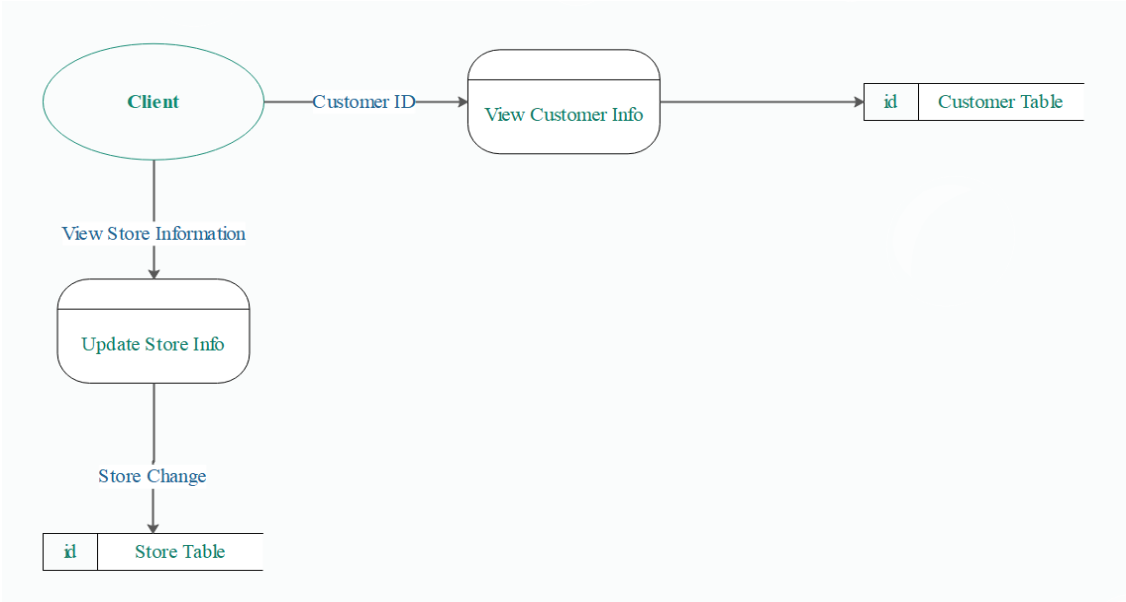
Figure 21

5.3.4 Customer subsystem

The customer subsystem on the platform has a wide range of functions, as illustrated in **Figure 22.** A customer can view/update their profile, view the best book of the year, add/delete/issue books, audios, videos, rate/read feedback, search/filter for specific podcasts and books.
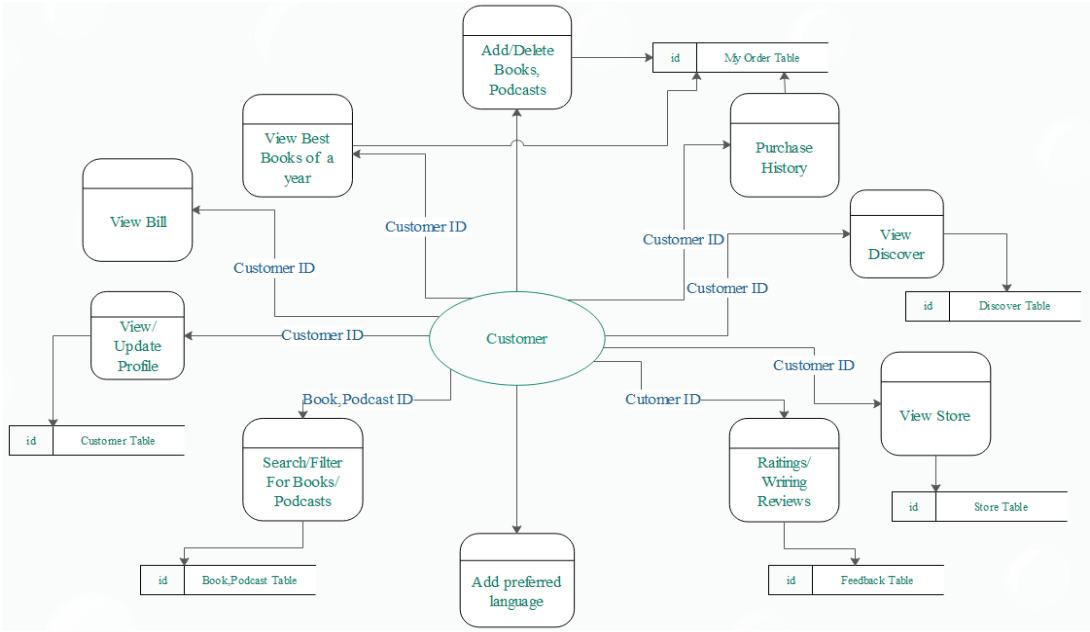
Figure 22

6. Data Design

6.1 Data Description

This subsection will provide the entities, fields and constraints in Goodreads database [10] as shown from **Figure 23 to Figure 28.**

Field	Type	Null	Key	Default
▶ Shelf_List	text	YES		NULL
Series_List	text	YES		NULL
Review_List	text	YES		NULL
Groups_List	text	YES		NULL
Book_List	text	YES		NULL
Recommendation	text	YES		NULL
Users_Profile_Email	varchar(500)	NO	PRI	NULL
Compare_Book	varchar(500)	YES		NULL
Want_to_Read_Books	varchar(500)	YES		NULL
Current_Read_Books	varchar(500)	YES		NULL
Created_Shelf	varchar(500)	YES		NULL
Read_List_of_Books	varchar(500)	YES		NULL
Challange_joined	varchar(500)	YES		NULL
Comment_List	varchar(500)	YES		NULL

Figure 23: User Account entity

Field	Type	Null	Key	Default
▶ AuthorName	varchar(500)	NO		NULL
Author_Published_Date	date	YES		NULL
Author_books_Rating	int	YES		NULL
Authors_Followers	int	YES		NULL
Authors_ID	int	NO	PRI	NULL

Figure 24: Authors Profile entity

Field	Type	Null	Key	Default
▶ Book_ID	int	NO	PRI	NULL
Books_Title	varchar(500)	NO		NULL
Authors_Name	varchar(500)	YES		NULL
ISBN	int	NO	PRI	NULL
Languages	text	YES		NULL
Edition	text	YES		NULL
Characters	text	YES		NULL
Pages_COUNT	int	YES		NULL
Ratings_COUNT	int	YES		NULL
Reviews_COUNT	int	YES		NULL
Published_Date	date	YES		NULL
Published_Name	text	YES		NULL
AVERAGE_RAT…	float	YES		NULL

Figure 25: Books Details entity

Field	Type	Null	Key	Default
▶ Group_ID	int	NO	PRI	NULL
Joined_Group	text	YES		NULL
Group_Members	text	YES		NULL
List_Group	text	YES		NULL

Figure 26: Group info entity

Field	Type	Null	Key	Default
▶ First_Name	varchar(500)	NO		NULL
Last_Name	varchar(500)	NO		NULL
Email	varchar(500)	NO	PRI	NULL
Users_Password	varchar(500)	NO		NULL
Bio	text	YES		NULL
Genres	text	YES		NULL
Statue	text	YES		NULL
Website_URL	varchar(500)	YES		NULL

Figure 27: User Profile entity

Field	Type	Null	Key	Default	
▶ Bill_ID	int	NO	PRI	NULL	
Order_Dtare	date	YES		NULL	
Book_Title	text	YES		NULL	
Book_Quantity	int	YES		NULL	
Book_price	float	YES		NULL	
Total_Price	float	YES		NULL	
VAT	float	YES		NULL	

Figure 28: Bill entity

6.2 Data Dictionary

This section will present the data dictionary for Goodreads platform which are: entities, scope and description for each field as shown in the **Table 2** below.

Entity	Field	Description
User's Profile	First Name	User's First Name.
	Last Name	User's Second Name.
	Email	The user should use it to log in to the platform.
	Password	Customer should use it to log in into the platform and it should be unique.
	Bio	Snapshot that represents the most important information about the user.
	Website URL	Short link provided by the user.
	Genres	Collection of Favorite genres of the user's book.
	Statue	View user statuses.
	User's Followings	Get people a user is following.
	User's Followers	Get a user's followers.
User's Account	Join Challenge	User can join a challenge.
	Join Group	User can join a group for Sharing recommendations.
	Add Want to Read to My Books	List of books user wants to read later.
	Add Currently Reading to My Books	List of books user is currently reading.
	Add to My Read Books	List of user's books.
	Create Shelf	Add bookshelf.

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	Comment List	List of all comments on a subject.
	Recommendations	Recommendation's saved by the user.
	Compare Books	Compare books with another member.
	List of Books	Lists of user's book.
	List of Groups	List of all user's groups.
	List of Reviews	List all books on a member's shelf.
	List of Series	List of all series by an author
	List of shelves	List of all user's shelves.
Author's Profile	Author's Name	Author's name.
	Author's Published Date	Author's Published Date for the book.
	Author's Books Rating	Number of Rating for the Author's book.
	Author's Followers	List of the Author's followers.
	Author's ID	Each Author has a unique ID.
Books Details	Books Title	Title of the book.
	Publish Date	Formatted Date Day – Month – Year.
	Publisher's Name	First and Last name of the publisher.
	ISBN	Goodreads book IDs given ISBNs.
	Edition	All editions by work.
	Language	Language written for the book.

Group	Characters	Characters in the book written by the author.
	Rating Count	Number of Ratings submitted by users.
	Reviews Count	Number of Reviews written by users.
	Pages Count	Number of pages written by author.
	Group ID	Each Group has a unique ID.
	Join Group	User can join a group for Sharing recommendations.
	Group Members	All members of a particular group.
	List Group	List of all groups.
Bill	Bill ID	Each bill has a unique number.
	Order Date	Date of created order.
	Books Title	Title of the book.
	Book's Quantity	Number of books ordered.
	Book's Price	Price for each book.
	Total Price	Price for all books.
	VAT	Tax.

Table 2

6.3   Database Description

This subsection will present the Entity Relationship Diagram (ERD), Entity Relation (ER) mapping, and the database code for Goodreads system using MySQL as shown in the Figures below.

