Software Design Description

for

Web-based Online Bookstore

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24.05.2024

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1 Introduction

1.1 Summary

The online bookstore system is web-based platform that provides users with the capability to rent or purchase the books they are looking for. The system offers user 2 options to register with and without Google. After users sign in to the system, system provides 3 different search options for books: by category, by author, by title. After searching operation, user can select one of the books that is listed based on the given parameter and see further details.

Users can add books to shopping cart that is edited or viewed anytime for buying or renting. From the shopping cart, users can proceed to check-out and complete payment process by providing some details. Moreover, users can view their history of order, and if there is any, they can see also duration of the rented books. The system enables users to watch live broadcasts on YouTube where books are being read aloud and to engage in live chats with other users.

Users are allowed to report any issues they encounter on the site, and the system enables administrators, who has additional responsibilities such as adding books and updating books, to address and resolve these issues. The system also has super admins who grant these privileges to administrators.

1.2 Identified Stakeholders and Design Concerns

Users: Users are interested with searching books they want and rent or buy them.

Admins: Admins are interested with resolving issues that reported by the users in the system, adding new books to the system, updating books in the system.

Super Admins: Super Admins interested with granting the privileges to administrators.

Google: Google interested with allowing users sign in to the system with their google account:

YouTube: YouTube interested with allowing users to join live chat stream where books is read aloud and interact in live chatting.

Bank: Bank is interested with payment transaction.

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2 Glossary

N/A

3 Architectural Views

In this report, the architecture of software systems will be described based on the Logical View, Process View, Development View, and Deployment View, as suggested by Kruchten (1995)[1]

[1] P. B. Kruchten, "The 4+1 View Model of architecture," in IEEE Software, vol. 12, no. 6, pp. 42-50, Nov. 1995, doi: 10.1109/52.469759.

3.1 Logical View

The logical view shows the key abstractions in the system as object classes.

3.1.1 Class Diagram

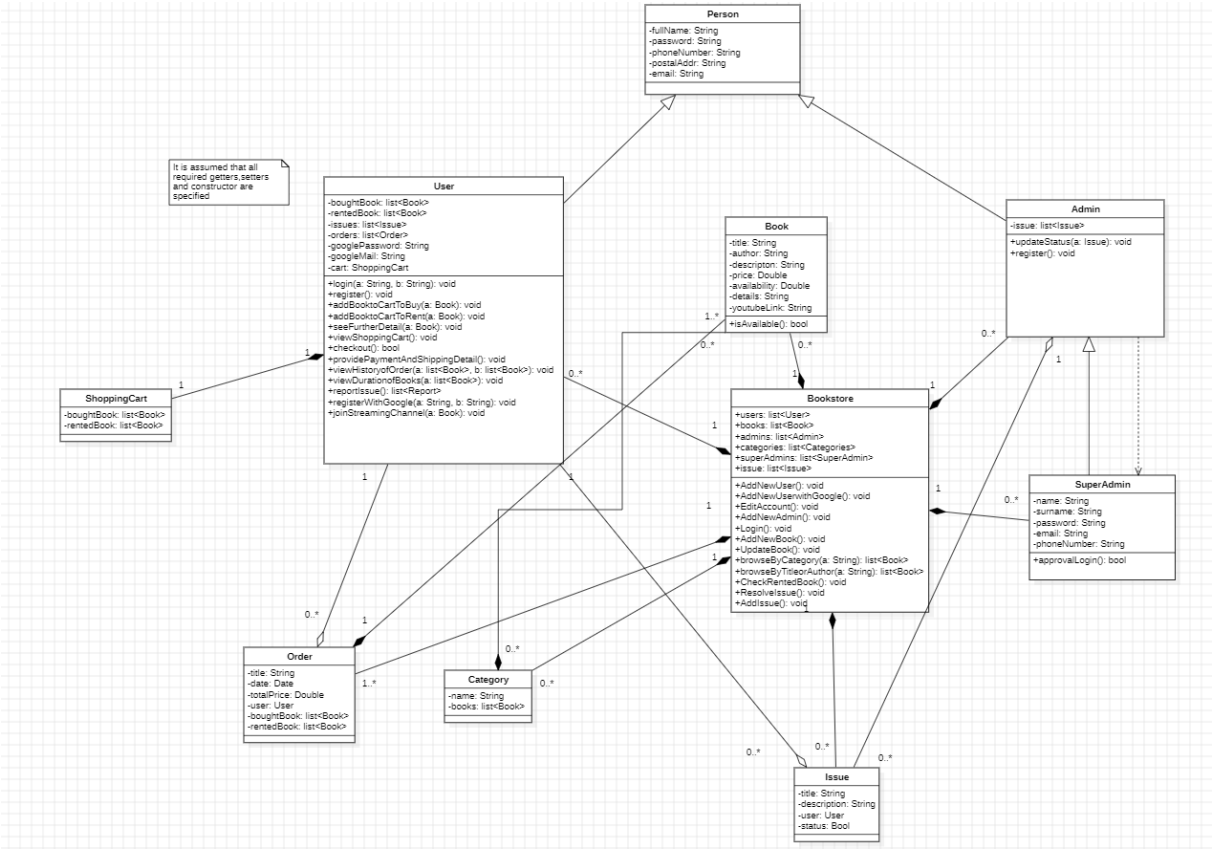

Figure 1: Class Diagram of System

Design Rationale: This diagram was drawn to show object-oriented system model by using the classes within the system and the relationships between them. Class attributes and methods are represented properly, and aggregation and composition relationships between the classes, along with multiplicities are shown in the diagram.

3.2 Process View

The process view shows how the system is composed of interacting processes.

3.1.2 Activity Diagram

Register as User Activity Diagram

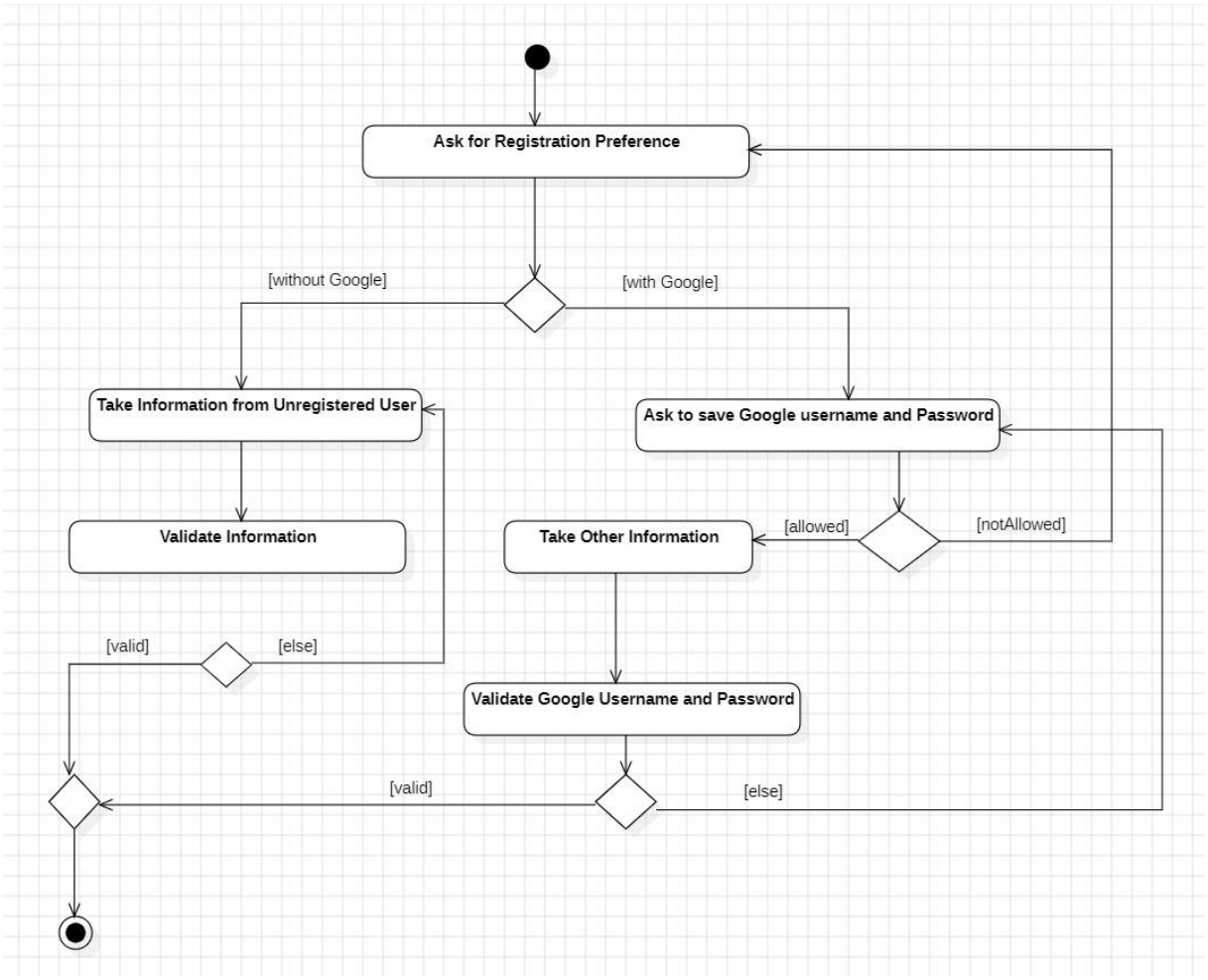

Figure 2: Activity Diagram of Register as User

Design Rationale: System ask users to register whether with Google or not. If user selection is register with Google, system asks to save their google account. If user does not accept saving their account, system again ask for registration preference. Otherwise, system takes other information from user. After that, system validates Google account, and password.

If these are not valid, system ask for registration preference again. If valid, register user with Google is completed successfully. If user selects register without Google, system takes user email, user password, and other details from user. After taking all parameters from the user, system validates information that is provided by the user. If information is not valid, systems will wait for taking new information from the user. If the information is valid, register users without Google is completed successfully.

Browse Diagram

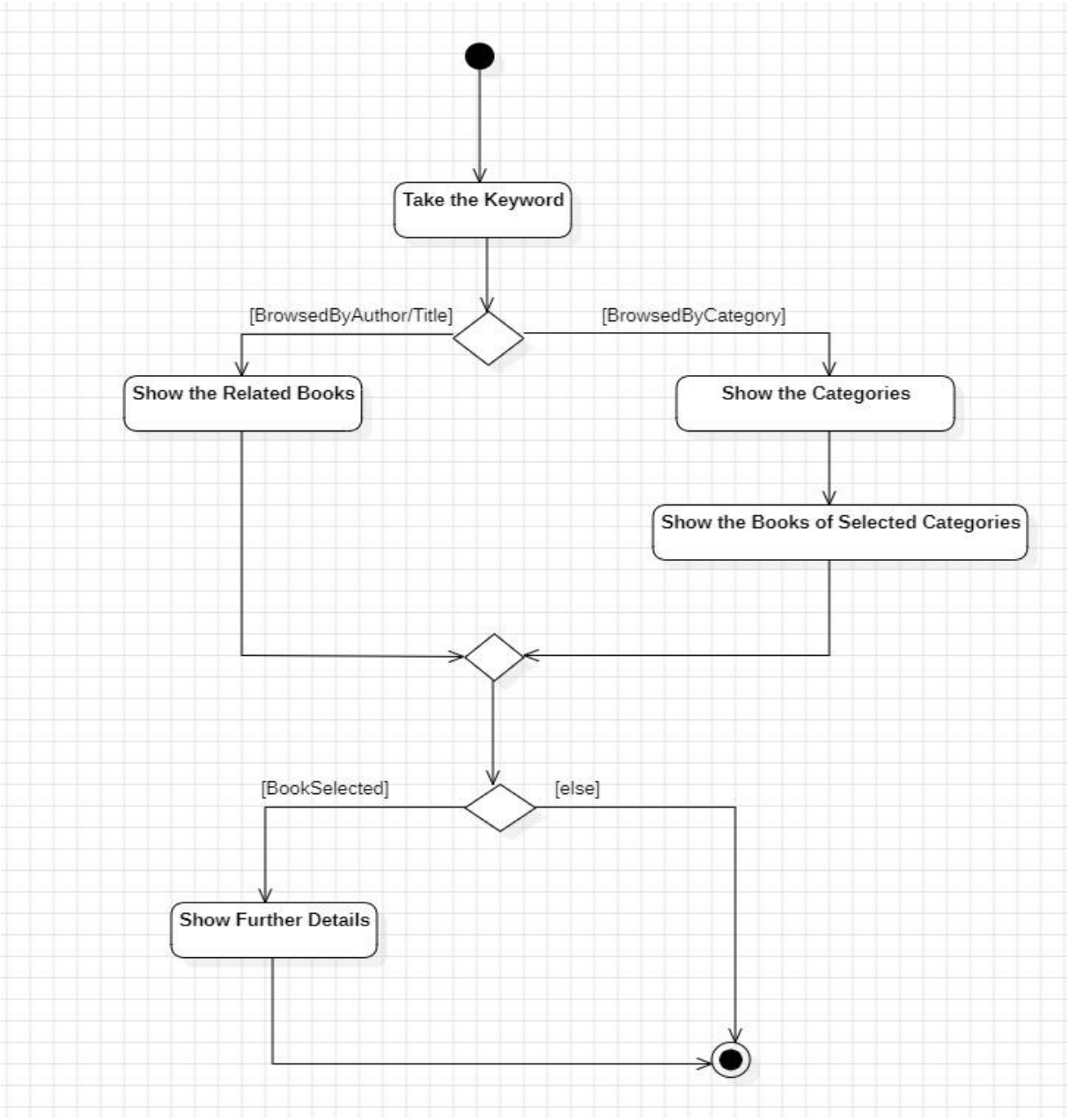

Figure 3: Activity Diagram of Browse

Design Rationale: System takes keyword from the user for performing browse operation. If the received keyword is author or title, list of related books will be displayed to user. If the keyword is category, list of available categories will be displayed to user. System asks user for selecting category or categories. After that, list of related books will be displayed

to user. If there is any selected book from the list of related books, user will see details of selected book.

