Readingplegia

A Voice-Controlled eReader for
Mobility-challenged Persons

Problem Definition

- Reading is difficult for the mobility impaired persons
- No e-reader contains built-in voice command capability
- Requirement of Assistive Technology tools
- Expensive
- Disabled persons in Ireland miss out on education which leads to difficulty in finding employment
- Disability Federation of Ireland (2020) claims employment for the disabled is 20% lower than the EU average of 50.8%

Project Goal

- Through Research in the needs for independent Literature reading of disabled persons with various arm impairments, or spinal cord injuries,
- to create specially designed mobile application to aid the book reading process for these people.

Project Scope

Build an Android application that:

- simplifies the process of reading books for mobility challenged persons
- integrates Google's Voice Assistant to send voice commands for turning pages and adding bookmarks

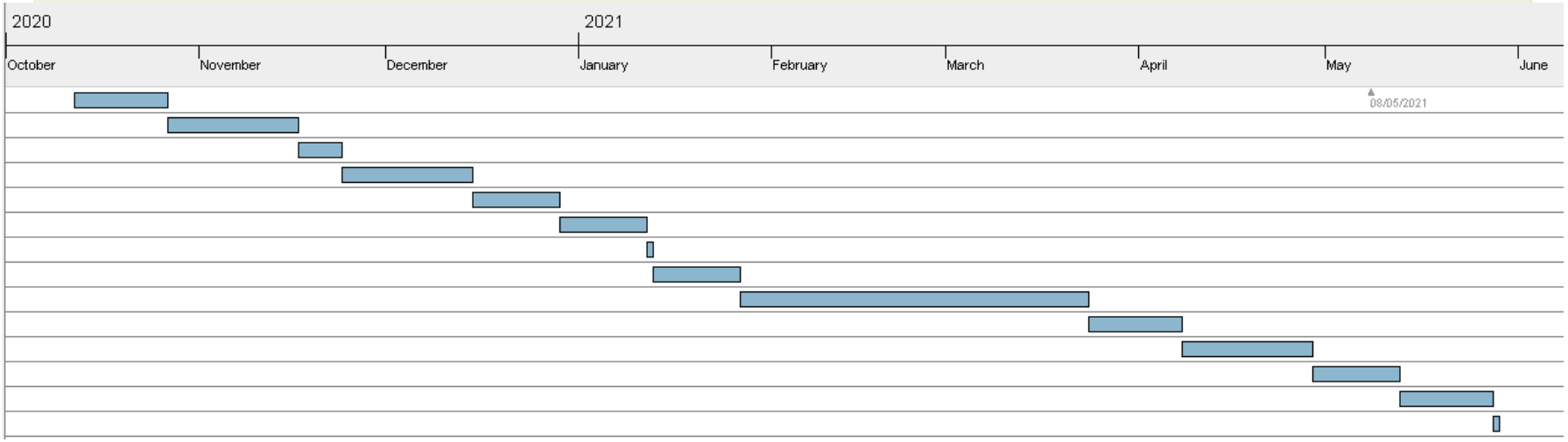
The project's Primary research & Prototype Evaluation is delimited to disabled persons with arm mobility impairments in Limerick area, Ireland.

Project Objectives

- Review Literature on the topic of mobility impaired and their needs of independent reading of books.
- Perform Primary Research, using *Quantitative* methodology
- Based on the results of the Primary & Secondary research to structure the system requirements in Conceptual model with UML Diagrams
- Design and Code the application’s GUI and Data structures
- User-evaluate the developed application and critically analyse the results
- Complete Thesis and present the Project