6.3.1 Database Relationship Diagram

Figure 29 below shows the ERD (Entity Relationship Diagram)
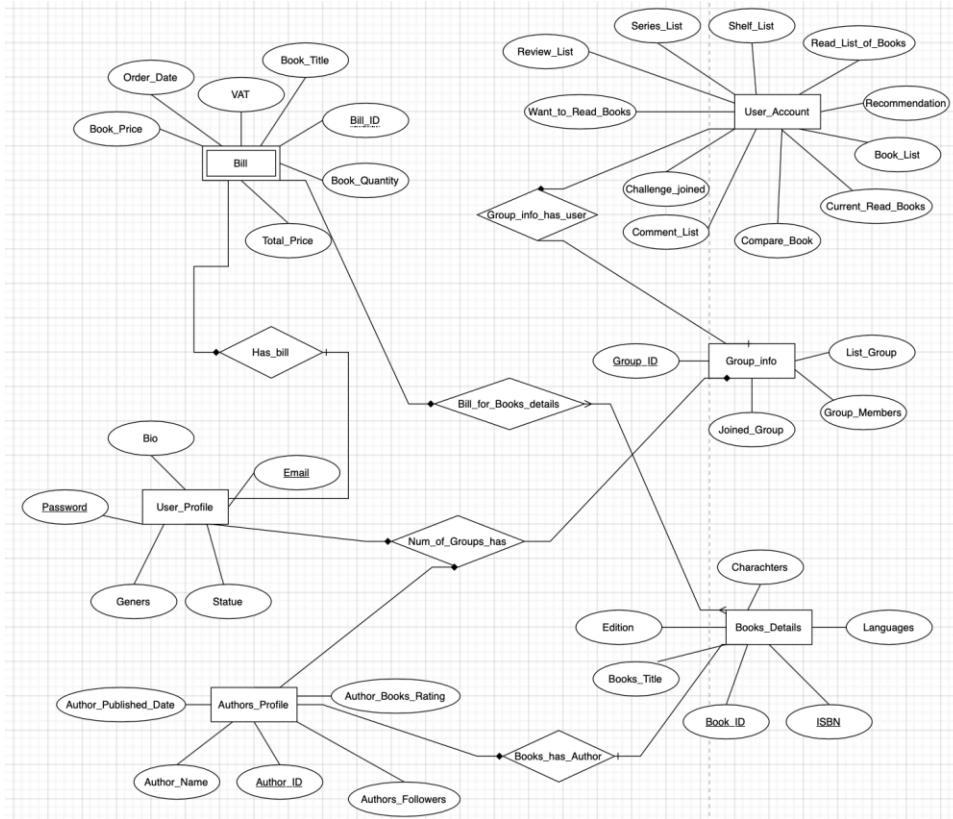
Figure 29

6.3.2 Database Entity Relation

Figure 30 below shows the ER Mapping

Figure 30

Copyright © 2022 by CS Year 4 – G1.
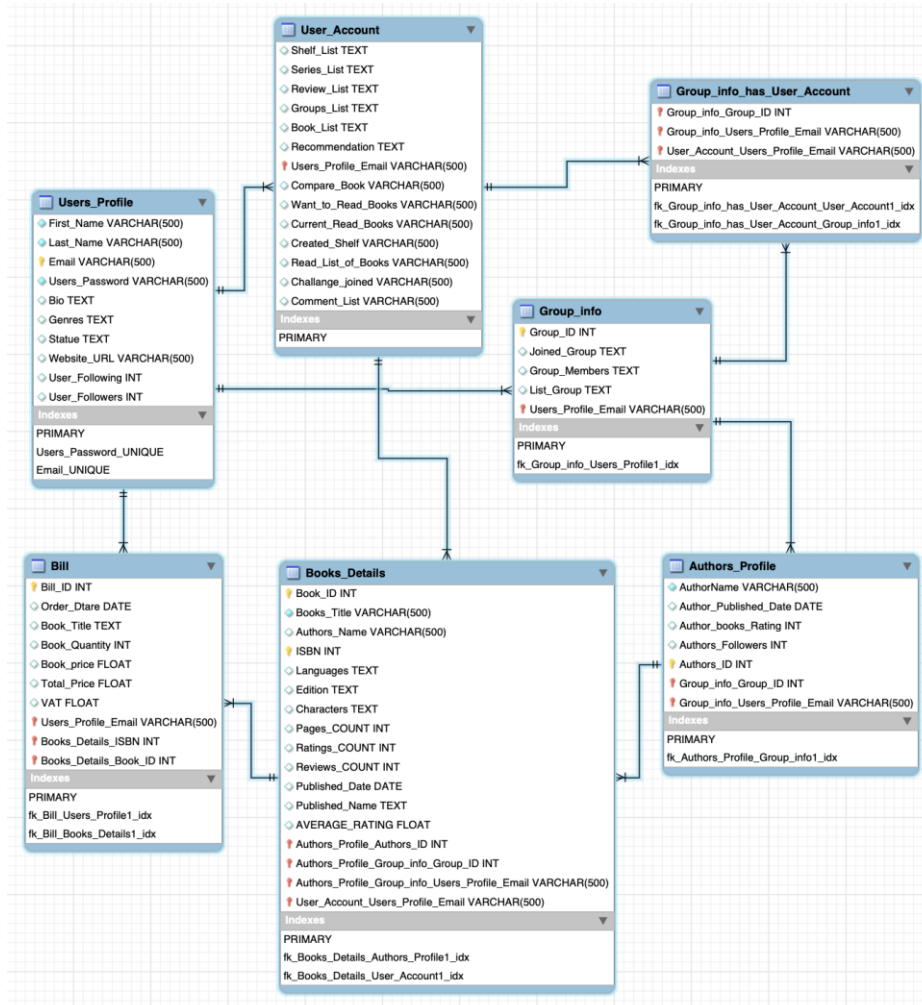
6.3.3 Database Relation Code

This subsection will present MySQL code for Goodreads database entities using MySQL Workbench.

Create database goodreads;
Use goodreads;

Create table books_details (
Book_id int,
Books_title varchar(500) not null,
Authors_name varchar(500) not null,
Isbn int not null,
Languages text,
Edition text,
Characters text,
Pages_count int,
Verage_rating float,
Ratings_count int,
Reviews_count int,
Published_date date,
Published_name text,
Primary key (isbn, book_id)
);

Create table users_profile (
First_name varchar(500) not null,
Last_name varchar(500) not null,
Email varchar(500) not null,
Users_password varchar(500) not null,
Bio text,
Genres text,
Statue text,
Website_url varchar(500),
Primary key (email)
);

Create table user_account0 (
Challenge_joined text,
Series_list text,
Review_list text,
Email_acc text not null,
Groups_list text,
Book_list text,
Recommendation text,
Want_to_read_books text,

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```
  Current_read_books text,
  Read_books text,
  Created_sehlf text,
  Compare_book text,
  Users_following int,
  Users_followers int,
Foreign key(emailacc) references users_profile(email)
 );


 Create table authors_profile (
 Authorname varchar(500) not null,
 Author_published_date date,
 Author_books_rating int,
 Authors_followers int,
 Authors_id int not null,
 Primary key (authors_id)
);


Create table group_info (
Group_id int not null,
Joined_group text,
Group_members text,
List_group text,
Primary key (group_id)
);

Create table lists (
Shelf_list text,
Series_list text,
Review_list text,
List_group text,
Book_list text,
Command_list text
);