Shopping Cart Activity Diagram

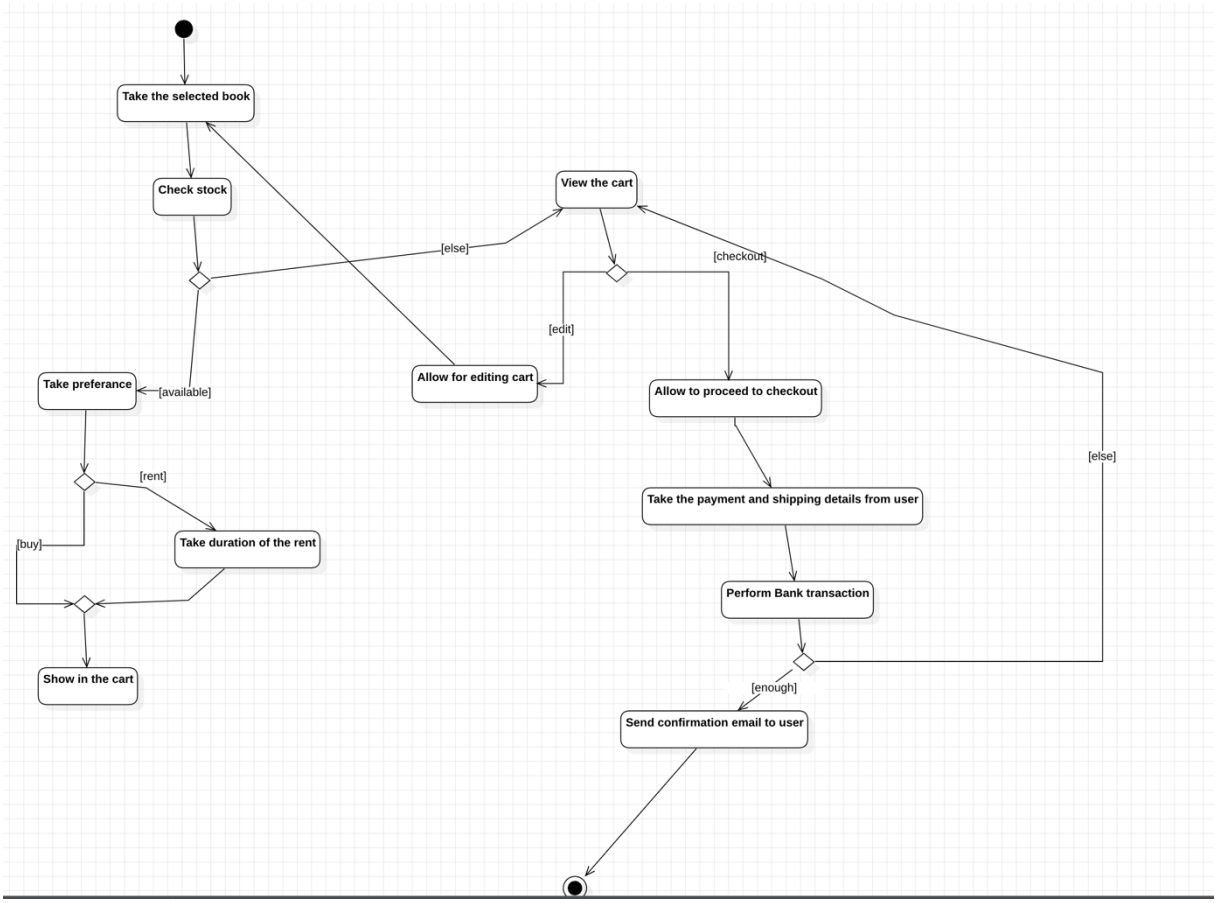

Figure 4: Activity Diagram of Shopping Cart

Design Rationale: System waits selected book for adding selected book to shopping cart. System will control the stock of the book. If there is enough stock, system asks user preference about buying or renting books. If user selects renting books, system asks user duration of rent time. After that, selected book is added to shopping cart. If there is not enough stock, system sends user viewing cart operation. User can add new books to shopping cart by editing the cart. Also, while viewing, user can proceed to checkout. If users proceed to checkout, system ask user shipping and payment details. After that bank transaction processes will be

performed. If result of bank transaction is successful, system sends confirmation email to user via google. If payment is failed, user goes back to view shopping cart again.

View History of Order Activity Diagram

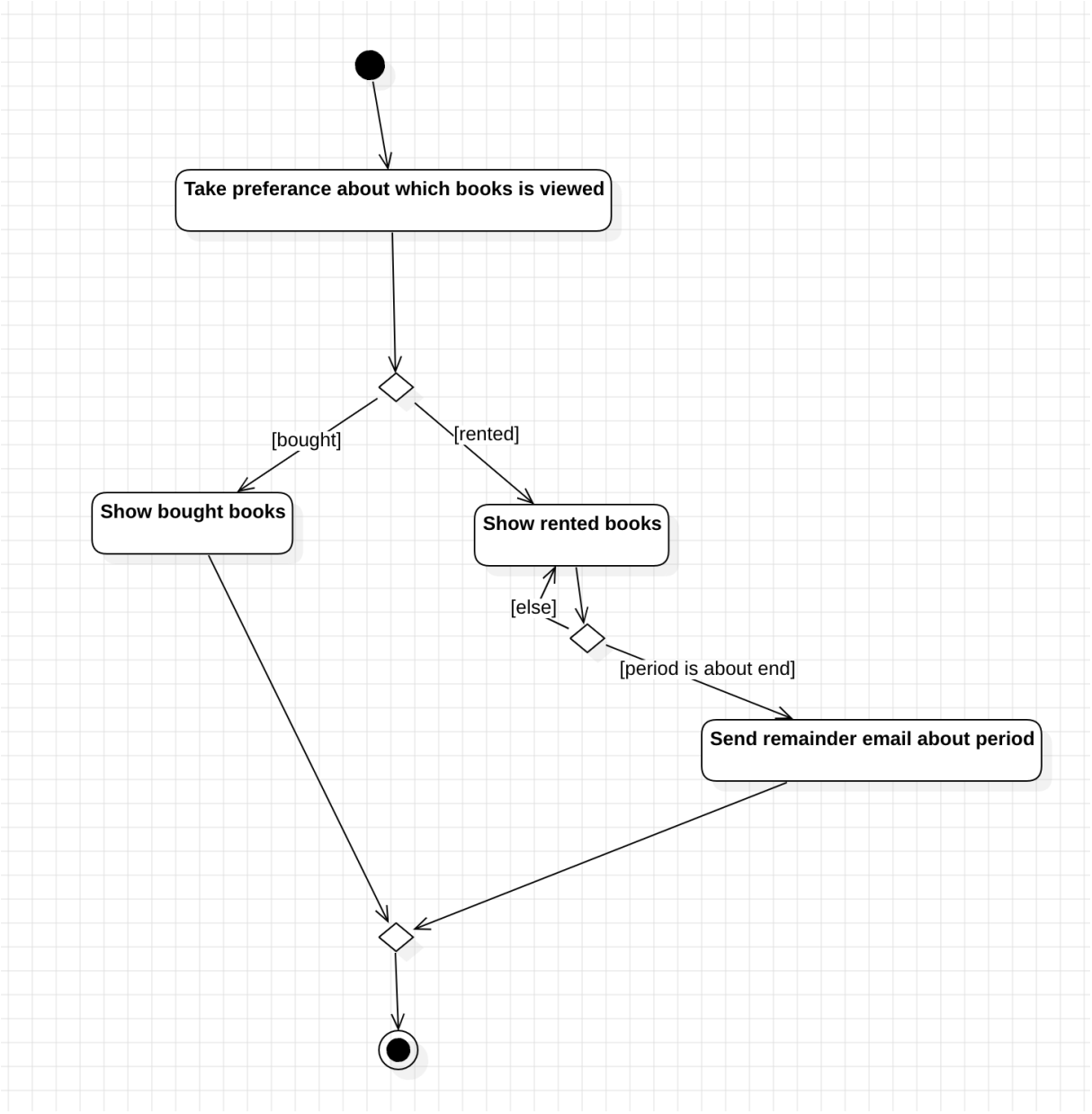

Figure 5: Activity Diagram of View History of Order

Design Rationale: System takes parameter from the users about which types of books they want to see based on the bought and rented books. If user selects bought, bought books will be displayed to user. If user selects rented, rented books will be displayed to user. In

addition, if the period of rented book is about end, system sends email about remaining duration to user via Google.

Admin Operations Activity Diagram

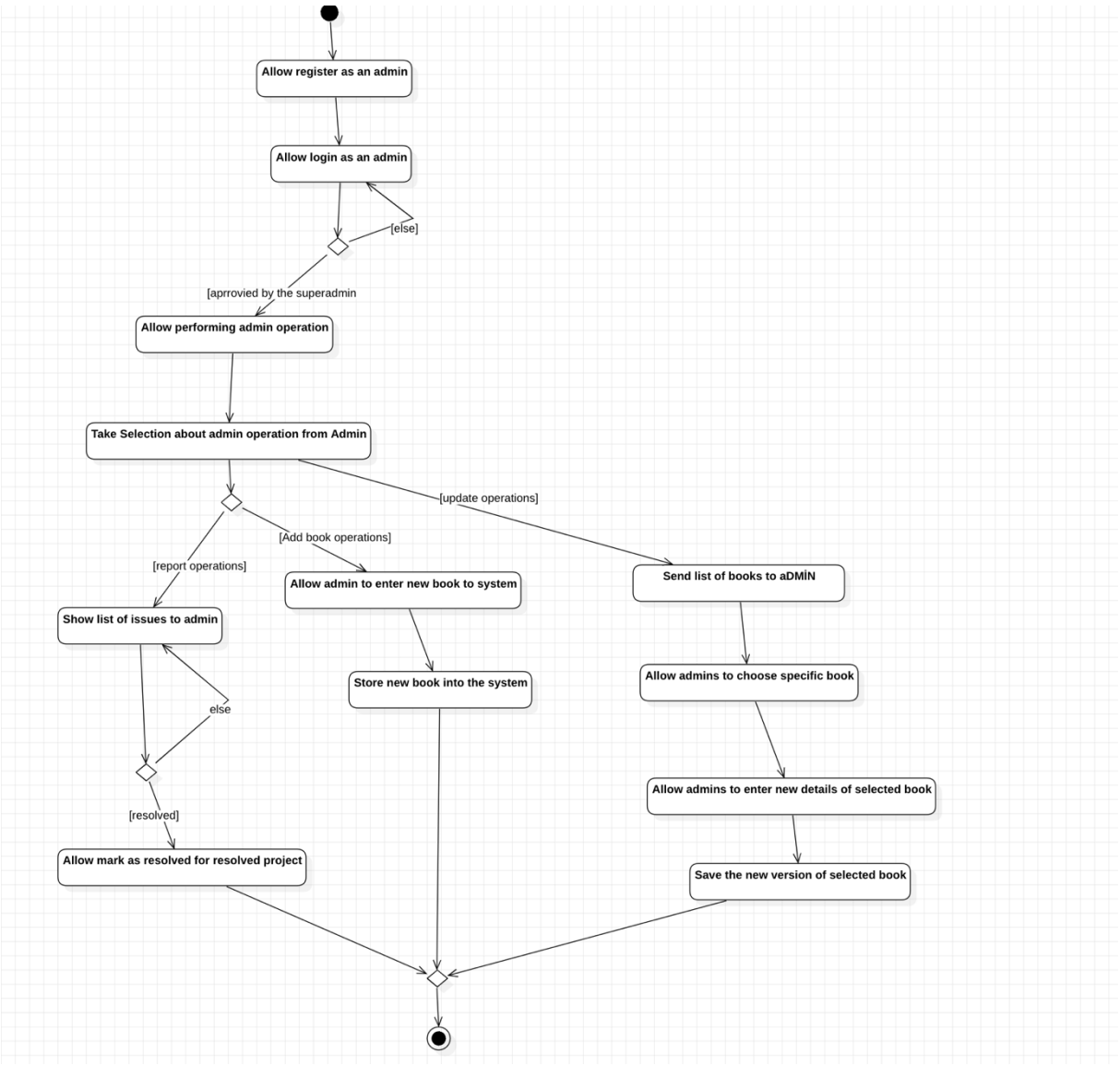

Figure 6: Activity Diagram of Admin Operations

Assumption: Only registered user can register as an admin.