Gantt Chart of the Project

Name	Begin date	End date
Perform initial research to identify suitable project topic	12/10/2020	26/10/2020
Perform preliminary Literature Review on the chosen topic to prepare the Project Proposal	27/10/2020	16/11/2020
Amend proposal draft according to supervisor's feedback	17/11/2020	23/11/2020
Design and distribute Survey questionnaire to sample of target audiences	24/11/2020	14/12/2020
Perform a comprehensive Literature review and write chapter 2 of the thesis	15/12/2020	28/12/2020
Perform System Analysis and Structure the application's functionality in a conceptual model; write thesis chapter 3	29/12/2020	11/01/2021
Submit First Draft of the Thesis for review	12/01/2021	12/01/2021
Learn required new languages	13/01/2021	26/01/2021
Undertake Design and Coding of the e-reader application to be integrated with Google Assistant and Google Home	27/01/2021	23/03/2021
Select appropriate testing method and perform application testing	24/03/2021	07/04/2021
Perform User Evaluation, analyse results, reflect on project achievements, conclude and provide scope for future work in chapter 6	08/04/2021	28/04/2021
Submit the second draft of the thesis	29/04/2021	12/05/2021
Prepare a PowerPoint presentation	13/05/2021	27/05/2021
Submit the Thesis and present the project	28/05/2021	28/05/2021



Research and Development

- Quantitative Research method:
  - Survey performed with sample of mobility impaired persons in Limerick area
  - Evaluation of the developed application performed with representatives of the same sample

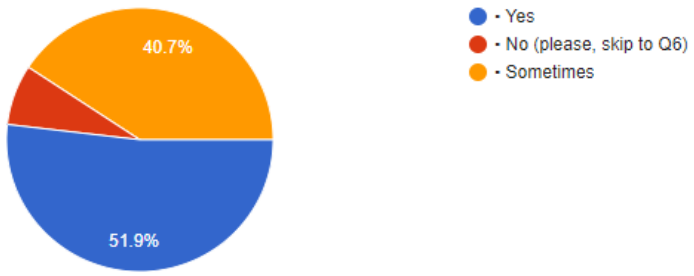
- Dynamic Software Development Method
  - Testing during development
  - Moscow method prioritises completion of requirements
  - Feedback obtained at each phase of the development

Initial Survey results

- Surveyed 27 participants, using Google Forms

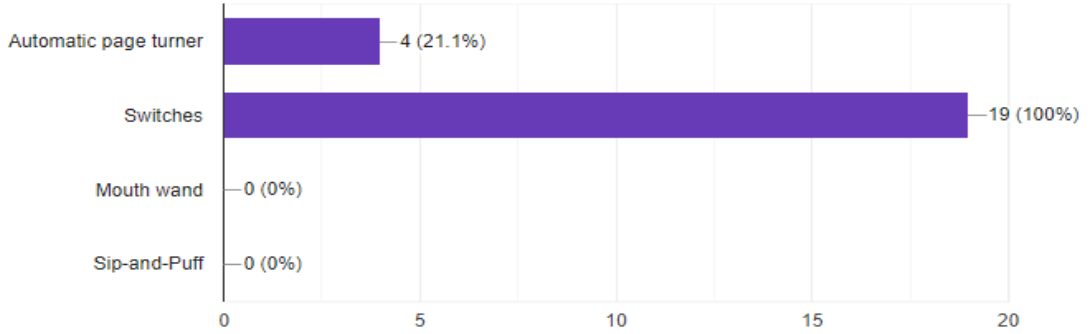
Q4. Do you (or the person you take care of) read literature often?

27 responses



Q14. If you have answered "Yes" to question 13, what assistive technology do you (or the person you took care of) use? (Please, select all that applies.)

19 responses



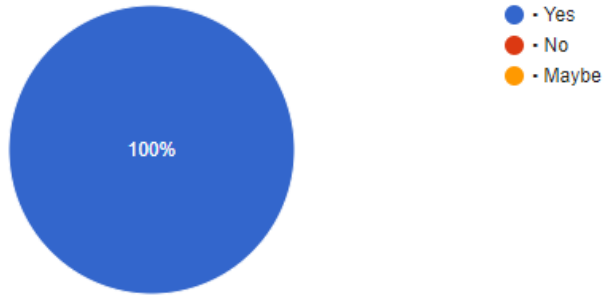
Q12. If you have answered "Yes" to Q10, please state the features you (or the person you took care of) liked most of such application(s).