Create table bill (
Bill_id int not null,
Order_dtare date,
Book_title text,
Book_quantity int,
Book_price float,
Total_price float,
Vat float,
Primary key (bill_id)
```

);

Alter table books_details;
Select count(*) as total_records,
    Count(distinct book_id) as num_books,
    Count(distinct authors_name) as num_authors,
    Count(distinct published_name) as num_publishers,
    Count(distinct languages) as num_languages
From books_details;
*Select * from books_details;*

Select published_name, count(distinct book_id) as num_books
From books_details
Group by 1
Order by 2 desc, 1
Limit 15;
Select min(average_rating) as min_rating,
  Max(average_rating) as max_rating,
    Round(avg(average_rating),2) as avg_rating;

7. Component Design

Throughout this section, we will examine what each component does in a systematic manner. Previously, we described the functional aspects. For each function listed earlier, we will summarize the algorithm used by the Goodreads application in a procedural description language (PDL) or pseudocode natural language, which can aid the comprehension of source code in unfamiliar programming languages. To express the design of a computer program, a set of programming language constructs is used. The code must be written in accordance with these statements [11].

7.1 Common Functions:

7.1.1 Sign In
signIn() {
Let client choose a way to sign in
If email has chosen, Then
 Enter email/username and password
 Check if email/username and password found in database Then
go to the home page
If client chooses Facebook
connect with Facebook database Then
 if email and password match in database
go to home page
If client chooses Twitter
connect with Twitter database Then
check if email/username and password match in database
Then go to home page
Else
Show an Error message "the email/username or password aren't correct please type again "
}

7.1.2 Forget password:
forgotPassword(){
Enter email/username
Type characters seen on the screen
If e email/username is found in the database and characters match
Then enter a new password
Else
Show Error message "the email or the charters aren't valued, type again "
}

7.1.3 Sign Out
signOut(){
When clients click on "More"

If client clicks on "Sign Out" button, then
Sign out from client account
Show welcome page
}

7.1.4 Delete profile
deleteProfile(){
When clients click on "More"
Show list of options
If client chooses "Setting" option, then
If "ACCOUNT SETTING "is chosen
show account information
if client clicks on "Delete my account "then
delete client account
update database
}

7.1.5 Sign Up
signUp(){
When client clicks on "sign up " button
Show signs up options
If client clicks on "sign up with twitter "
go to twitter sign up page
Connect with twitter database
Check if email, password match in database
Create a new account
Update database
If client clicks on "sign up with Facebook "
go to Facebook sign up page
Connect with Facebook database
Check if email, password match in database
Create a new account
Update database
If client clicks on "sign up with email "button
 go to email sign up page
Let client type email, password, username, birthday, gender and phone number
Check if email or username doesn't match in the database
Send a verifying SMS
If typed code matches SMS, then
save account information
Update database
Else
"Email or username belongs to a previous account, please type a new address and number "
Else

Show an Error message "Email is registered for another account, please enter different email address "
}

7.2 Client Functions
7.2.1 Edit Profile
editProfile() {
If there is invalid input
Then show Error message "Invalid input, check the format!"
Else
Update the fields in database
}

7.2.2 Update State
updateState(){
When client clicks on account
Let client enter new state
Check if client type in state
Update the database
}

7.2.3 Book Searching:
Searching(){
Show home page
Enter Title, author or ISBN of a book on search bar
If the input found in database
Then display all related topics
Else
Display " Try searching by both book title and author, double-checking your spelling or by ISNB."
}

7.2.4 Creating a custom shelf:
customeShelf(){
If client clicked on "My Books" Icon, then
If client clicked the "+" button
Enter shelf name and suggested genres
If client clicked on the "CREATE SHELF "button
Then update the database
}

7.2.5 adding book to list
addBook(){
If client chosses "Want to Read" button
Then book is added to the list

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If client clicked on "Currently Reading" button
Then book is added to the Currently Reading list
}

7.2.6 remove a book form shelf
removeBook(){
if client clicked on the list
and hold the book and swapped it left to right
then showcase the delete option
if option "delete" is clicked
then remove book from shelf
update the database
}

7.2.7 Delete a shelf
deleteShelf(){
If client clicks on My Books, then
Display all shelfs information
Let client chooses a shelf
If a shelf is chosen then
Open the shelf page
If client click on " …" button then
Show client option to " add book" ,"share" or "delete" a book
If customer choose "Delete Shelf" then
Delete shelf from database
Update database
}

7.2.8 Book Discovery:
bookDiscovery(){
When client clicks on "Discover" page
Show "books of the week" list
Show "trending books" list
Show "new releases this month "list
Show "new releases this year "list
Show "popular titles" list
If client clicks on any list above, then
Display all books on the list
}

7.2.9 Review a book