Design Rationale: Registered users can register as an admin to system. However, for every login to admin panel which privileged operations take place, admins need approval by the super admin. If admins cannot get approval by the super admin, they go back to login

process. If admins get approval by super admin. System allow super admins to perform their privileged operations. System takes parameter from admins to determine which operation they want to perform. If admin wants to address issues that are submitted by the users, system will show list of issues to admins. If they resolved issue, system allows for marking this issue as resolved. Otherwise, this issue still displayed in the list of issues. If admins want to add new book to system, system allow admins to enter new book by asking its' details. After that, created new book is stored into the system. If admin wants to update the existing book, system will send the list of existing books in the system. After that, system allows admin to select specific book for entering new details of selected book. System saves new details of selected books finally.

Stream and Chatting Activity Diagram

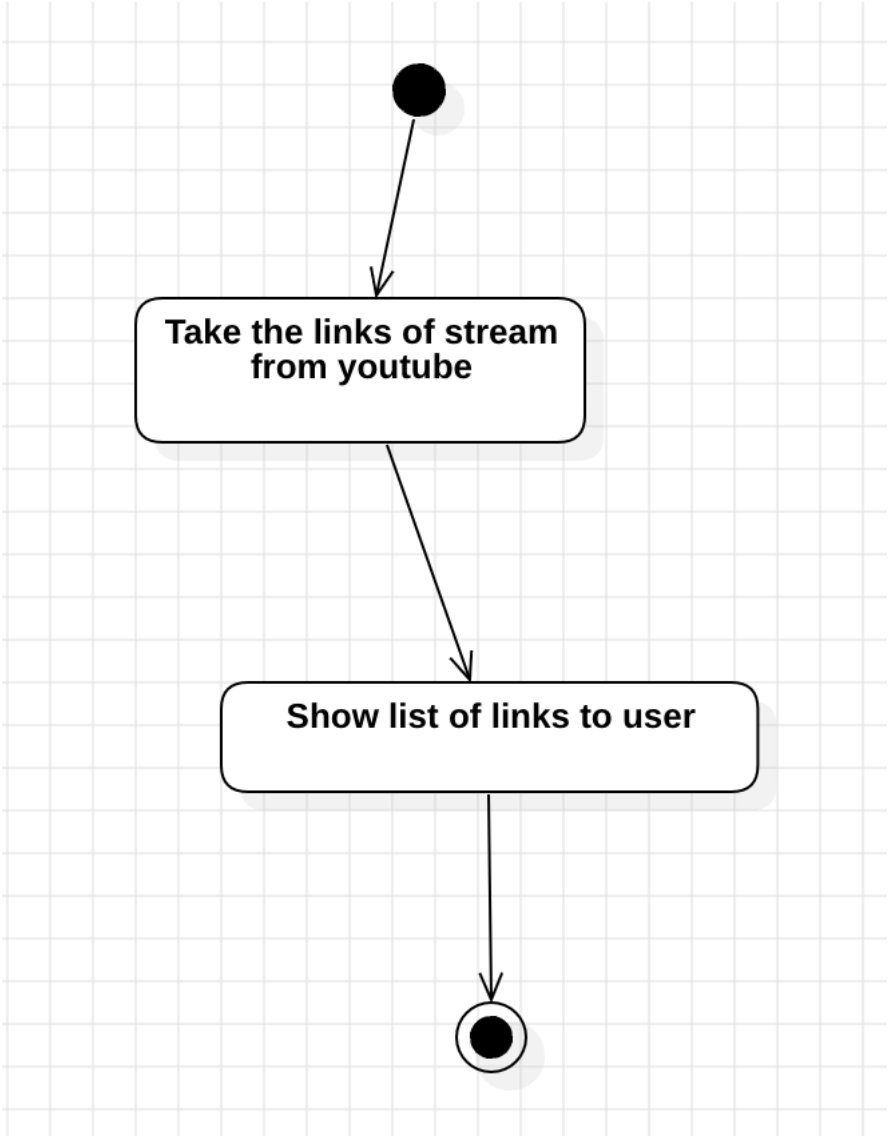

Figure 7: Activity Diagram of Stream and Chatting

Design Rationale: System take list of links of stream where books are read aloud and providing interacting live chatting via YouTube. After system receives links from YouTube, again system will show the list of links to user. User can go to stream and chat with other users in the stream by clicking the link in the system.

3.1.3 Sequence Diagrams

Add Book Sequence Diagram

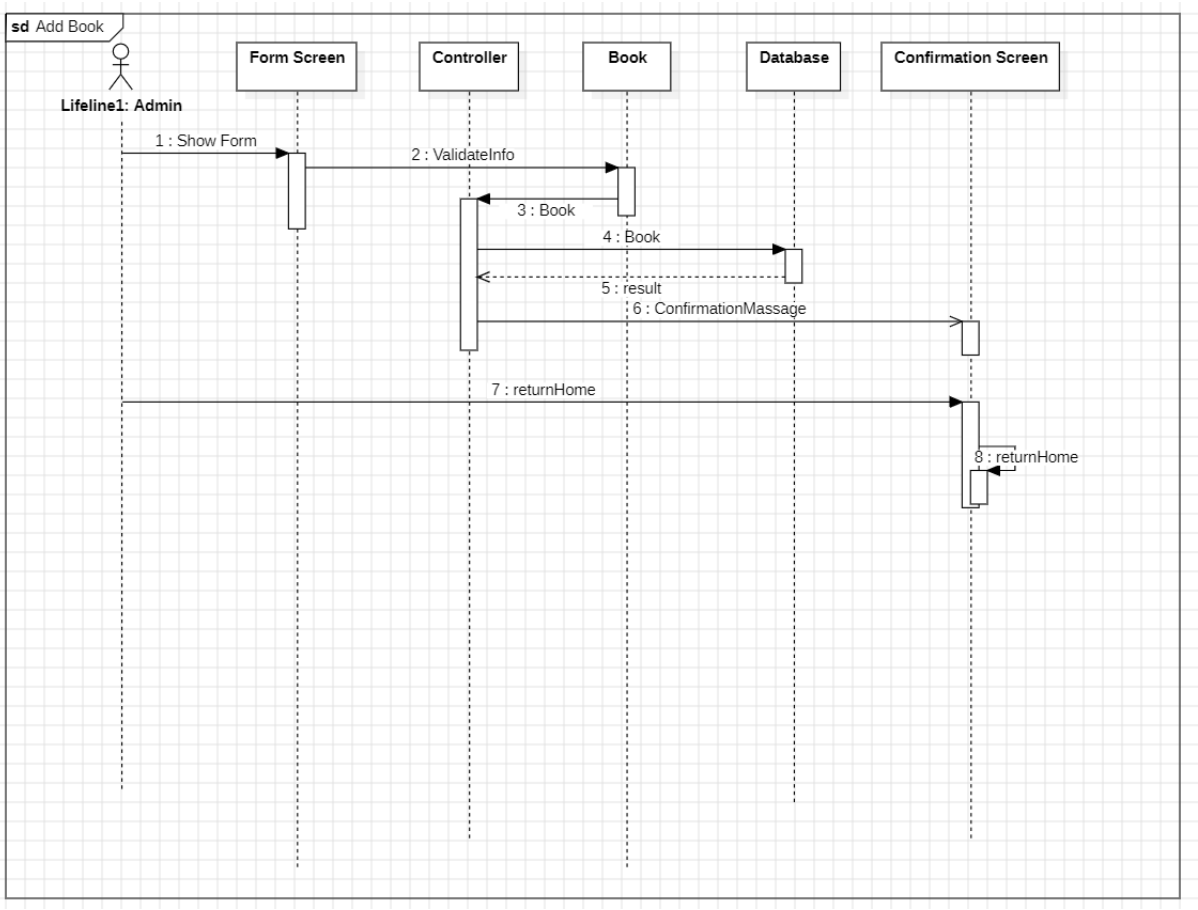

Figure 8: Add Book Sequence Diagram

Design Rationale: Add book sequence diagram is a diagram that shows the interactions between the admin and the system during the process of adding a new book to the system. After the admin enters the necessary information on the form screen, the book is added to the database via the controller. After the admin addition process is completed successfully, you will be directed to the confirmation screen. Admin can send a request to the confirmation screen to return to the home page.

View Cart and Checkout Sequence Diagram

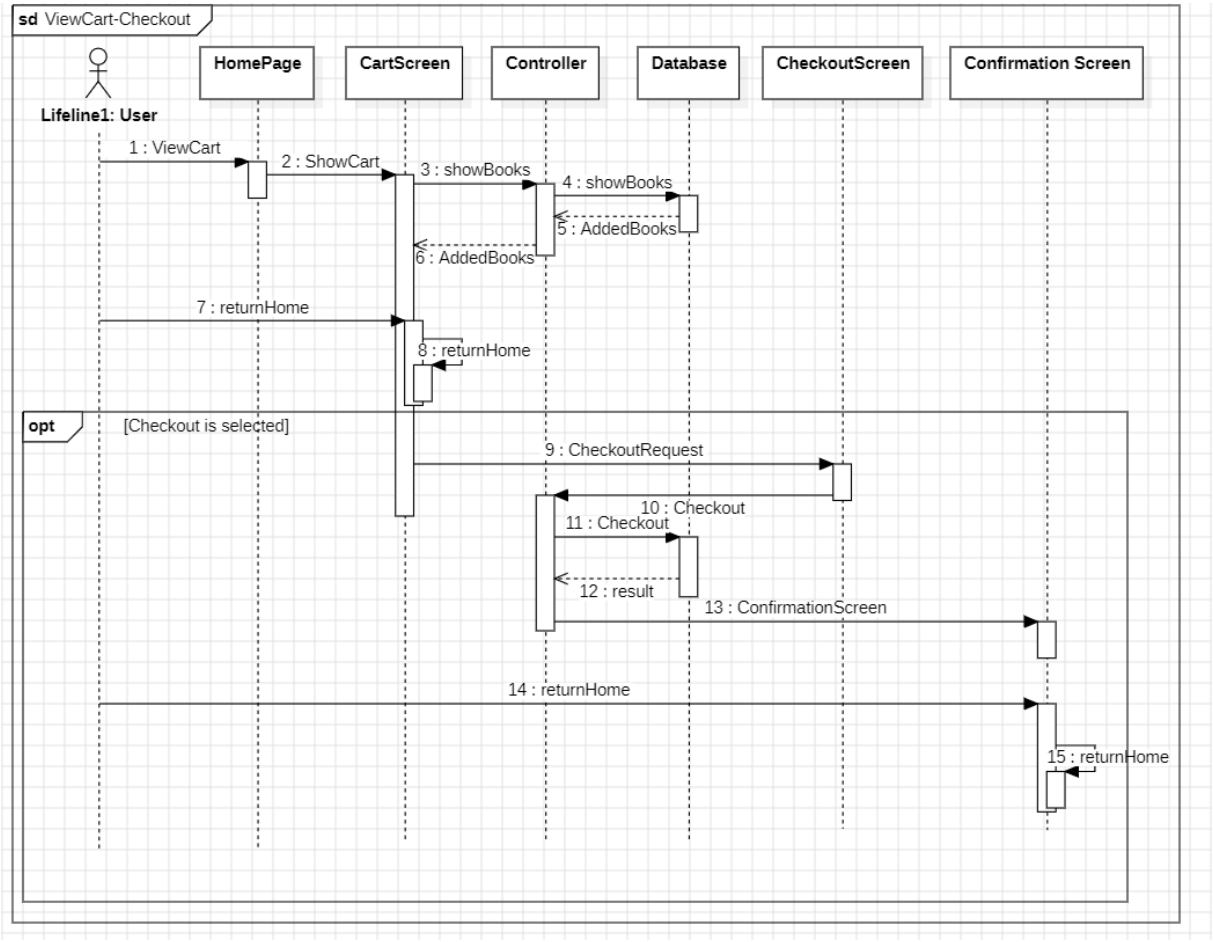

Figure 9: View Cart and Checkout Sequence Diagram

Design Rationale: View Cart and Checkout sequence diagram is a diagram that shows the interactions between the user and the system while viewing the cart and checking out. The user can send a request to display the cart on the home page and the cart is displayed via the controller. If the user does not want to check out, they can return to the main screen. If the user wants to check out, they are directed to the checkout screen and when the process is completed successfully, they are directed to the confirmation screen. The user can return to the home page from this screen.