15 responses

Downloading books from amazon
Downloading from book store
Download books
Downloading books
Saving your page
Telling how far you are in the book
Kindle
Keep page number
Dictionary

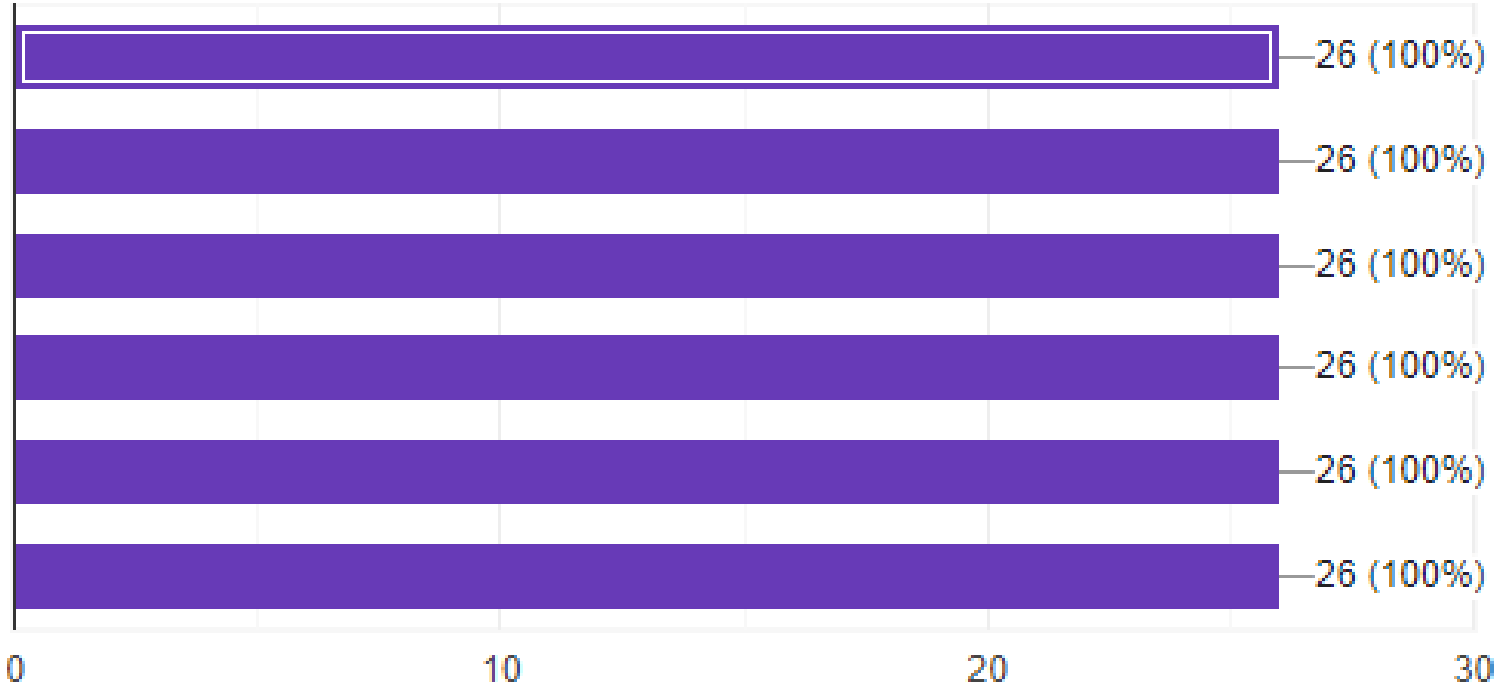
Q18. Would you be interested in using a mobile application that can interface the voice assistant of a home IoT device, like Google Home, to help with reading on your (or the person you took care of) mobile smart device, without the need of another person's assistance?