bookReview(){
Let client choose a book
Show client book rating

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If client rated this book
Show option to "write a review "
If clients clicks on "write a review " then
Show long empty space to be written on
Client must check if the comment is a spoiler
If yes then click on "SPLOIERS ? " button
If not then don't click on it
if "Done" button is chosen then
update database
}

7.2.10 Review Reporting
reviewReporting(){
Let client choose a book
Show book information
If client scrolls down and chooses the " ***" button
Then review is reported to the support team}

7.2.11 account sharing
accountSharring(){
When client open account page
Show account information
If client click on "share "icon then
Let client picks his preferred media to share
Account is shared
}

7.2.12 Edit profile
EditProfile(){
When client opens profile page
Show profile information
If client chooses " EDIT PROFILE " button then
Show profile editing page
If "Done " button is chosen
Then update database
}

7.2.13 Buy books
buyBooks(){
When client clicks on book option
Show book page
When clients chooses a book

Show book author, summary and price
If client clicks on "+" button
Then add book to cart
Show cart summary
If client clicks on "Payment"button
Then check if payment is successful
Display order details
Update book states and database
Else
Display error message "Payment process isn't successful, Try again "
}

7.2.14 Listen To Podcast
playPodcast(){
When client clicks on Podcast page
Show Podcast page
If client clicks on a podcast
Show podcast name, hosts, guests, ratings, length, and price
If the payment process is successful, then
 If client clicks on "Play "button
 Then play podcast audio
Else
Display error message "Payment process isn't successful, Try again "
}

8. Detailed System Design

Most components described in the System Architecture section will require a more detailed discussion. Other lower-level components and subcomponents may need to be described as well. Each subsection of this section will refer to or contain a detailed description of a system software component. The discussion provided should cover the following software component attributes:

8.1 Classification, Definition and Responsibilities

The classification, definition, and responsibilities of each component will be presented in this section. Shown in **Table 3** below.

COMPONENTS	CLASSIFICATION	DEFINITION AND RESPONSIBILITIES
COMMON FUNCTIONS		
LOGIN	Function	By using this function, the user can access their account by entering their email address and password.
FORGOT PASSWORD	Function	If the user enters an email that matches one of the emails stored in the database, this function will check for matches.
CHANGE PASSWORD	Function	Passwords can be retrieved by e-mail or phone number using this function.
EDIT PROFILE	Function	Users can modify profile information and control their accounts using this function.
CLIENT FUNCTIONS		
CREATE A SHELF	Function	In this function, the client is allowed to create the shelf by providing all the necessary information.
EDIT BOOKS, PODCASTS INFORMATION	Function	Clients can manage their shelf information, including books and podcasts.
ADD NEW BOOKS, PODCASTS	Function	Using this function, the client can add books and podcasts to their shelf.
DELETE BOOKS, PODCASTS	Function	Using this function, the client can delete books and podcasts from their shelf.
EDIT BOOKS, PODCASTS	Function	By using this function, clients can modify different aspects of the shelf, such as price, adding upcoming books, book availability, book name, book description and book rating.
VIEW DISCOVER STATISTICS	Function	Reports about the books/store can be viewed using this function.
ADD LANGUAGES	Function	Clients can use this function to change the preferred language, so most languages are supported.
CUSTOMER FUNCTIONS		

USER REGISTRATION	Function	The registration function allows users to register on the platform. They must provide first name, last name, password, email, phone number, birth date, address, and gender.
ADD TO CART	Function	Customers will be able to add books to their carts using this function.
ADD TO WANT TO READ	Function	This function will allow the customer to add books and podcasts to the Want to Read list.
ADD TO READ	Function	This function will allow the customer to add books and podcasts to the Read list.
REMOVE FROM CART	Function	This function will allow the customer to remove books and podcasts from the cart.
REMOVE FROM WANT TO READ	Function	This function will allow the customer to remove books and podcasts from the Want to Read list.
REMOVE FROM READ	Function	This function will allow the customer to remove books and podcasts from the Read list.
CHECKOUT	Function	Customers can use this function to view their cart with the total price. They can also add a coupon in the promotion field, choose their preferred payment method, and enter the address information.
PREVIOUS ORDERS	Function	The customer is able to view previous purchases by using this function.
WRITE A REVIEW	Function	Using this function, customers can write book or podcast reviews.
DIRECT MESSAGE / CHATBOT	Function	Messages can be sent to friends and received from them and from the client in this function.
ADD FRIENDS	Function	To make the application a suitable environment for communication, the customer can add friends by entering their username, email address, or phone number.
ADD FAVORITE GENRES	Function	With this function, the customer can easily access books and podcasts related to his interests by adding favorite genres.