See History of Order Sequence Diagram

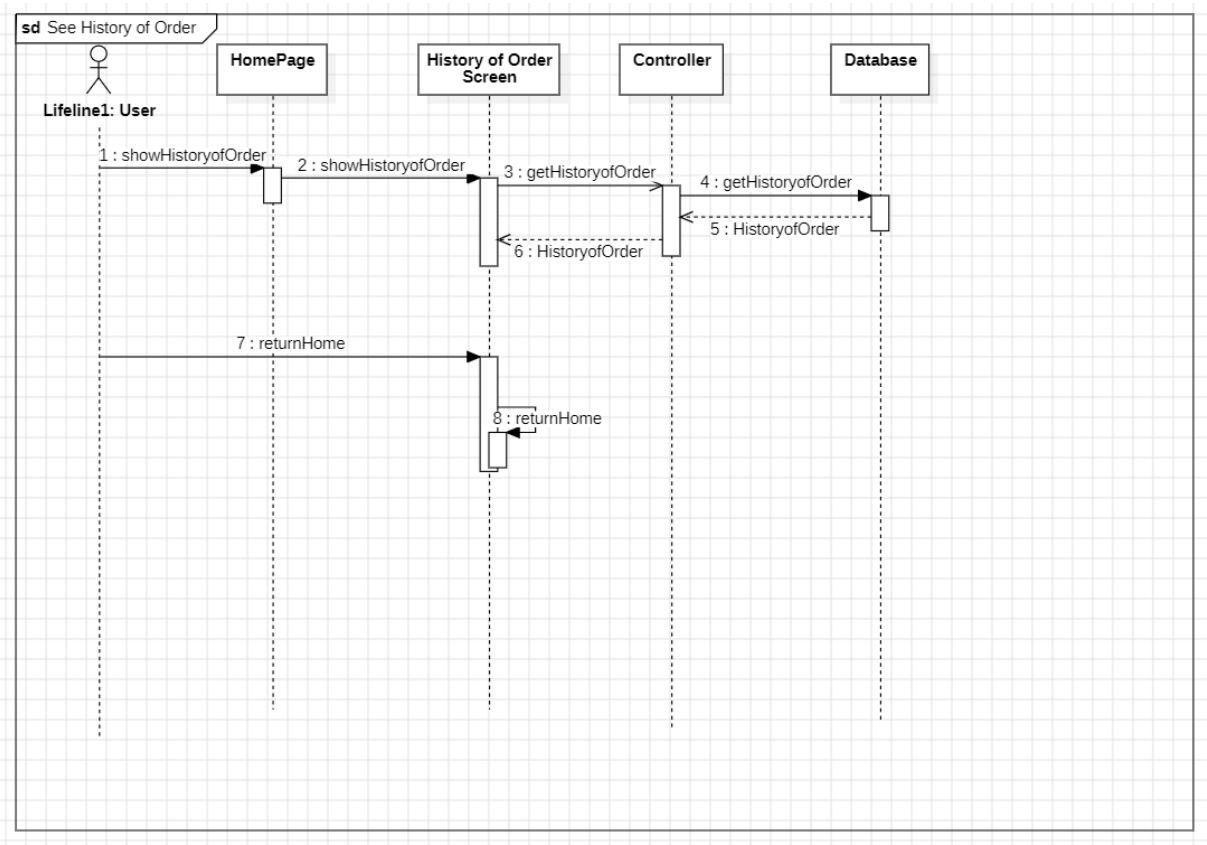

Figure 10:See History of Order Sequence Diagram

Design Rationale: The See History of Order sequence diagram shows the relationship between the user and system while viewing history of order. After the user is directed to the relevant screen on the home page, he can view the order history via the controller. The user can return to the home page from this screen.

Update Book Sequence Diagram

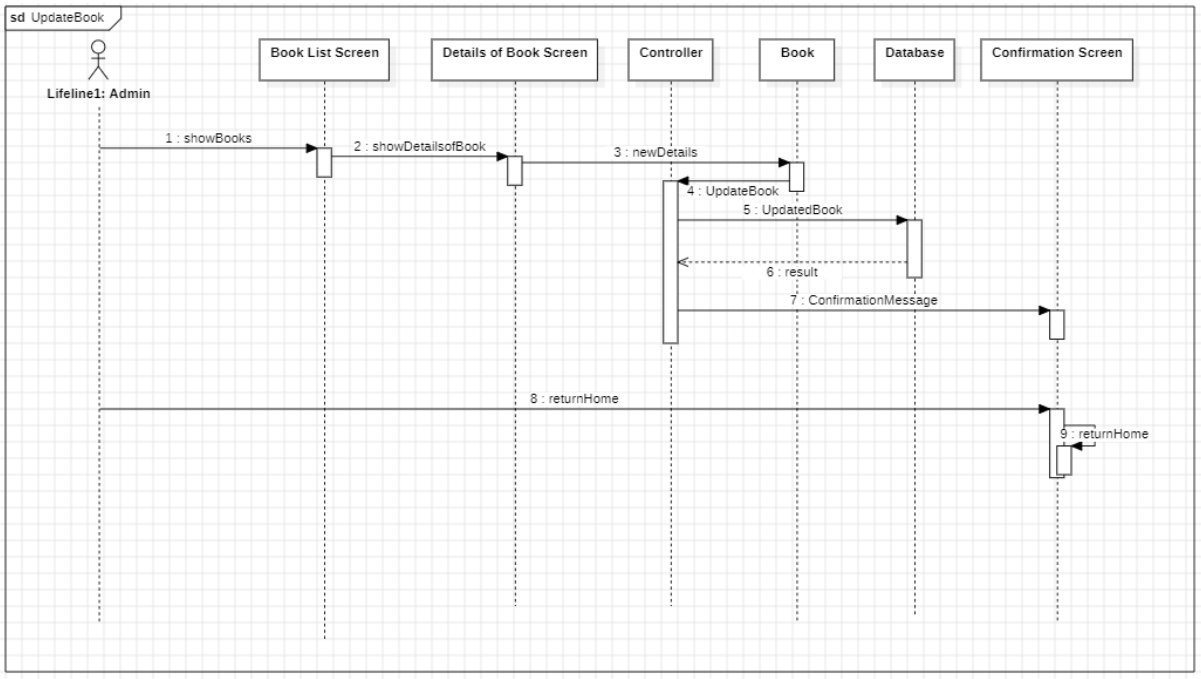

Figure 11: Update Book Sequence Diagram

Design Rationale: The Update Book sequence diagram shows the relationship between the admin and the system when updating the details of an existing book. The user can view the book list in the database via the controller and update the book details. After the update process is completed, admin will be directed to the confirmation screen. Admin can return to the home page from this screen.

Report Issue Sequence Diagram

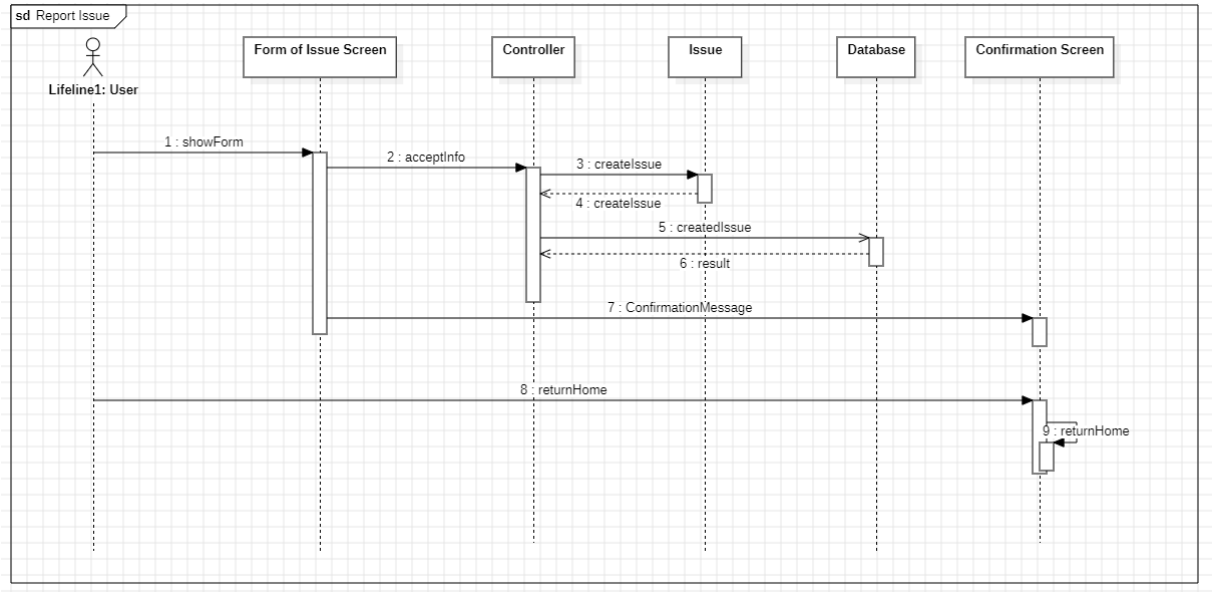

Figure 12: Report Issue Sequence Diagram

Design Rationale: The Report Issue sequence diagram shows the relationship between the user and the system while the user reports an issue. The user sends the necessary information to report a issue to the system by filling form in the form screen, and this issue is sent to the database via the controller. After the process is completed, the user is directed to the confirmation screen. The user can return to the home page from this screen.

Sign-Up Sequence Diagram

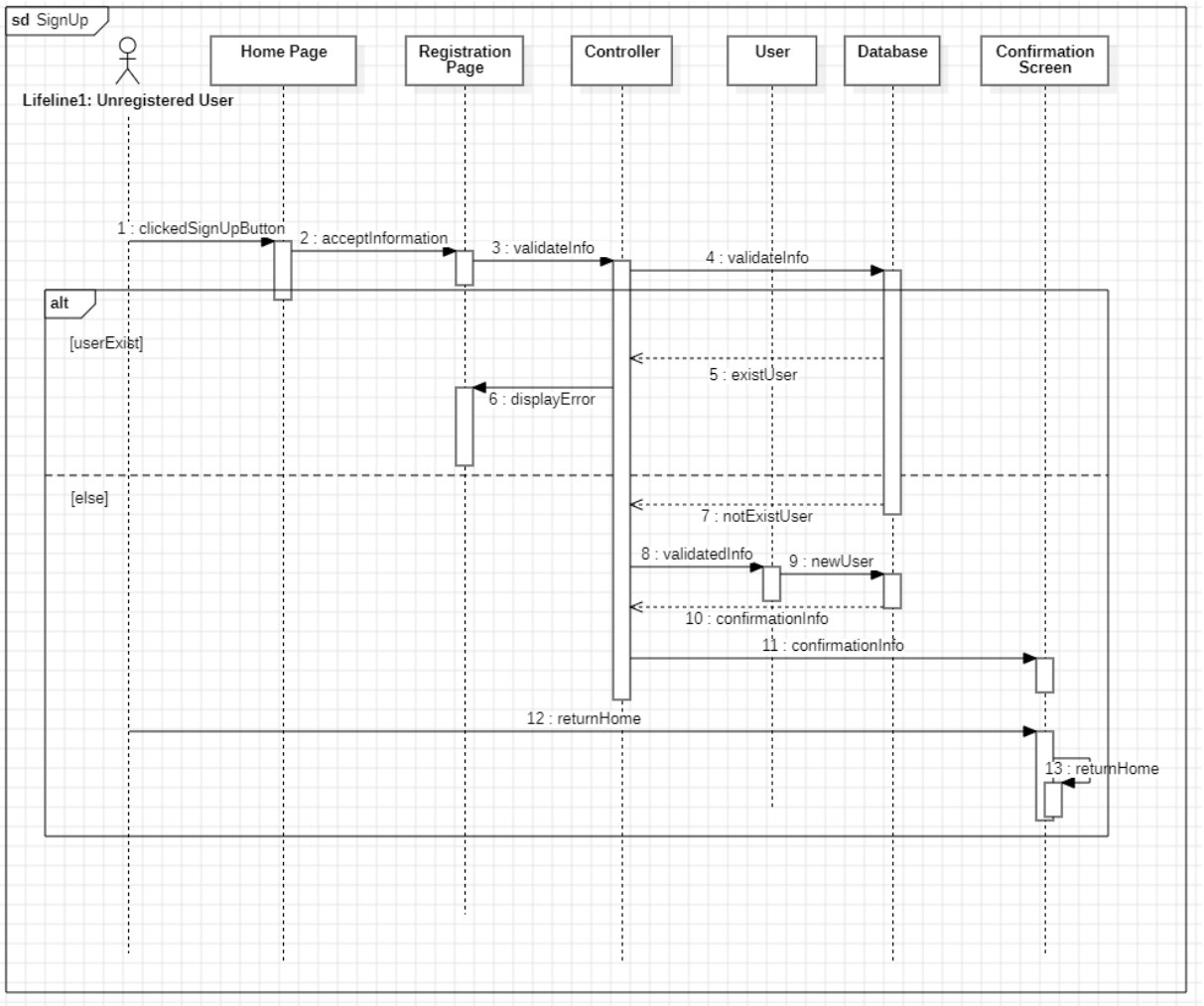

Figure 13: Sign-Up Sequence Diagram

Design Rationale: The Sign-Up sequence diagram shows the relationship between the unregistered user and the system during registration. After the user fills in the required information for registration, a new user is created and saved in the database by checking whether another user with the same information is in the system. Unregistered user can return to the main screen after registering to the system.