26 responses



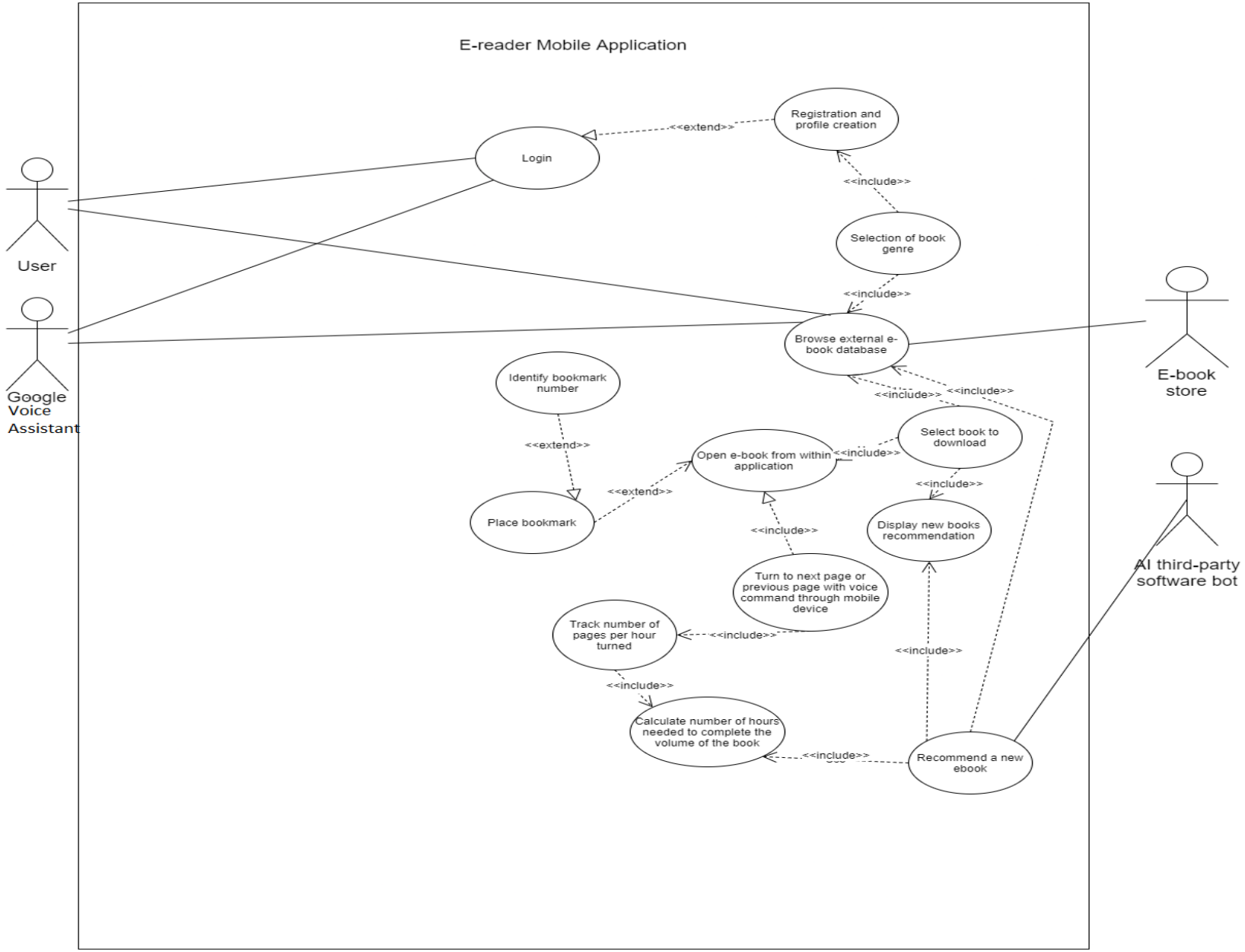
System Requirements

- Login & Registration
- Turn book pages by voice command
- Add bookmarks through voice commands
- Identify books on device to open
- Choose favourite genres
- Go to book store on genre page