EXPLORE ALL GENRES	Function	Customers may not be familiar with the genres they like, so this function allows them to browse the genres that pique their interest.

Table 3

8.2 Constraints and Composition

This section includes the components constraints and compositions (Pre-condition and Post-condition) of each component in the **Table 4** below.

COMPONENTS	CONSTRAINTS	PRE-CONDITION	POST-CONDITION
COMMON FUNCTIONS			
LOGIN	An account must first be created by the user.	Enter email/username/phone number and password.	Check if the information is valid.
FORGOT PASSWORD	An account must first be created by the user.	Enter email/username/phone number.	Reset the new password by sending a code to the email/phone number.
CHANGE PASSWORD	The password must be 8 characters long including at least: – 1 Uppercase letter – 1 Lowercase letters – Numbers – 1 Symbols	Enter your new password via the link sent to you by e-mail or through a text message.	A new password will be stored in the customer's database.
EDIT PROFILE	Data must be valid.	Modify the personal information you want to edit.	Updated personal information will be stored in the customer database.
CLIENT'S SUBSYSTEM			
CREATE A STORE	Stores must have commercial registers	Enter the store information	Data will be stored in the store database.
EDIT STORE INFORMATION	Data must be valid.	Modify the information you want to edit.	Data will be stored in the store database.
ADD NEW BOOK, PODCAST	None.	Add new content in the store	The new content will be stored in the database of the store
EDIT NEW BOOK, PODCAST	Data must be valid.	Modify the information you want to edit.	Data will be stored in the store database.
DELETE BOOK, PODCAST	It must not have an effect on the customer's current purchases.	Delete the content.	Data will be deleted from the store database.
VIEW STORE STATISTICS	Stats must be displayed correctly.	Statistic display.	Reports about content can be viewed.
CUSTOMER'S SUBSYSTEM			
CREATE AN ACCOUNT	The password must be 8 characters long including at least: – 1 Uppercase letter – 1 Lowercase letters – Numbers – 1 Symbols The format of an email must be correct.	Enter email/username/phone number and password.	Data will be stored in the customer database.

	The phone number must be unique.		
ADD TO CART	A product's information must be filled out in all fields.	Add the contents to the cart.	Ask the user if they wish to continue shopping or go to the checkout page.
ADD TO WISHLIST	None	Add content to the Wishlist	Display the item in the Wishlist.
CHECKOUT	– The customer must have an account – The contents must be in the cart.	Add a coupon in the promotion field, choose their preferred payment method, and enter the address information.	Pay the bill and then click show bill details
PREVIOUS ORDERS	Customer must be logged in and have made previous purchases.	Click on purchase history.	Display previous purchases.
DIRECT MESSAGE / CHATBOT	Customer must be logged in.	Write/read message.	Send / receive message.
WRITE A REVIEW	Customer must be logged in.	Writing reviews and setting a period to start and end reading the book with the option to activate the spoilers.	Send the review and feedback to the Community Reviews.
ADD FRIENDS	– Customer must be logged in. – Accounts must already be registered before they can be added.	Add a friend.	Add it to your list of followers.
ADD FAVORITE GENRES	– Customer must be logged in.	Select the favorite genres.	Saved in favorite genres.
EXPLORE ALL GENRES	– Customer must be logged in.	Select the genres.	Display all genres according to the genres you selected.

Table 4

8.3 Uses/Interactions

This section presents the main function in the system in a sequence diagram for the common functionality, client's, customer's functionality as well.

8.3.1 Common Functions

 This subsection presents the common functionalities between the Client and the Customer.

8.3.1.1 Sign-Up Functionality

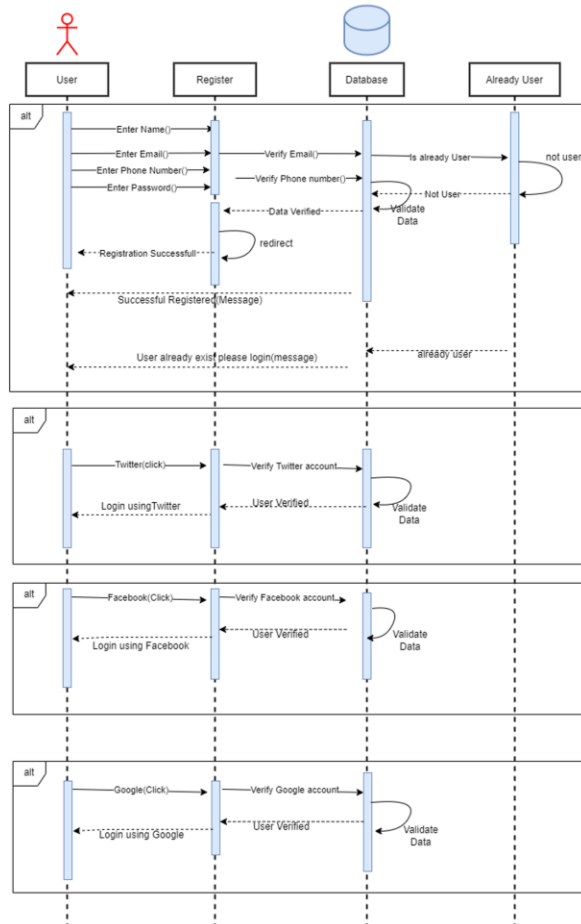**Figure 31** below shows the sequence diagram for Sign-Up functionality.

Figure 31

Copyright © 2022 by CS Year 4 – G1.

8.3.1.2 Login Functionality

Figure 32 below shows the sequence diagram for Login functionality.
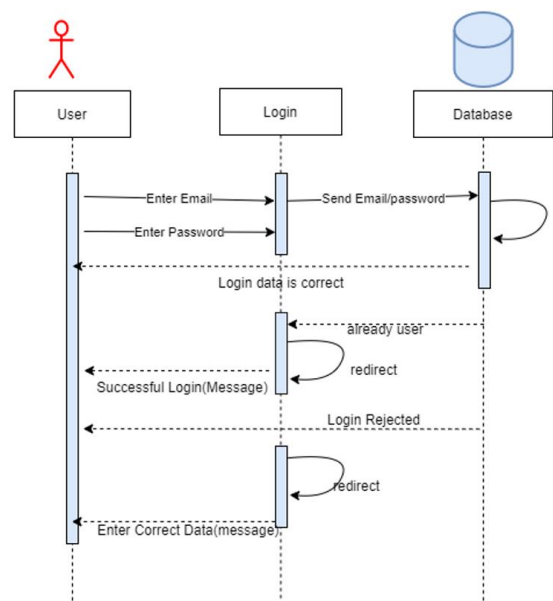

Figure 32

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8.3.1.3 Change Password Functionality

Figure 33 below shows the sequence diagram for Change Password functionality.
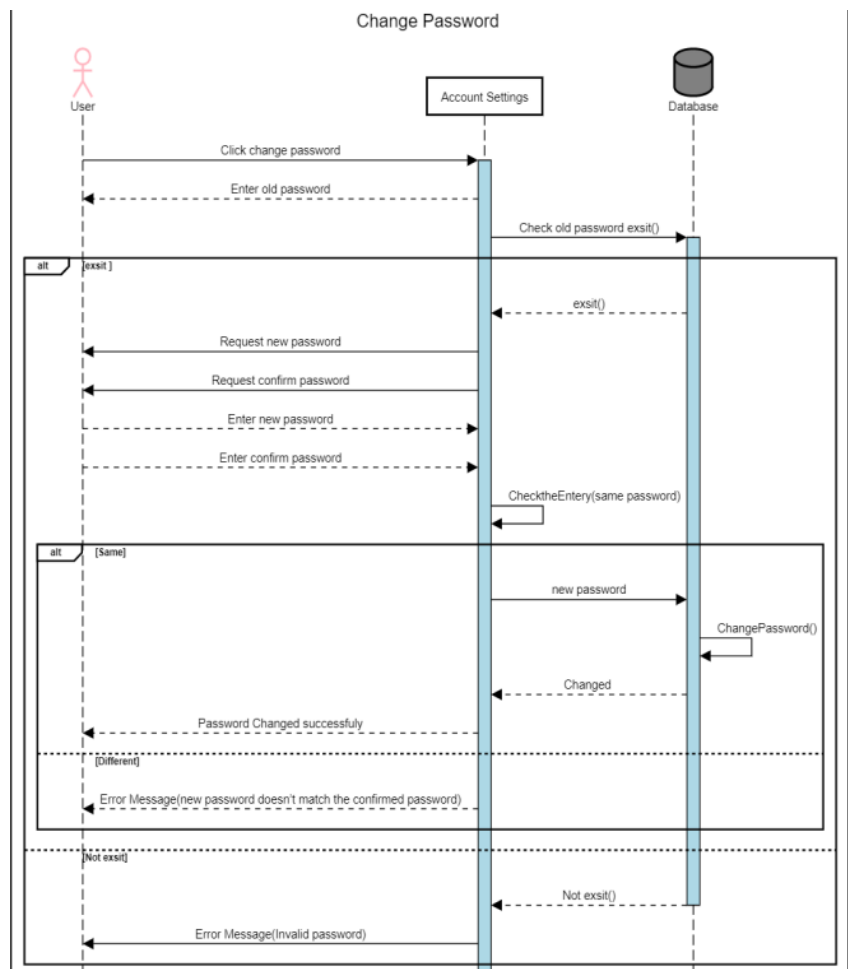
Figure 33

8.3.1.4 Edit Profile Functionality

Figure 34 below shows the sequence diagram for Edit Profile functionality.

Figure 34

Copyright © 2022 by CS Year 4 – G1.
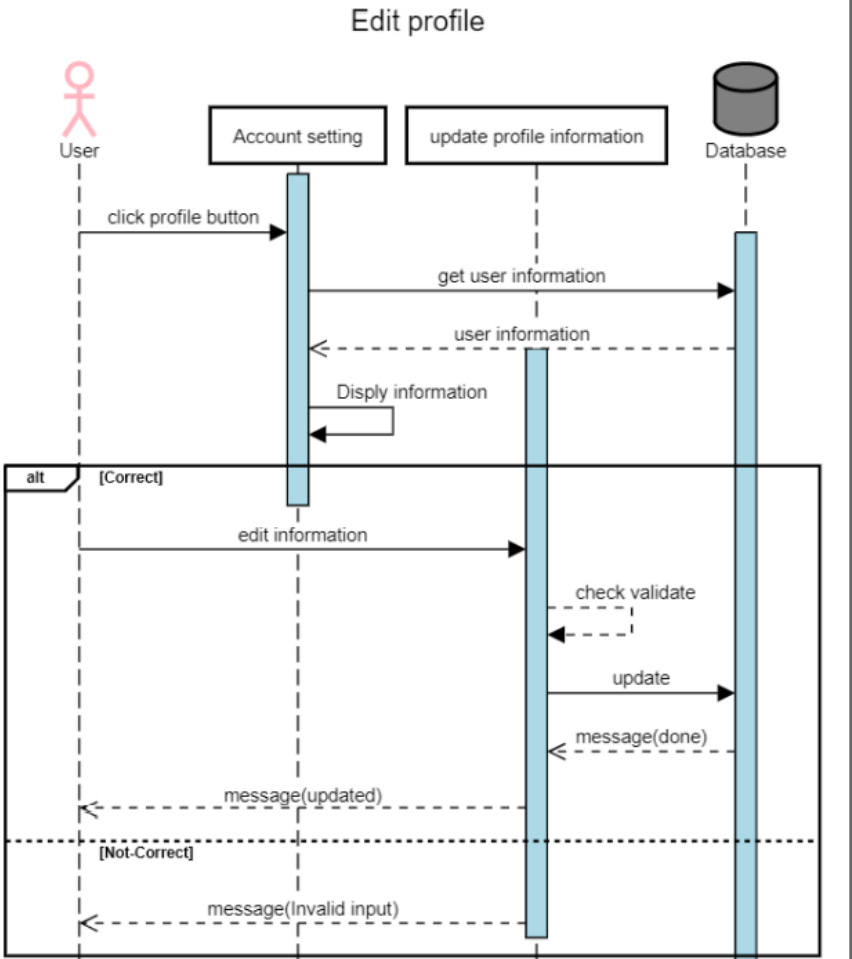
8.3.2 Client's Functions

This subsection presents the functionalities for the client.

8.3.2.1 Create and update store information

Figure 35 below shows the sequence diagram of create and update store information functionality.

Figure 35

Copyright © 2022 by CS Year 4 – G1.
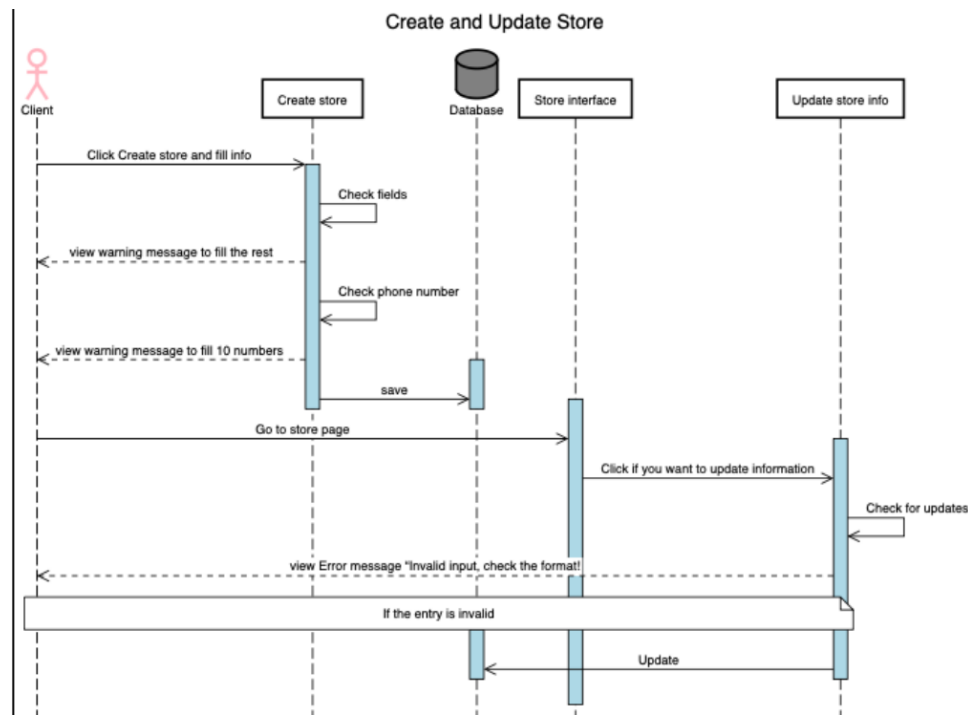
8.3.2.2 Add new Book and Podcast

Figure 36 below shows the sequence diagram of adding new Book and Podcast functionality.
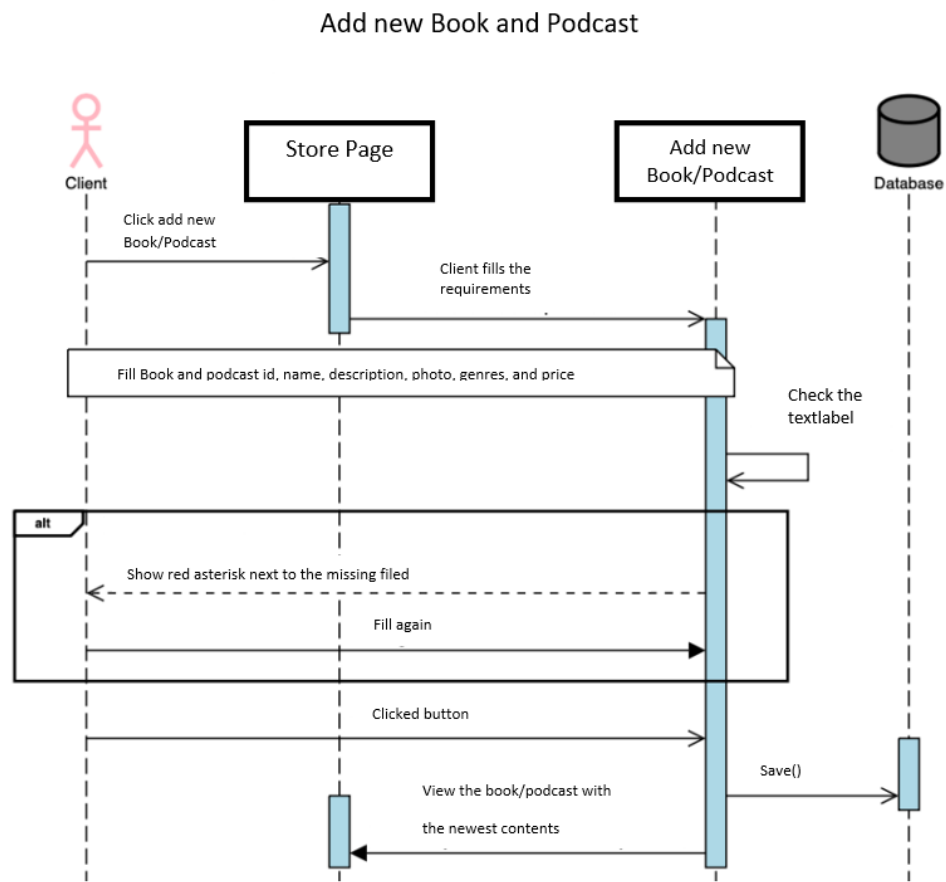
Figure 36

8.3.2.3 Store Statistics Functionality

Figure 37 below shows the sequence diagram of store statistics functionality.
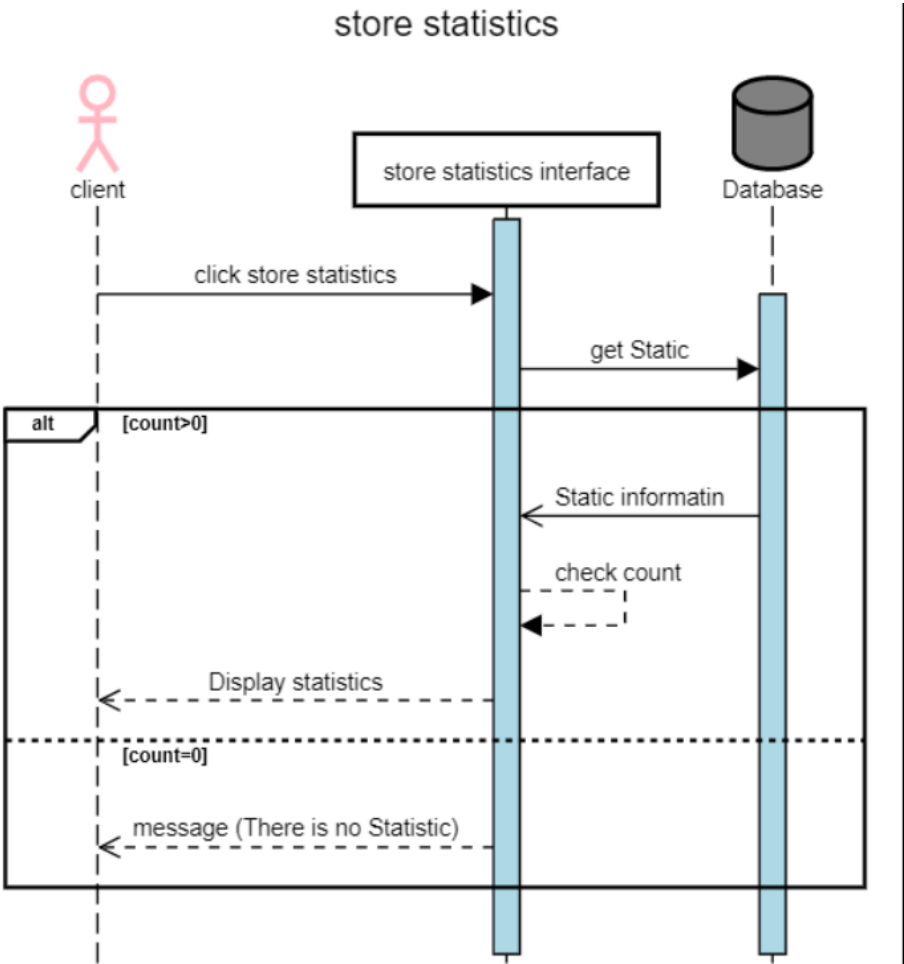
Figure 37

8.3.3 Customer Functions
This subsection presents the functionalities for the Customer.

8.3.3.1 Delete Book and Podcast