Add Book to Cart Sequence Diagram

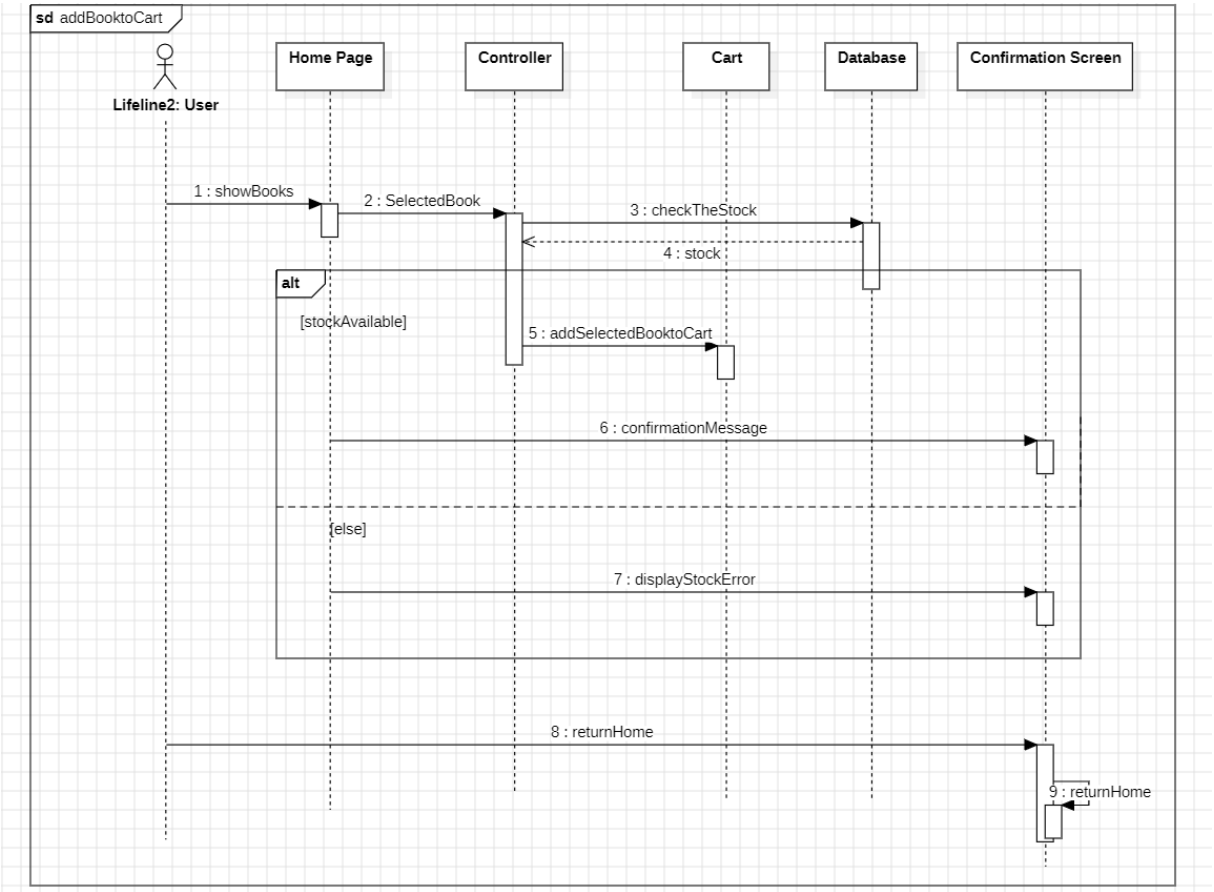

Figure 14: Add Book to Cart Sequence Diagram

Design Rationale: The Add Books to Cart sequence diagram shows the relationship between the user and the system when the user adds a book to his cart. After checking the stock of the selected book via controller, it is sent to the user cart. After process, the user can return to the home page.

Browse by Author Sequence Diagram

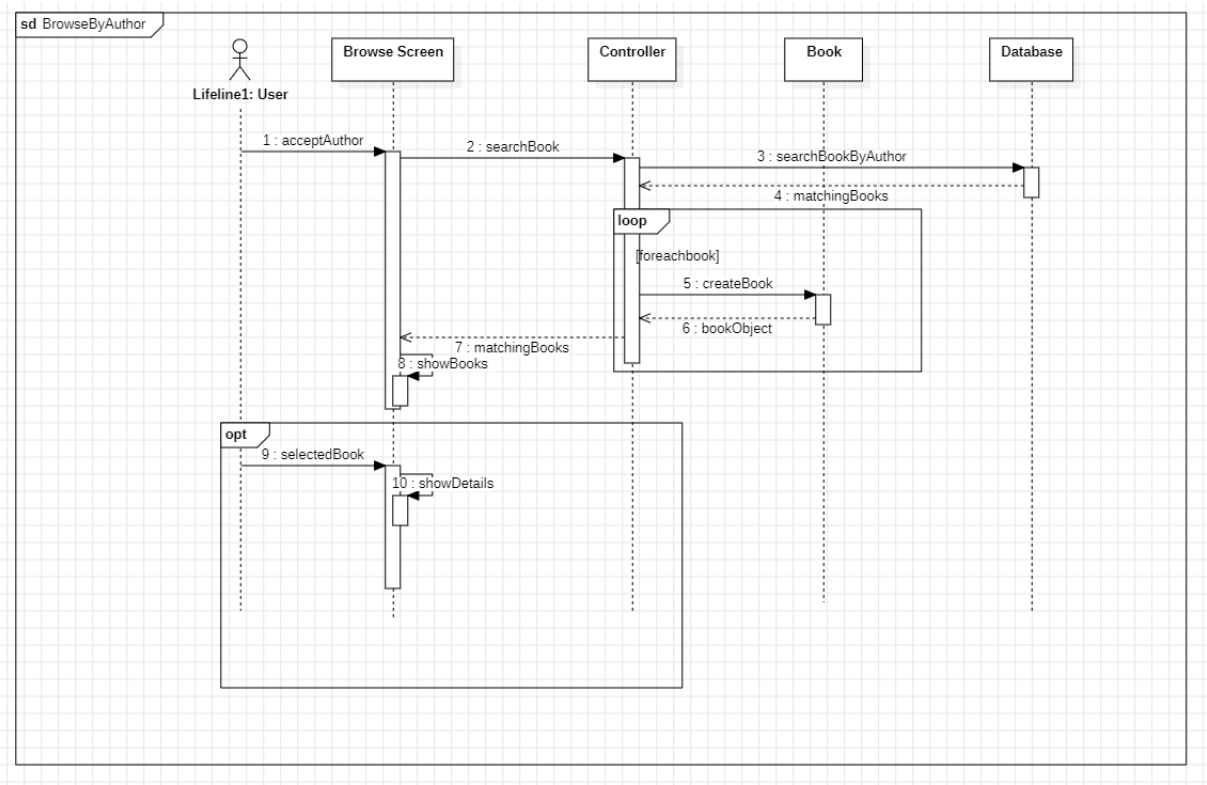

Figure 15: Browse by Author Sequence Diagram

Design Rationale: The Browse by Author sequence diagram shows the relationship between the user and the system while searching for the desired book by the author's name. The user can view its details by selecting a book among the matching books.

These sequence diagrams were drawn to show interactions between actors and the objects within a system. The diagrams that were drawn as a general sequence diagram shows screens, databases, objects, and interactions between them.

3.1.4 Data Flow Diagrams

Context Diagram

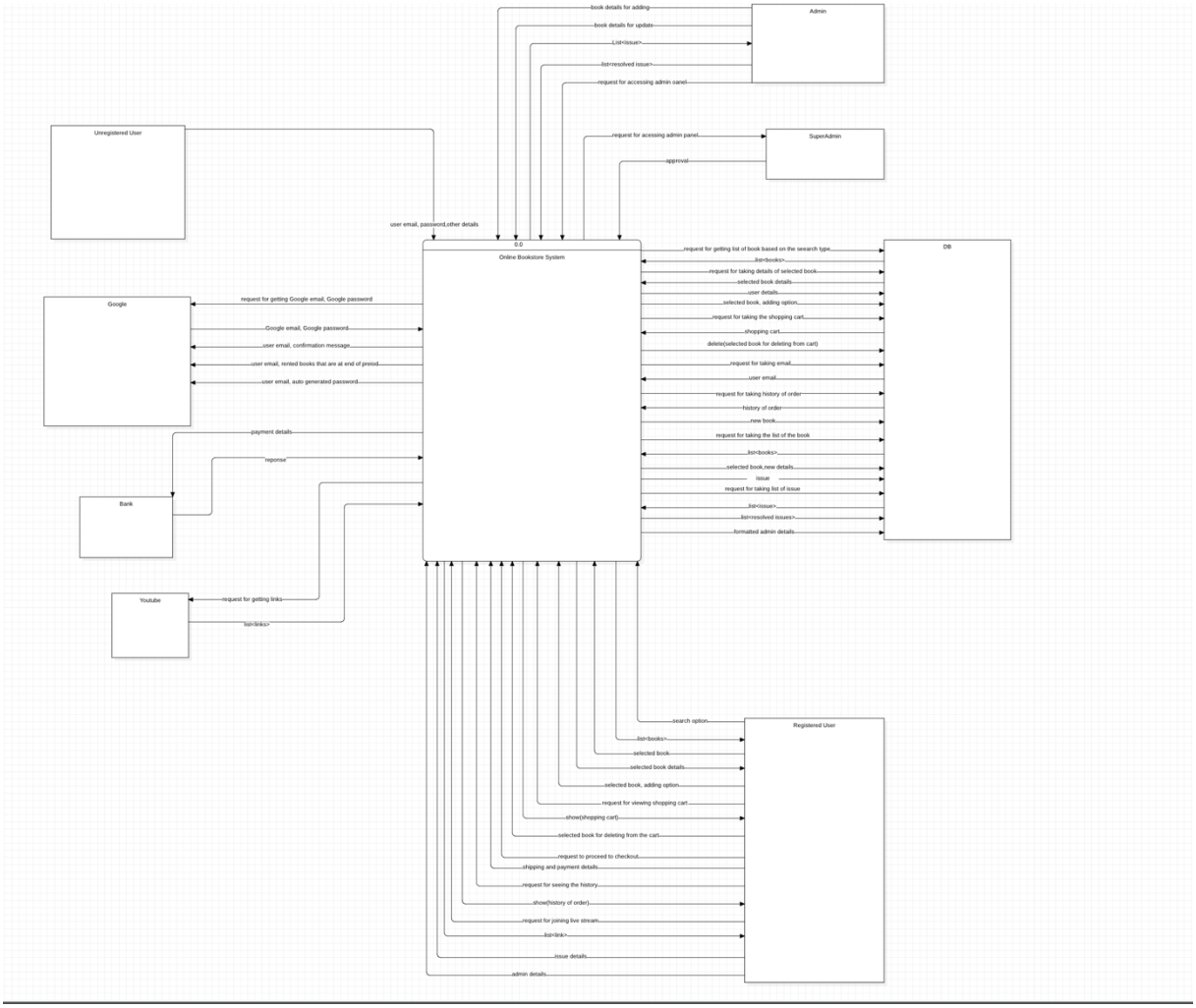

Figure 16: Context Diagram of the System

Design Rationale: In this model, whole bookstore system is accepted as an one system and their input, output, relationship between external system and system itself including database.