Figure 38 below shows the sequence diagram of deleting the Book and Podcast functionality.
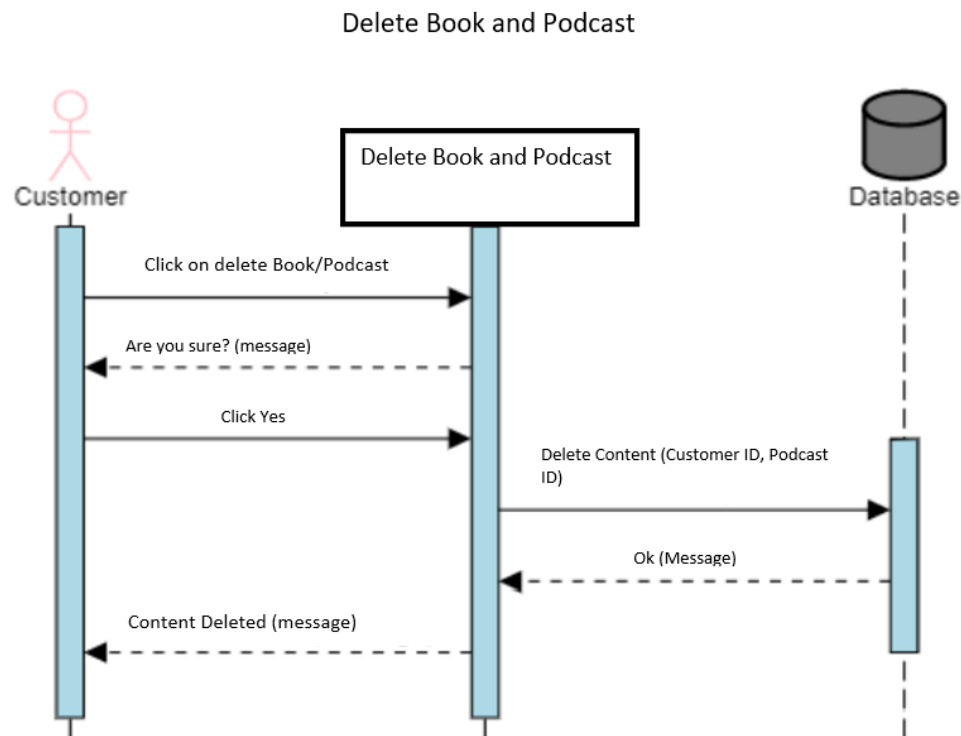
Figure 38

8.3.3.2 Add In Cart and Wish List Functionality

Figure 39 below shows the sequence diagram of Add in Cart and Wish List Functionality.

Figure 39

Copyright © 2022 by CS Year 4 – G1.
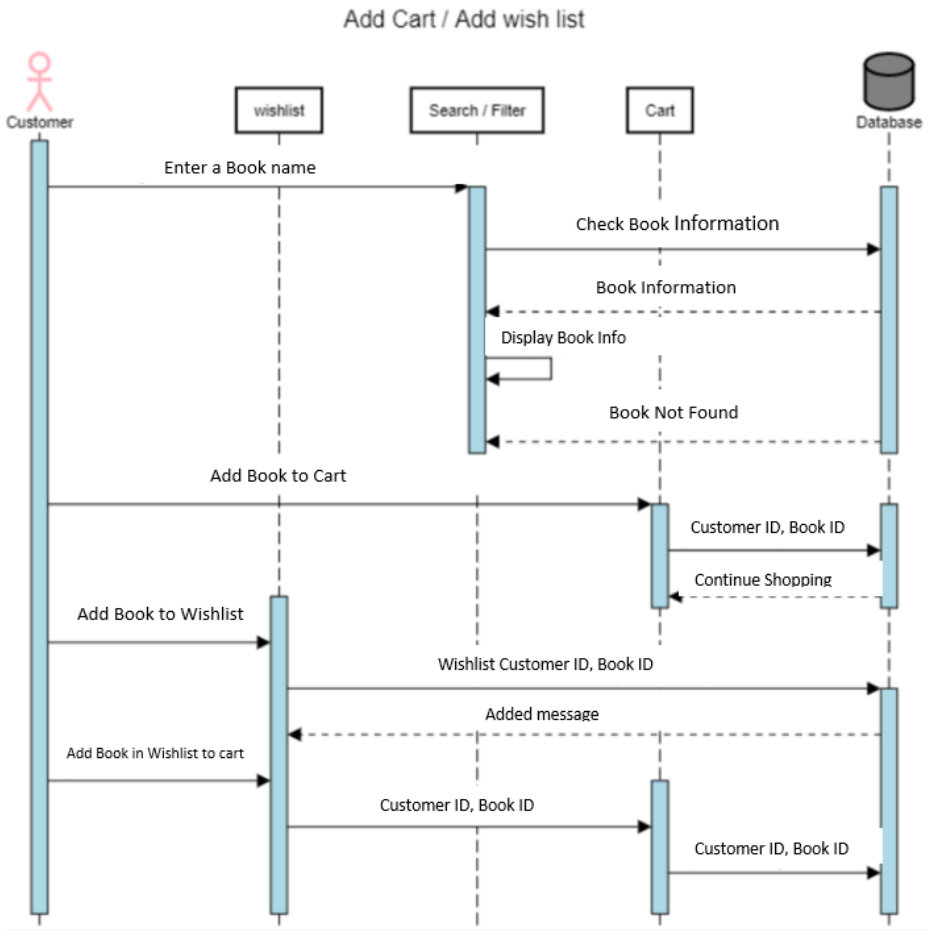
8.3.3.3 Checkout Functionality

Figure 40 shows the sequence diagram of checkout functionality.

Figure 40

Copyright © 2022 by CS Year 4 – G1.
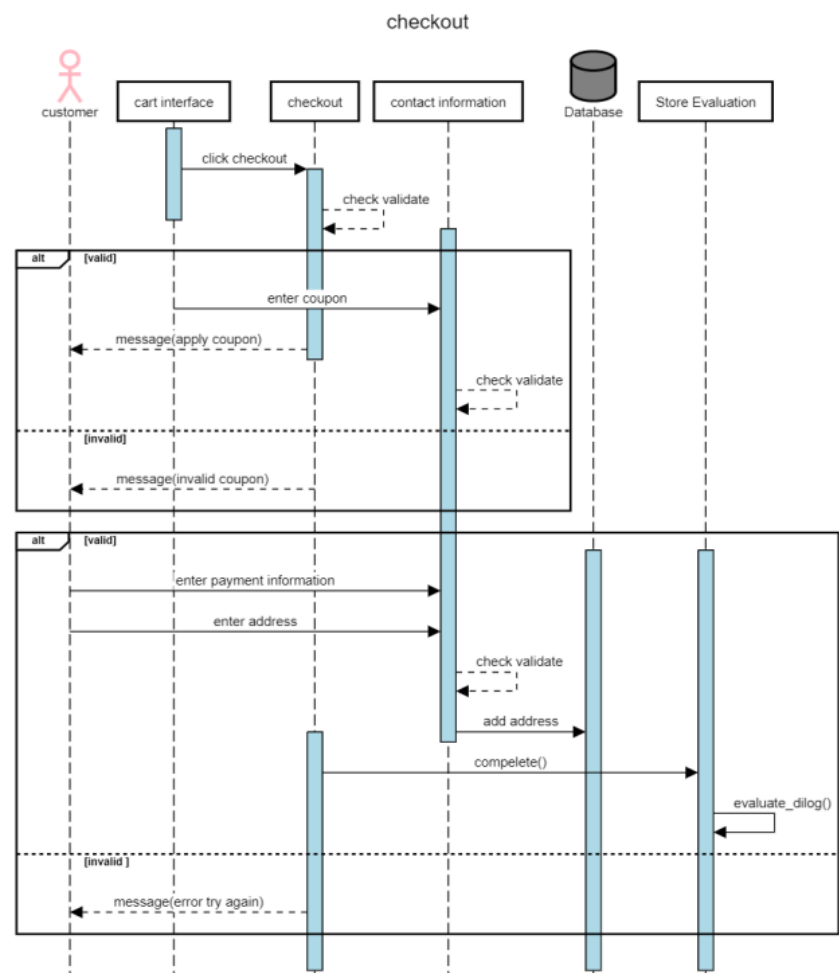
8.3.3.4 Create Account Functionality

Figure 41 shows the sequence diagram for creating an account.
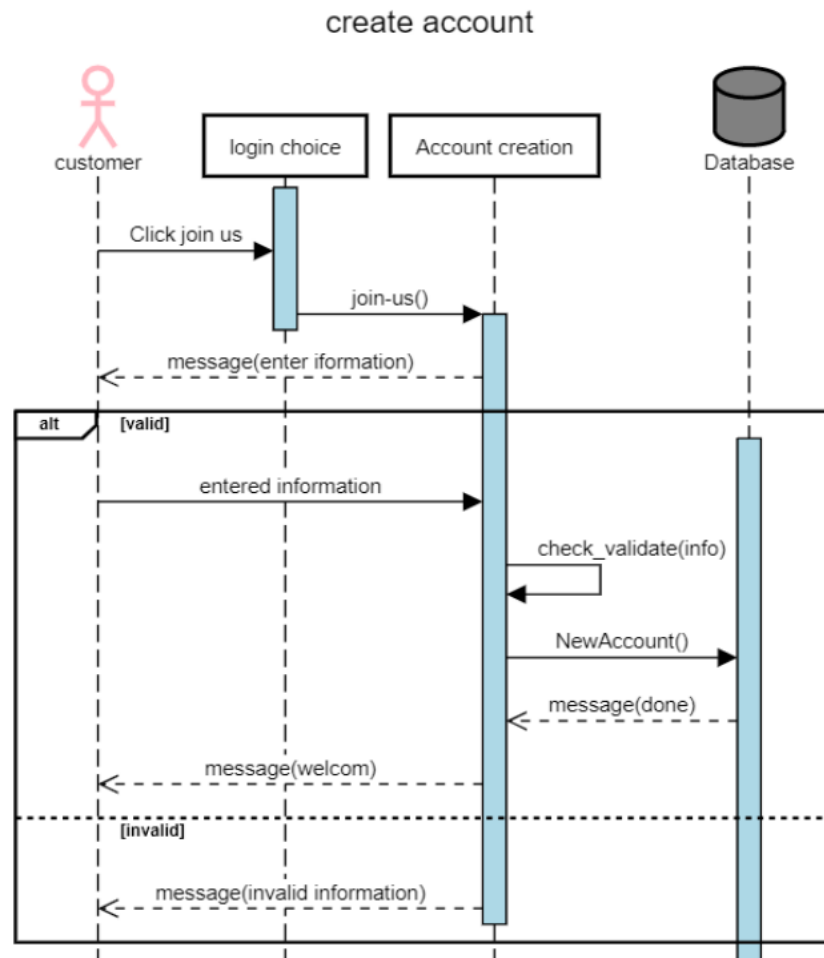
Figure 41

8.4   Resources

Goodreads requires external entity resources for its application, and this section will present them. As shown in **Table 5** below, this entity manages, affects, or requires resource specification.

Type	Resources
Operating system	IOS and android.
Memory storge	2GB or 4 GB
Database	MySQL
Transaction	OLTP (Online Transaction Processing Systems).

Server	Switchover (Takso)
Internet connection	Network

Table 5

Table 6 shows the race conditions and deadlock situations that may occur and how could be resolved.

Race conditions and deadlock	Description	Solution
Network connection	When the device doesn't connect to the internet.	Notify the user to check the internet connection and try again.
Lock monitor	When client clicks" close" during payment process stage	Notify the user that the payment process can't be interrupted and after its success, another operation is next.
Transaction	when the book being sold out at the customer payment process stage.	The payment method will be stopped, and failed message will appear, and book state will be updated.

Table 6

8.5   Processing

In this subsection, we discuss the description, inputs, and outputs of the components of the Goodreads platform.

8.5.1 Common Functions

8.5.1.1 Login

The Login component is described in **Table 7** below along with its input, output, and constraints.

DESCRIPTION	THE PLATFORM ALLOWS CLIENTS AND CUSTOMERS TO LOG IN.
INPUT	Click the login button in the top right corner of the page and choose your registration method, such as e-mail, phone number, Twitter, Facebook or Google Account, that you previously registered with.
OUTPUT	Enter to specified homepage (customer's homepage or client's homepage).
CONSTRAINTS	If the user enters incorrect information, such as email, phone number, Twitter, Facebook, Google account, or verification code, an error message is displayed and the user is redirected back to the login page.

Table 7

8.5.1.2 Change password

The Change password component is described in **Table 8** below along with its input, output, and constraints.

DESCRIPTION	CLIENT AND CUSTOMER CAN CHANGE THEIR PASSWORD
INPUT	Enter the old and new passwords along with the confirmation password you received via email or text message when you click on the Change Password button.
OUTPUT	Password has been successfully changed.
CONSTRAINTS	If the user entered an incorrect old password or Table 11confirmation password, an error message is displayed and the user is redirected back to the change password page.

Table 8

8.5.1.3 Edit profile

The Edit profile component is described in **Table 9** below along with its input, output, and constraints.

DESCRIPTION	CLIENT AND CUSTOMER CAN EDIT PROFILE INFORMATION.
INPUT	Click on Account settings and choose the settings you want to change.
OUTPUT	Modifications have been successfully made to the account information.
CONSTRAINTS	If the user enters incorrect data, the user will see the message "invalid input".

Table 9

8.5.2 Client Functions

8.5.2.1 Store Statistics

The Store statistics component is described in **Table 10** below along with its input, output, and constraints.

DESCRIPTION	CLIENTS CAN BE ABLE TO VIEW THE STATISTICS OF THE STORE.
INPUT	Click on store statistics.
OUTPUT	Clients view all statistics.
CONSTRAINTS	-

Table 10

8.5.2.2 Delete Book and Podcast

The Delete Book and Podcast component is described in **Table 11** below along with its input, output, and constraints.

DESCRIPTION	CLIENT CAN DELETE BOOK AND PODCAST.
INPUT	Click on delete Book and Podcast.
OUTPUT	Book and podcast have been successfully deleted.
CONSTRAINTS	-

Table 11

8.5.3 Customer Function

8.5.3.1 Create Account

The Create Account component is described in **Table 12** below along with its input, output, and constraints.

DESCRIPTION	CUSTOMER CAN CREATE A NEW ACCOUNT
INPUT	A user can register using an e-mail, a phone number, a Twitter, Facebook or Google account, followed by choosing their first and last names, their birth dates, their gender, the genres they are most interested in, and whether they wish to receive news and coupons from stores. Customer must agree to the terms of use and privacy policy before using the app.
OUTPUT	Customer will be added to the system.
CONSTRAINTS	If some fields are missing, a red asterisk will be shown.

Table 12

8.5.3.2 Checkout

The Checkout component is described in **Table 13** below along with its input, output, and constraints.

DESCRIPTION	VIEW ALL ITEMS WITH THE TOTAL PRICE, PLUS ADD THE PROMOTION CODE FIELD IN CASE THE CUSTOMER HAS ONE, THEN SELECT THE PAYMENT METHOD AND FILL OUT THE INFORMATION.
INPUT	Click the checkout button.
OUTPUT	Print order bill to the customer.
CONSTRAINTS	If a customer has not logged into the system, a warning message appears (you must log in first).

Table 13

8.5.3.3 Add to Cart/Wishlist