Level-0 Data Flow Diagram

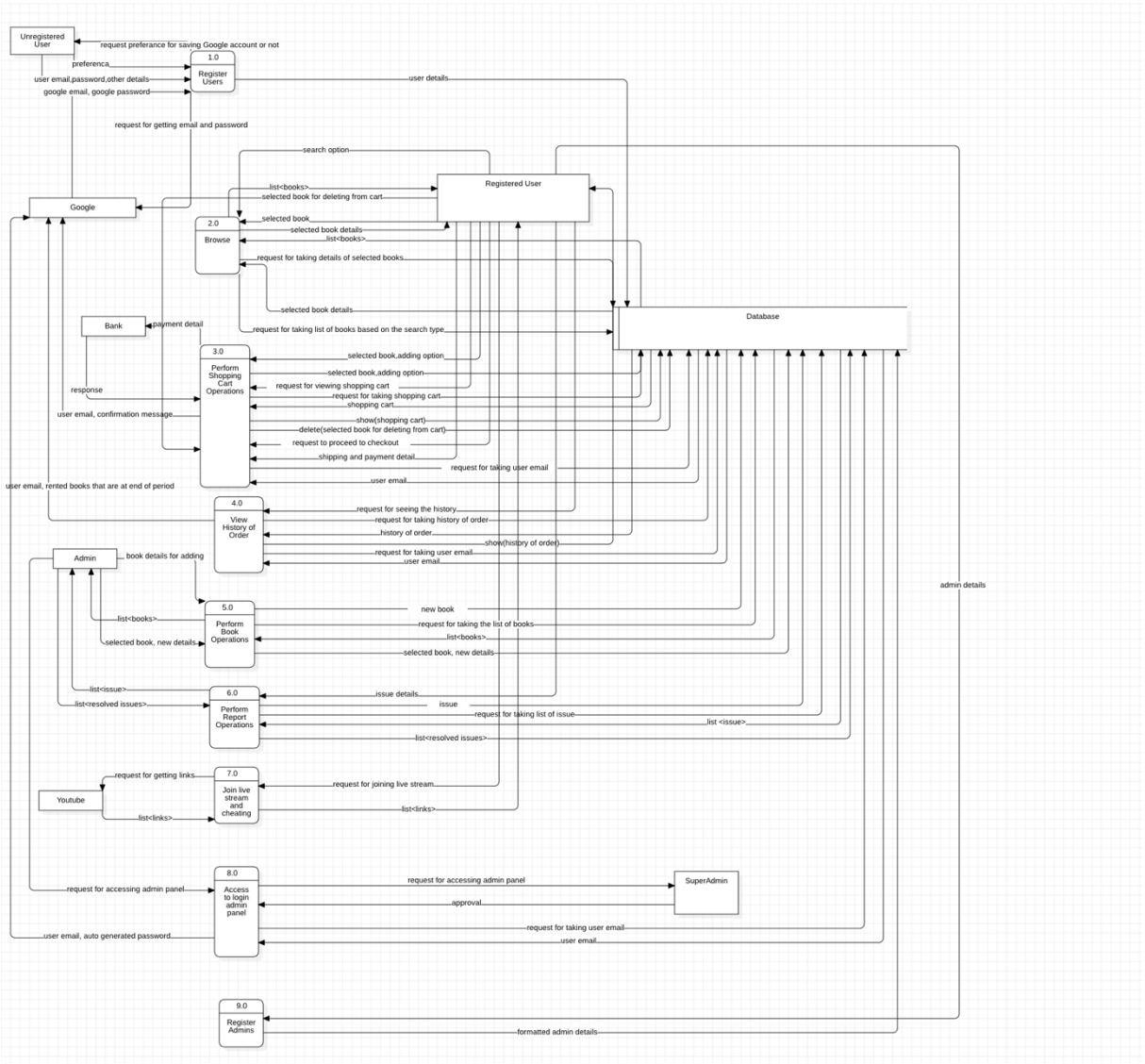

Figure 17: Level-0 Data Flow Diagram of the System

Design Rationale: In the level 0 data flow diagram, system is decomposed of major processes. Input, output relationship that is in context diagram are separated between major processes. Every input and output will be stated clearly at level-1 diagram.

Level-1 Data Flow Diagrams

Register as User Level-1 Data Flow Diagram

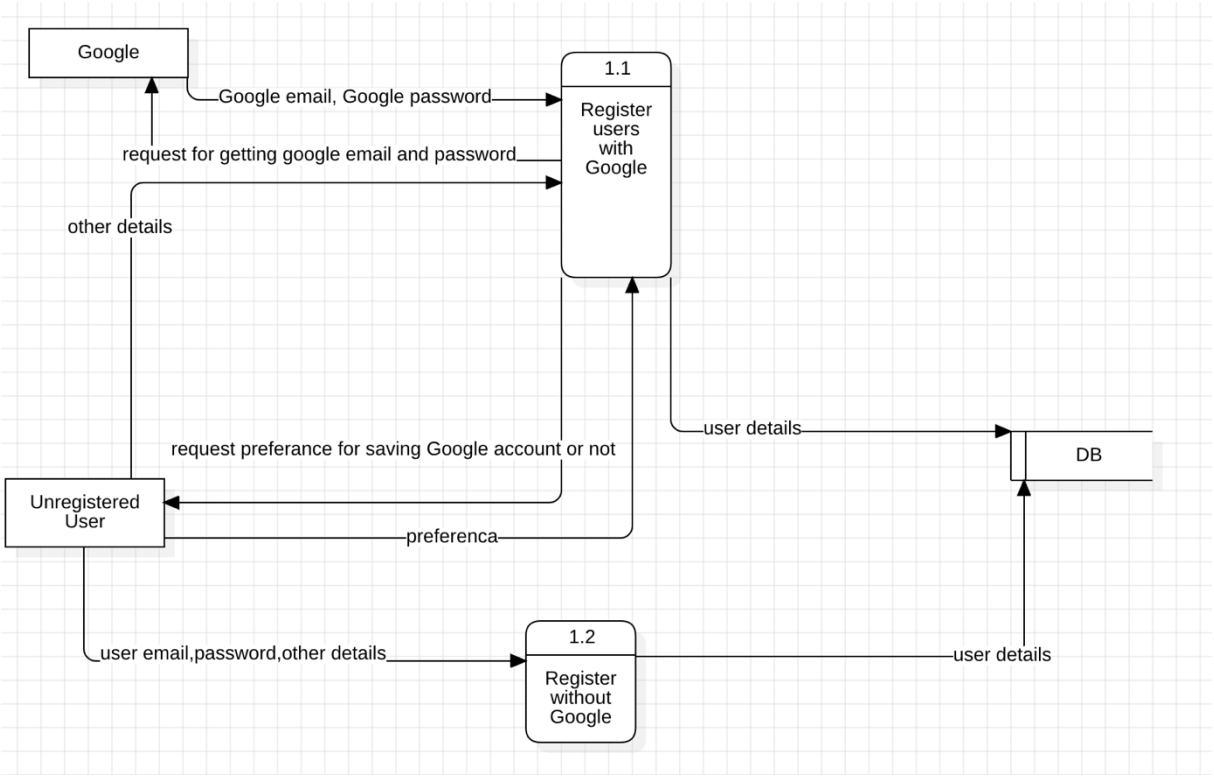

Figure 18: Register as User Level-1 Data Flow Diagram

Design Rationale: This is decomposed version of register users in the level-0 diagram. It has 2 separate processes: register with Google, register without Google. Register with Google send request to Google for taking Google email, and password. After that, system takes other details like full name, phone number. The output of this process is sent to database for storing users. In register without Google, user enters user email, user password, and other details. Also, again output of this process is sent to database for storing users.

Browse Level-1 Data Flow Diagram

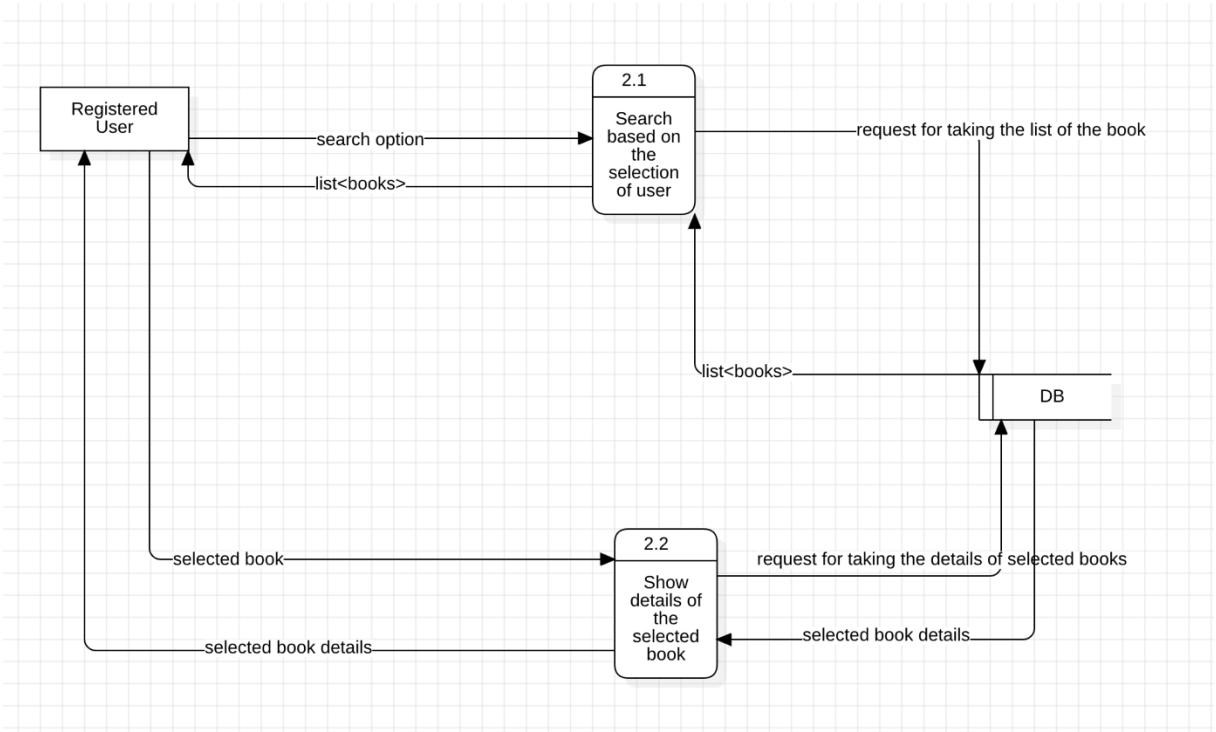

Figure 19: Browse Level-1 Data Flow Diagram

Design Rationale: This diagram is decomposed version of browse process at the level-0. It contains 2 processes: search based on the selection of user, show details of the selected book. Registered user sent search option to process 2.1. After that, based on the selection, process sent request to database for getting the list of related books. Database sent the list of related books to process. Process sent this list to user for showing related books to user. User sent selected book that is selected thanks to list of books that is coming from search operation to process 2.2. Process 2.2 send request for taking details of the book from the database. Database sent selected book details to process 2.2. Process 2.2 sent these details to registered user for showing details.