The Add to cart/Wishlist component is described in **Table 14** below along with its input, output, and constraints.

DESCRIPTION	CUSTOMER CAN ADD TO THE CART /WISHLIST ANY CONTENT (BOOK AND PODCAST)
INPUT	Click on add to the Cart/Wishlist.
OUTPUT	The Book/Podcast will be added.
CONSTRAINTS	If the content is deleted a message will appear to the customer "The Book/Podcast is no longer available".

Table 14

8.5.3.4 More info of Book/Podcast

The More info of Book/Podcast component is described in **Table 15** below along with its input, output, and constraints.

DESCRIPTION	**CUSTOMER CAN DISPLAY MORE INFORMATION ABOUT THE CONTENT (BOOK AND PODCAST).**
INPUT	Click on the copy link/statistic/ reviews button.
OUTPUT	Choosing copy will copy the book/podcast link, choosing statistics will display book/podcast statistics, and clicking review will display the community reviews.
CONSTRAINTS	-

Table 15

8.6 Interface/Exports

This section shows the main activities that are associated with the application as shown in **Table 7 to Table 15**. The subsystem's functionality of GoodReads will be known by the system to make sure that it will work as planned. Also, the classifications, definitions, responsibilities, constraints, and composition of every system component must be understood properly.

8.6.1 Login Interface:

Actors	- Client
Description	The user can access by valid username and password. The username and password should match the data in the database. Users can also access by sign in with Facebook and Twitter which will connect to their database to guarantee secure entrance. After it has been verified then the user will be redirected to their own homepage interface.
Data	- Username - Password -email address -phone number -Twitter or Facebook account information
Stimulate	User issued a command by clicking on one of the buttons (Log in as an client)
Response	-client: access the client homepage and use the functionalities that are available to them.
Comments	In case of invalid username, password, email or phone number an error dialog box will be displayed with message "Incorrect username/email or password, please try again".

8.6.2 Password Retrieve Interface:

Actors	- Client
Description	The user will be able to retrieve their password only if the email/username entered matches the data in the database.
Data	-email address -phone number
Stimulate	User issued a command by clicking on "forgot password"
Response	An email or SMS message will be sent to the user with the new password.
Comments	If the entered email or phone number was invalid, then an error message will be displayed "invalid email or phone number".

8.6.3 Cart Interface:

Actors	- Client
Description	The customer can edit the shopping cart by adding or removing books anytime. Also, the customer can move any books to the wish-list or proceed to checkout.
Data	-
Stimulate	User issued a command by clicking on the "shopping cart" icon
Response	The customer can delete or move any books to the wish list. Also, if the books quantity field becomes zero, then it will be removed from the shopping cart automatically and move it to wish list.
Comments	In case one of the books is sold while the customer is proceeding to the checkout, a warning message will be displayed "one of the books is sold out"

8.6.4 Wishlist Interface:

Actors	- Client
Description	The customer can edit the shopping cart by adding or removing books anytime. Also, the customer can move any books to the wish-list or proceed to checkout.
Data	-
Stimulate	User issued a command by clicking on the "shopping cart" icon
Response	The customer can delete or move any books to the wish list. Also, if the books quantity field becomes zero, then it will be removed from the shopping cart automatically and move it to wish list.
Comments	In case one of the books is sold while the customer is proceeding to the checkout, a warning message will be displayed "one of the books is sold out"

8.6.5 View Book Interface:

Actors	- Client
Description	View books and display more details about it such as the availability in stock, size, and author and rating.
Data	-
Stimulate	User command issued by clicking on a book.
Response	The customer will see more details about the book.
Comments	-

8.6.6 Manage Order Interface:

Actors	- Client
Description	A page contains the orders information (order ID, order's details, price) with button for each order to print all the information.
Data	-
Stimulate	User command issued by clicking menage order button in the client homepage
Response	Client will be able to see all order history
Comments	-

8.6.7 Edit Account Interface:

Actors	- Client
Description	Adding and modifying account from different aspects such as name, Bio, profile image, favorite genres and a website URL
Data	-
Stimulate	User command issued by clicking edit profile button in the account page
Response	Client will be able to see the updated profile
Comments	-

8.7 Detailed Subsystem Design

This section outlines the main components and demonstrates how the data will flow. Below is a flowchart that illustrates the client and customer subsystems.
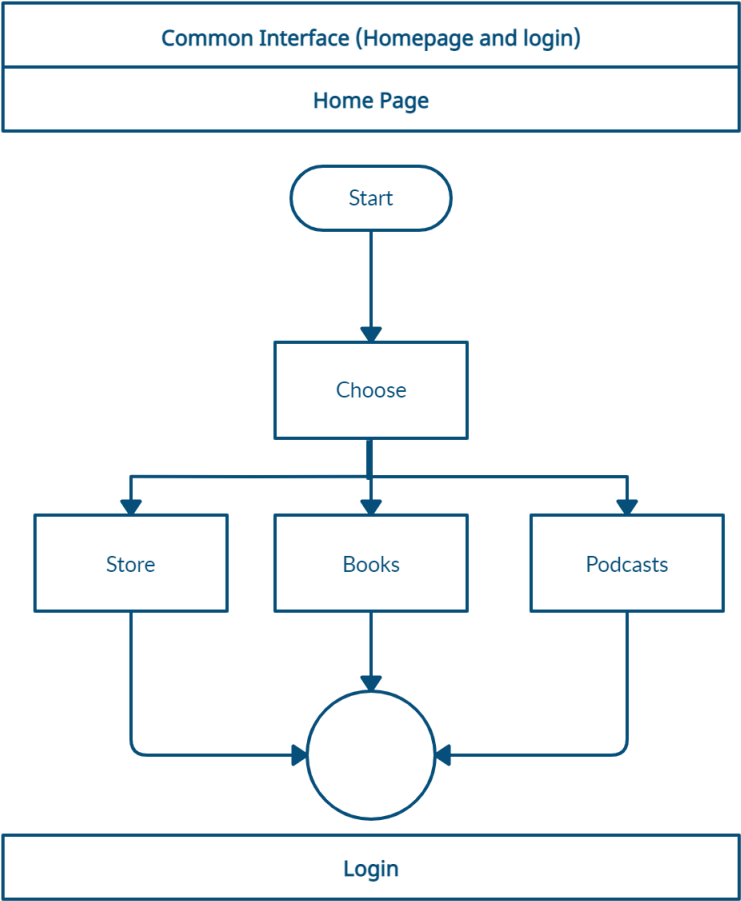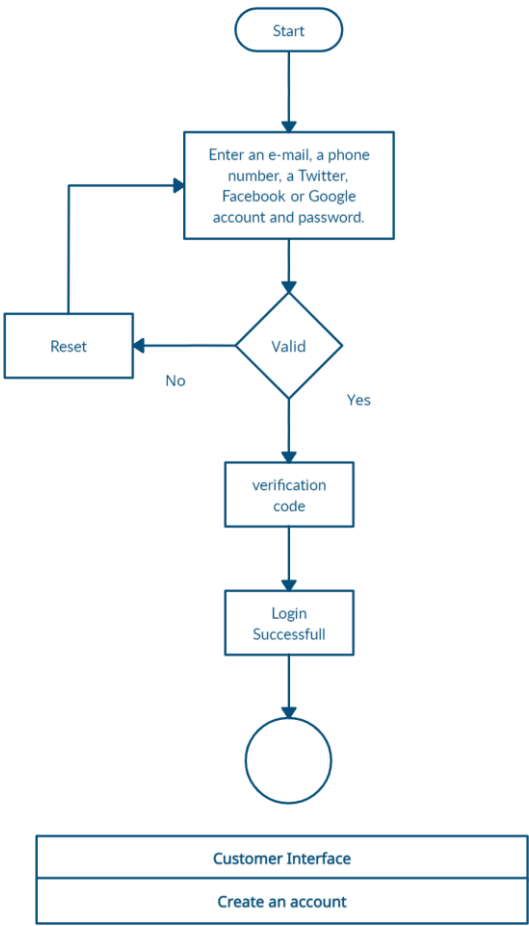
8.7.1 Homepage FlowChart

Figure 42

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8.7.2 Login FlowChart

Figure 43

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8.7.3 Create a Store Flowchart

Figure 44

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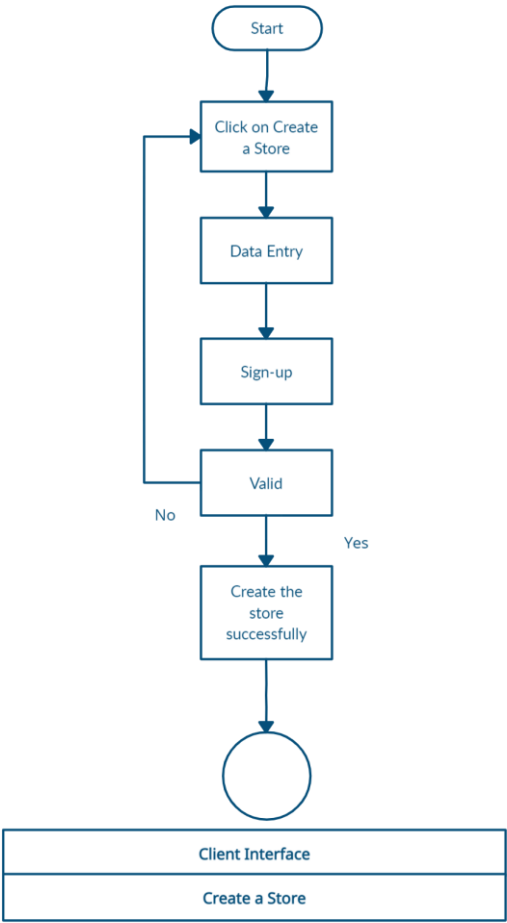
8.7.4 Filter / Search for Book /Podcast FlowChart