Shopping Cart Operation Level-1 Data Flow Diagram

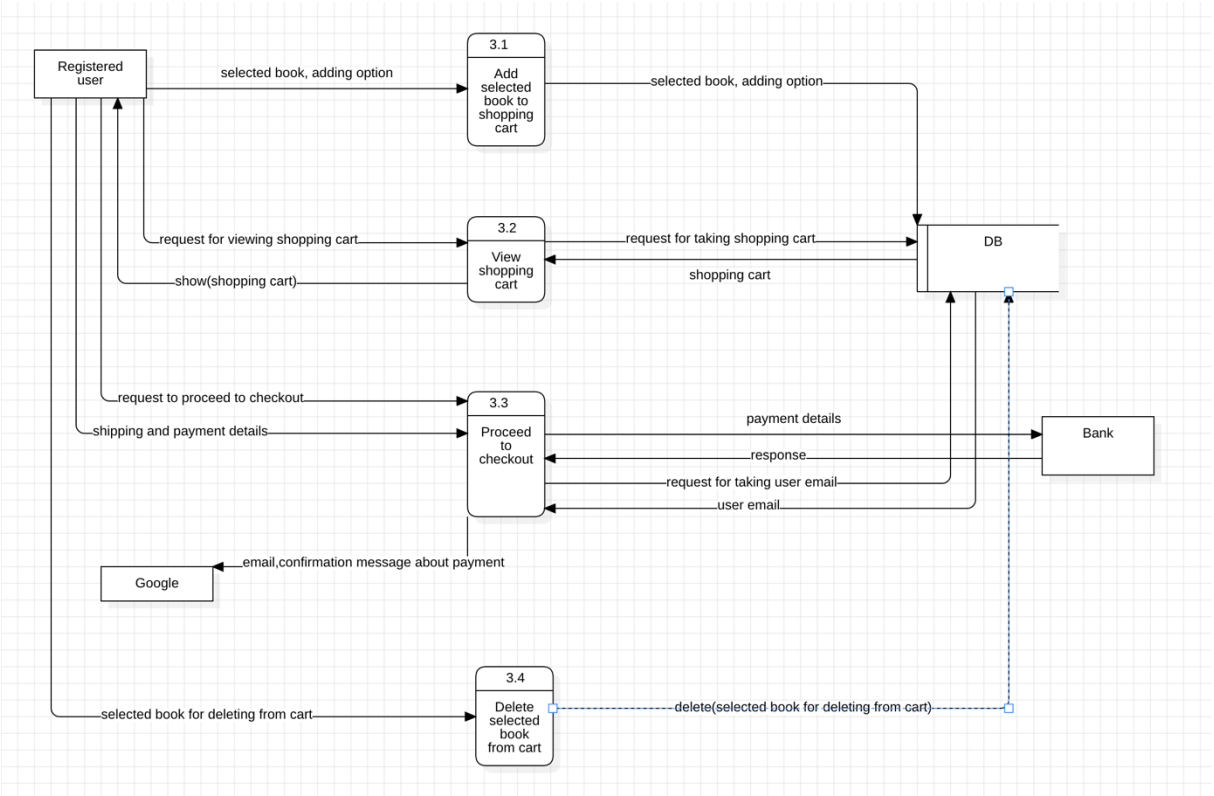

Figure 20: Shopping Cart Operation Level-1 Data Flow Diagram

Design Rationale: This diagram is the decomposed version of perform shopping cart operations in the level-0 diagram. Process 3.1 take the selected book and adding option (buy, rent) from the user. Process 3.2 sent these details to database for storing them in the shopping cart. Process 3.2 take request from the user for displaying shopping cart. Process transfers this request to database for getting shopping cart from DB. Database sent the shopping cart as a response. Process 3.2 sent result of show (shopping cart) function to user for displaying the shopping cart to user. Process 3.3 take request from the user to proceed to checkout. Process 3.3 sent payment details to bank for performing bank transaction. As a result of bank transaction, bank sent response to 3.3 process. If the transaction is successful, process 3.3 sent request to bank for getting user email, database sent user email to process 3.3 as a response. This email and content (verification message) is sent from process 3.3 to Google for sending

confirmation email about payment. Process 3.4 takes selected book input for deleting from the cart from the user. Process sent delete (selected book for deleting from cart) function to database for deleting this book from database.

Assumption: Editing cart means adding new books to cart and deleting existing books from shopping cart.

View History of Order Operation Level-1 Data Flow Diagram

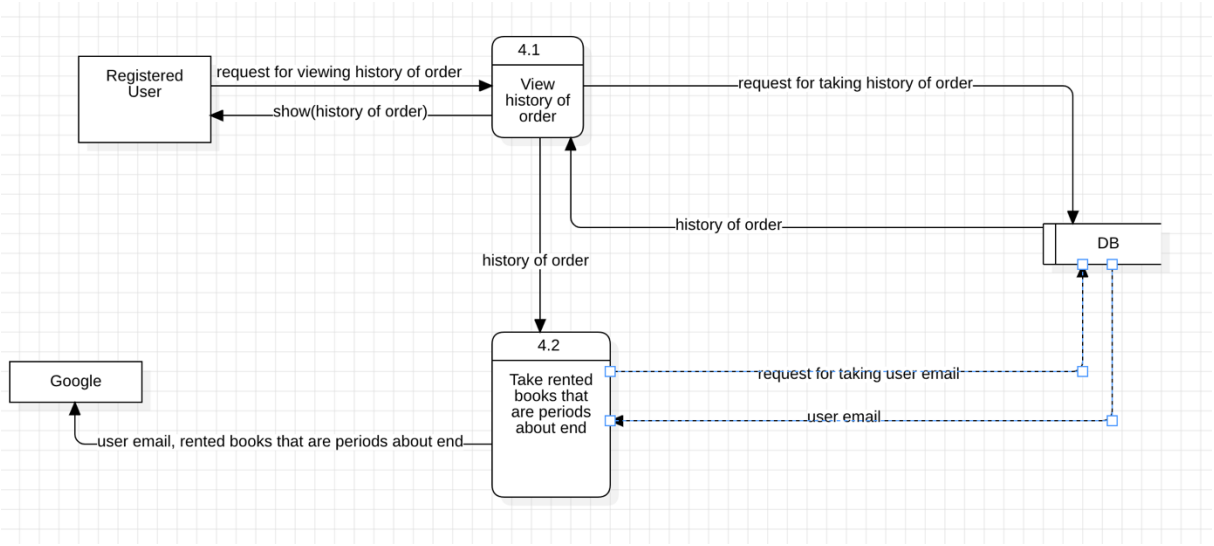

Figure 21: View History of Order Operation Level-1 Data Flow Diagram

Design Rationale: This diagram is decomposed version of view history of order process in the level-0 diagram. User sent request to process 4.1 for viewing history of order. Process 4.1 transform this incoming request to database for taking the history of order. Database sent history of order as a response to request. After that show (history of order) function is sent from process to user for displaying history of order to user. History of order is also sent to process 4.2 for determining which rented books' duration time is about end. After that, process sent request for taking user email, database sent user email to process a response to request that is coming from process. Finally, process sent user email, and determined rented books are sent to Google for sending email about rented books which their duration time is about end to user.

Perform Book Operations Level-1 Data Flow Diagram

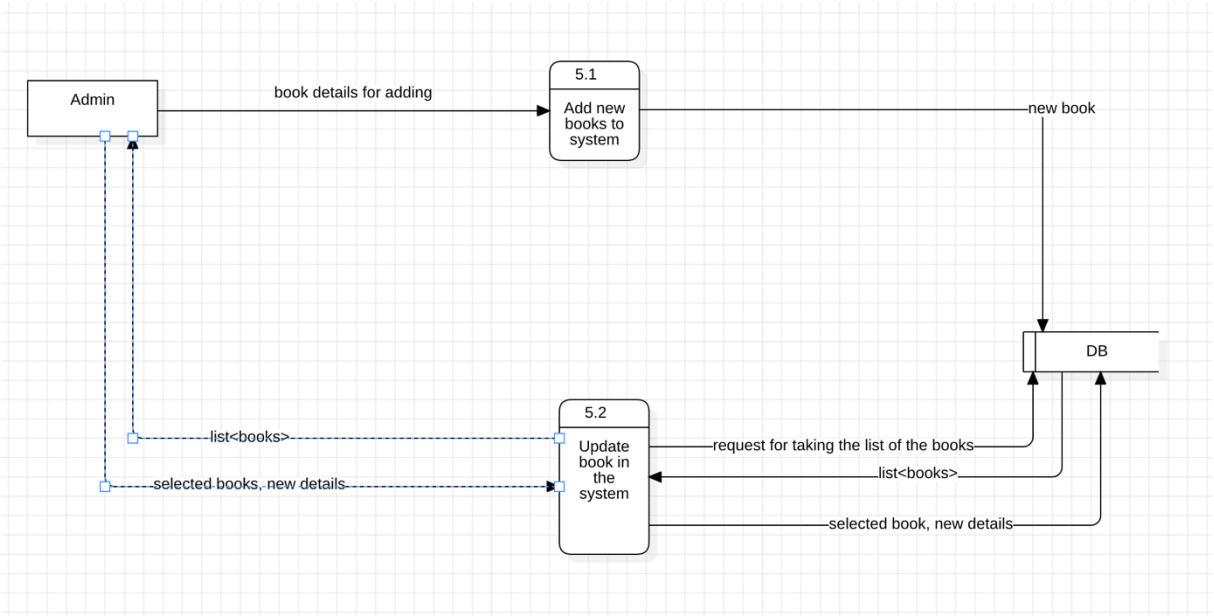

Figure 22: Perform Book Operations Level-1 Data Flow Diagram

Design Rationale: This diagram is the decomposition version of perform book operations process in the level-0 diagram. Process 5.1 is used for adding new books to system. It takes book details of the new book from the user, and the output of this process is sent to database for storing new book in the system. Process 5.2 is used for updating the existing books in the system. To do that, process 5.2 sent request to database for taking the list of existing books in the system, database sent list<books> to process as a response to request that is coming from process. After that, this list of books is sent from process to user for showing the current books to user. User sent selected books, that is selected from the list of books coming from process, and new details to process for updating the existing selected book. Finally, for storing new details of book selected book and new details are sent to database.

Perform Report Operations Level-1 Data Flow Diagram

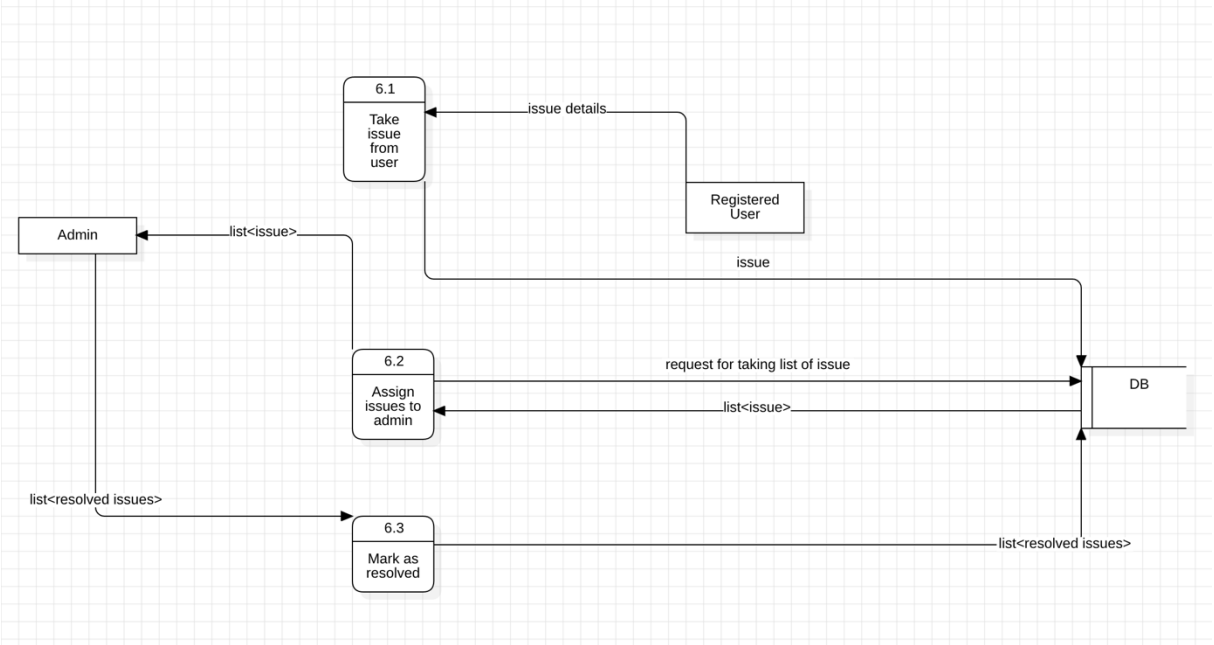

Figure 23: Perform Report Operations Level-1 Data Flow Diagram

Design Rationale: This diagram is decomposed version of perform report operations process in the level-0 diagram. Process 6.1 takes issue details from the user, and process sent this issue details as an issue to database for storing issues in the DB. Process 6.2 is used for taking the list of existing issues and assign them to admin. Process 6.2 sent request for taking the list of issues to database, database sent list of issue to process as a response to request. Process 6.2 sent list of issue coming from database to admin. Process 6.3 take list of resolved issues from admin for marking them as resolved, and process sent list of resolved issue that is coming from admin is sent to database for storing resolved issues into the system.

Join Live Streaming Channel and Interactive Chatting Level-1 Data Flow Diagram

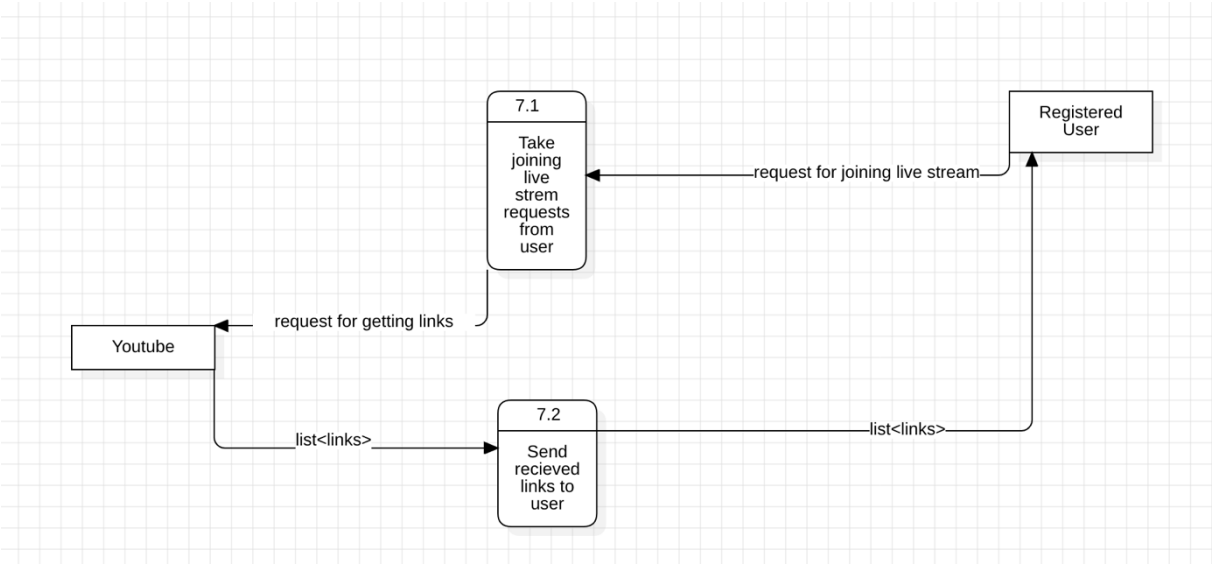

Figure 24: Join Live Streaming Channel and Interactive Chatting Level-1 Data Flow Diagram

Design Rationale: This diagram is decomposed version of the join live stream and chatting process in the level-0 diagram. Registered users send request for joining the live stream into process 7.1. Process 7.1 send request to YouTube for getting list of links of stream. YouTube sent list of existing stream links to process 7.2. Process 7.2 sent list of links that are coming from YouTube to user for showing them to user.

Access to Login Admin Panel Level-1 Data Flow Diagram

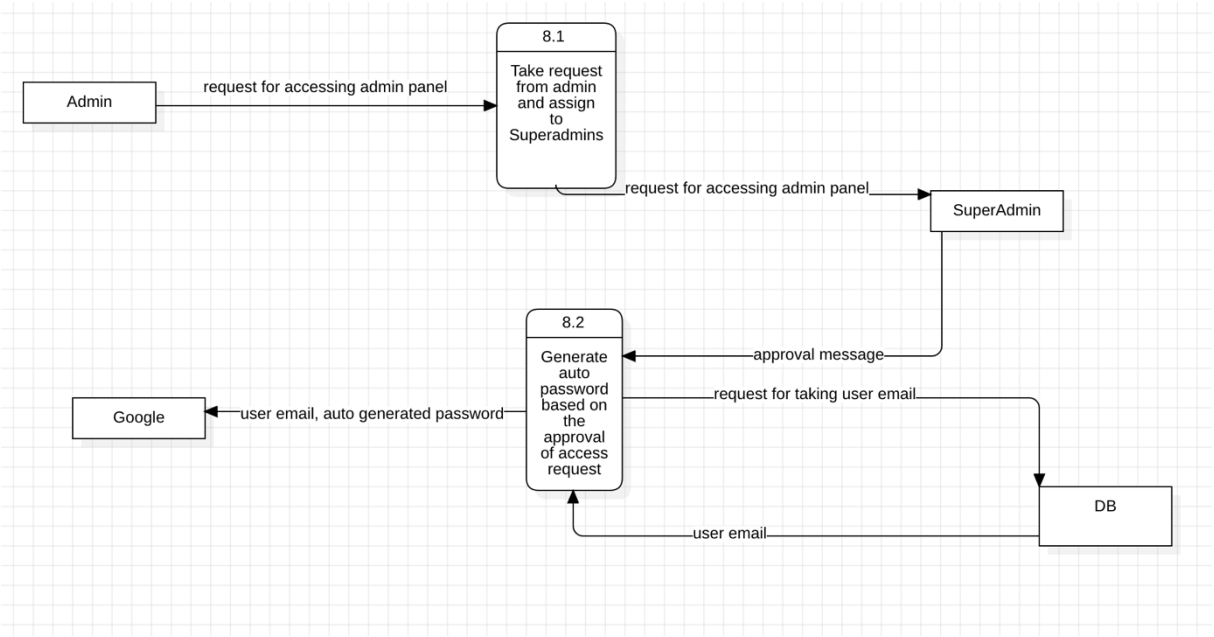

Figure 25: Access to Login Admin Panel Level-1 Data Flow Diagram

Design Rationale: This diagram is the decomposed version of Access to Login Admin Panel process in the level-0 diagram. Process 8.1 is used for taking access request from admin and assign them to super admin for evaluation. Super admin does the evaluation and sent approval message to process 8.2. Process 8.2 takes user email from the database, and it generates auto generated password for allowing admins to login. Process 8.2 sent user email and auto generated password to Google for emailing auto generated password to admin.

Register as Admin level-1 Data Flow Diagram

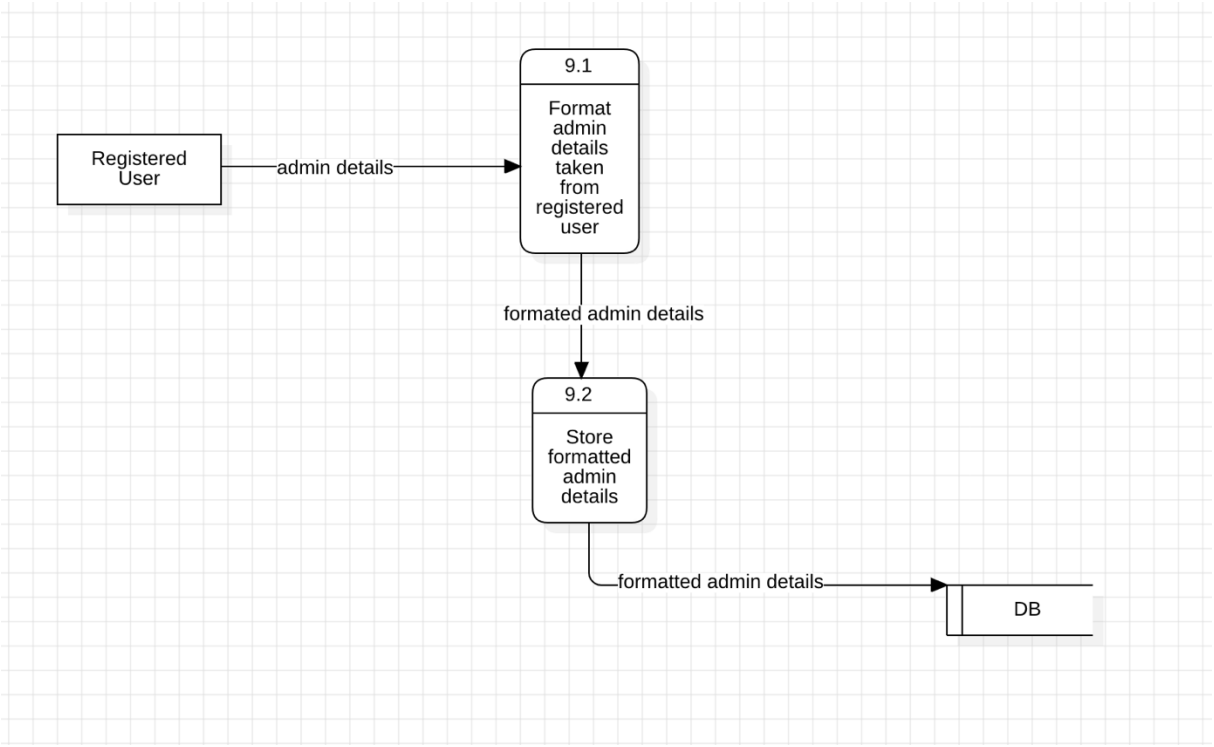

Figure 26: Register as Admin level-1 Data Flow Diagram

Design Rationale: This diagram is the decomposed version of Register Admin process in level-0 diagram. Process 9.1 take admin details from the user, and it format admin details. After that, it sent formatted admin details to process 9.2 to store admins information at the database.

Assumption: Only registered user can register as an admin to system.

3.2 Development View and Physical View

The development view shows how the software is decomposed for development, and the physical view shows the mapping of software onto hardware.

3.2.1 Component Diagram and Deployment Diagram

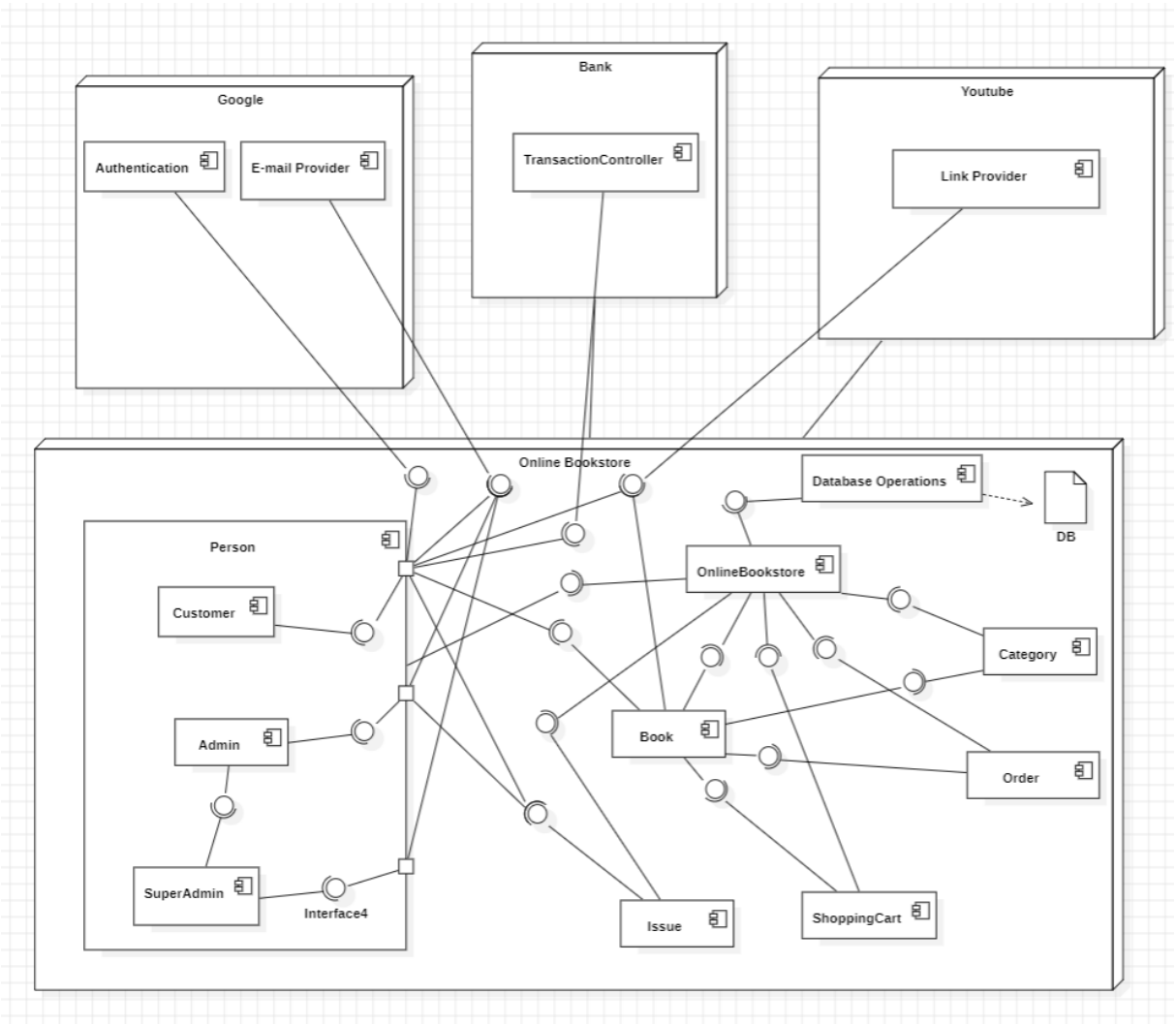

Figure 27: Component Diagram and Deployment Diagram of the System

Design Rationale: This diagram shows how the online bookstore system is related to external systems such as Google, Bank and YouTube, and the relationships between the internal components of the system. The YouTube link provider sends YouTube channel links related to the books to the system. In this way, the user can join live streaming channels and benefit from the interactive chat feature. The bank establishes a relationship with the system by checking payment transactions. Google, on the other hand, makes the registration with Google feature available by authenticating during registration. In addition, the email provider component

ensures that the e-mails that the user receives after checkout and admin takes auto-generated passwords after sending every login requests.

4 References

N/A