```
                    (  )

              Filter/Search
                 for a
              Book/Podcast

                  Valid

  No Match  ←──  Display Results
   Found
              No          Yes

                   (  )

  ┌─────────────────────────────────────┐
  │          Customer Interface          │
  ├─────────────────────────────────────┤
  │   Filter/Search for a Book/Podcast   │
  └─────────────────────────────────────┘
```
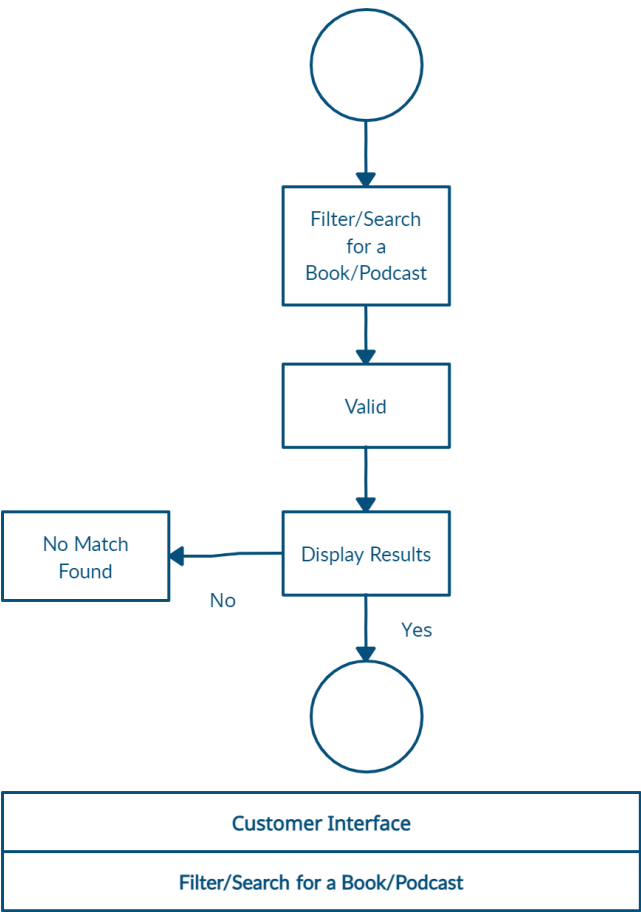
Figure 45

8.7.5 Write/Read Reviews FlowChart
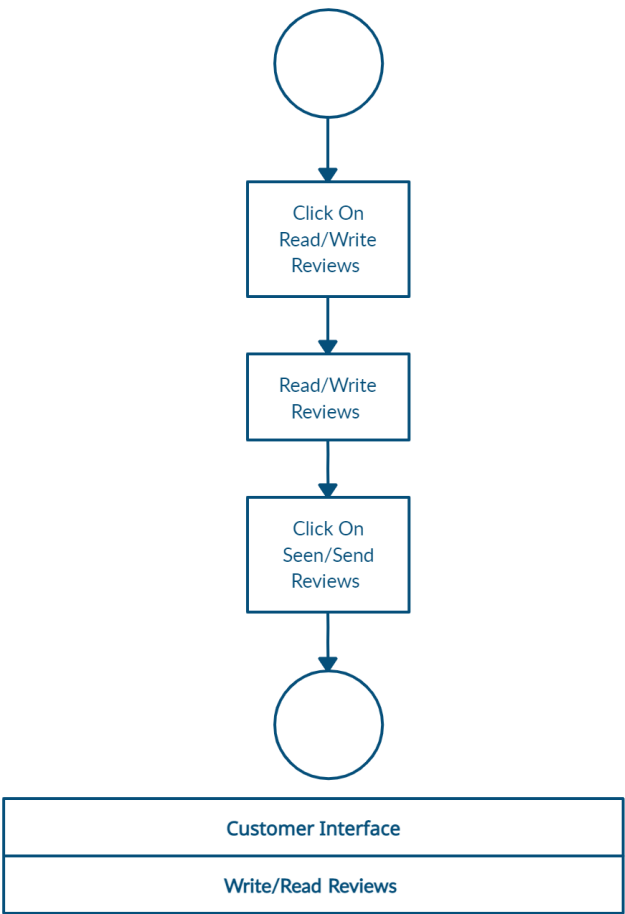
Figure 46

8.7.6 Shopping Cart FlowChart
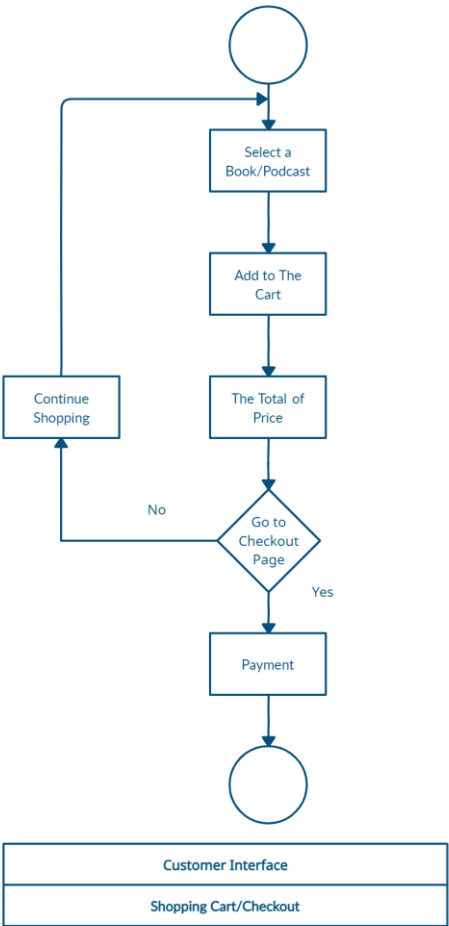

Figure 47

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9. Other Design Features

Goodreads uses client-server for the whole system. But some subsystems and interactions will use other architectures and patterns. For instance, checkout, evolution payment, and viewing the bill operations are sequential.
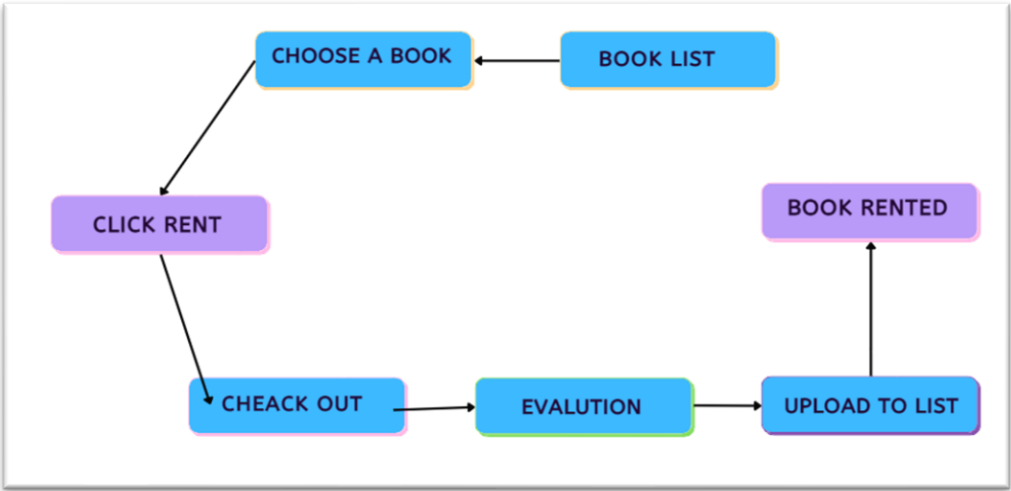

Figure 48

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10. Requirements Traceability Matrix

The purpose of each component will be addressed in systematic detail throughout this section as shown in **Table 16** below.

A system's objectives are achieved through its functions. It is possible to state these functions explicitly or to deduce them based on the requirements. As a result, equipment, personnel, facilities, software, or a combination of these will be employed to perform or accomplish the functions. [12, p.45]

Observed In	Associated ID in SRS	Technical Assumptions and Customer Needs	Functional Requirement	System Component
Common	FR1	The client can login by providing a valid username and password.	Log-in	Login
	FR2	The client must confirm the client identity with the password plus a five-digits verification code. The verification code will be sent through an SMS message. Verification	Verification	Confirm the customer's identity
	FR3	Convert between languages using the language button	Converter	Language converter
	FR4	Showcase Home page for Goodreads application and show several pages the client could view when press by the indicator. Page for book discovery, podcast, shelf's, client registration and log-in.	Homepage	View homepage
	FR5	The page shows all the different books, and the client must choose one of these books to start creating a shelf.	Homepage	View book shelfs
Customer	FR6	The client should be able to register and must provide a first name, last name, password, email, phone number, and gender. The client can also choose to register from Facebook, Apple and Amazon. The client must agree on the terms of use and have read the privacy policy.	Customers Registration	Registration
	FR7	Shows all wish books that that selected as wish to buy, as well as the items that out of stock in the cart.	Wish book list	view
	FR8	Shows the categories of books	Discovery page	view
	FR9	Searching for any book in the search bar by typing title, author name or ISBN.	Customers	Search

	FR10	**where the users can add and delete books from the cart and then process to checkout.**	**Cart page.**	**Edit**
	FR11	**View all books in cart with total price. then choose the preferred payment method and pay.**	**Checkout Page**	**view**
	FR12	**Filter books from different genres, price range, rating, author, most popular and newly arrived.**	**Filter**	**View**
	FR13	**Listen to podcasts in all languages and different types**	**Podcast page**	**view**

Table 16