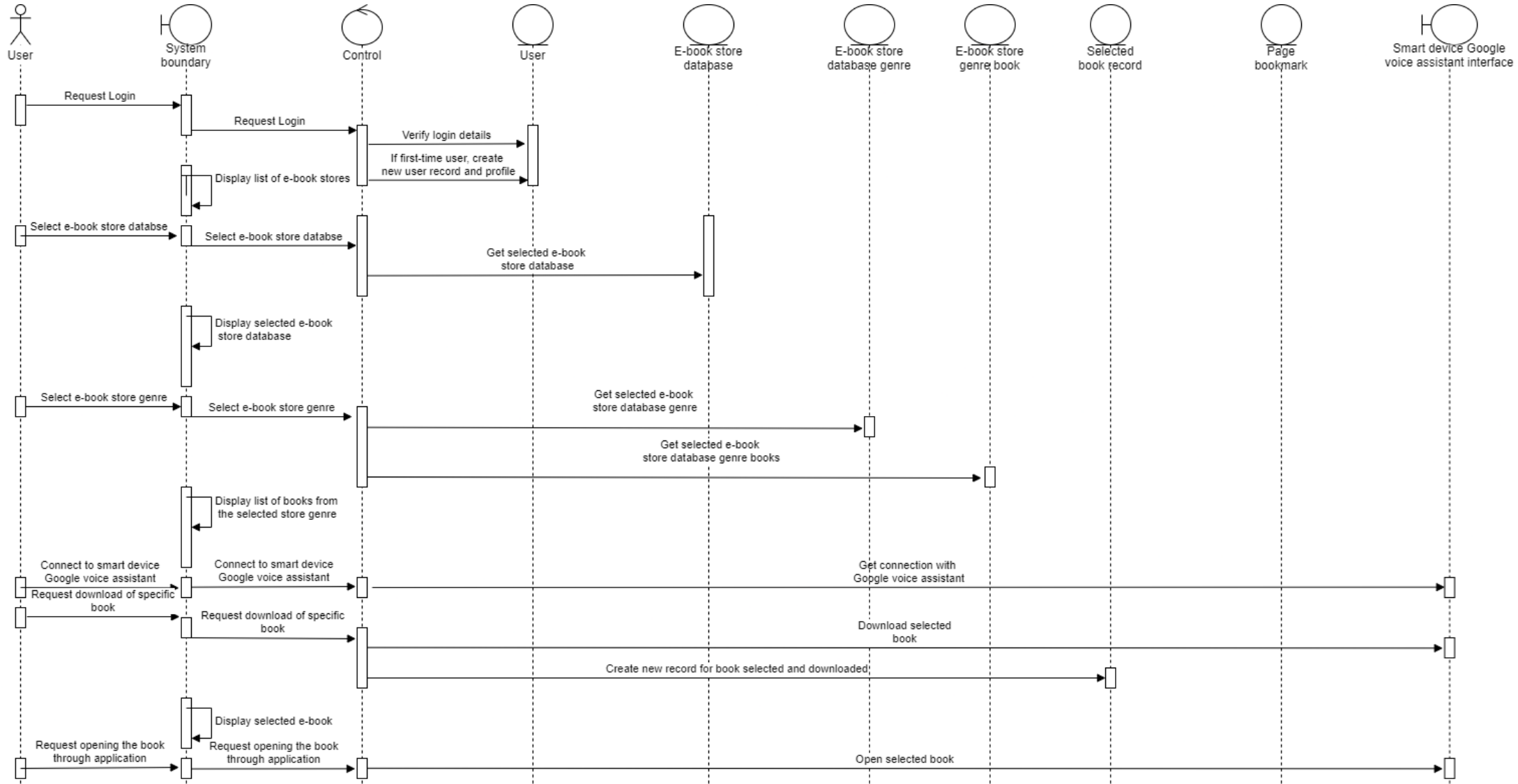


Conceptual Model:
Use Case Diagram

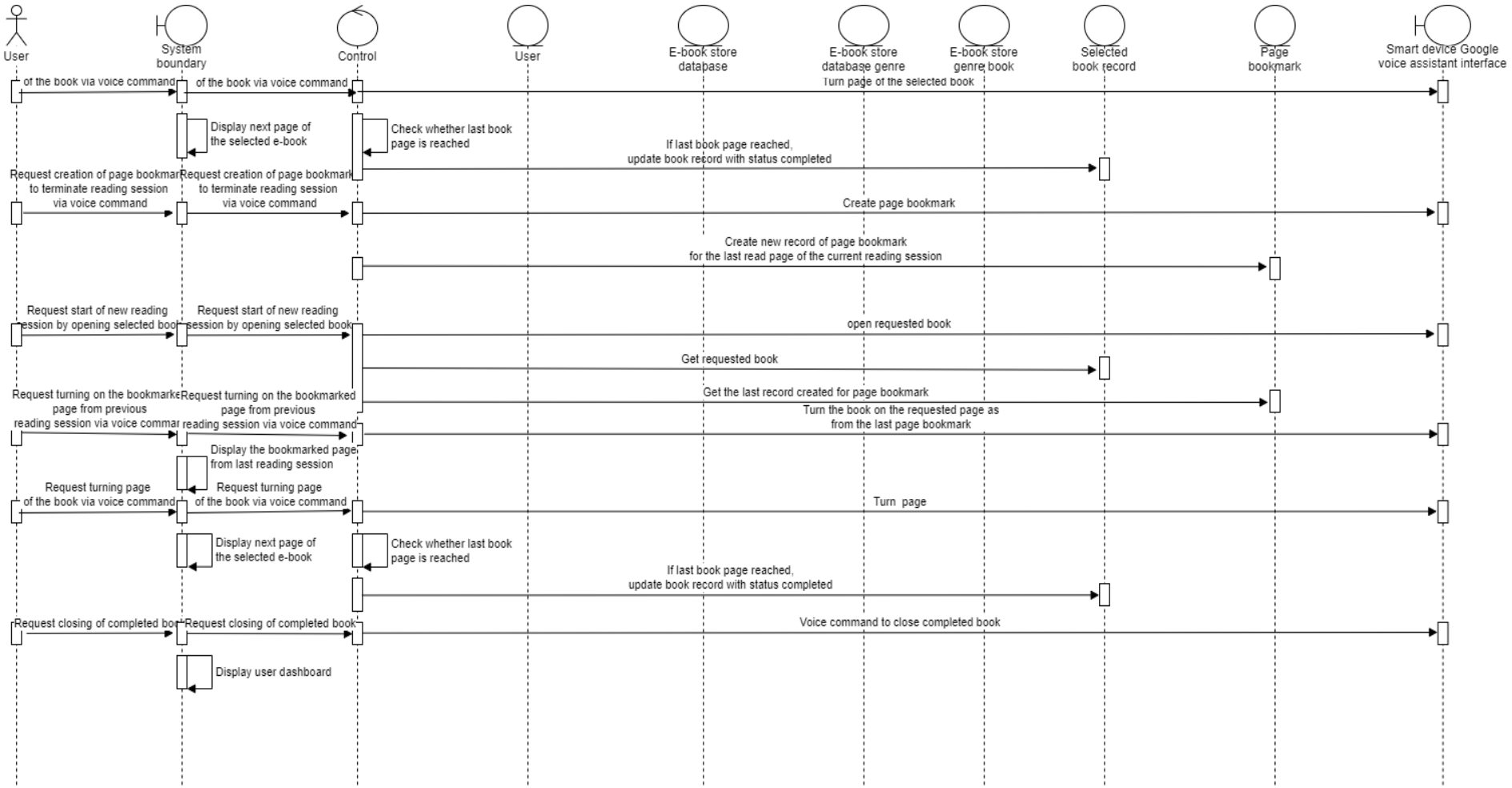
- Actors external to the system, involved in functionalities inside the system
- Use Case specifies unit of system's functionality
- <<include>> and <<extend>> show types of relationships between Use Cases



Conceptual Model:
Sequence Diagram

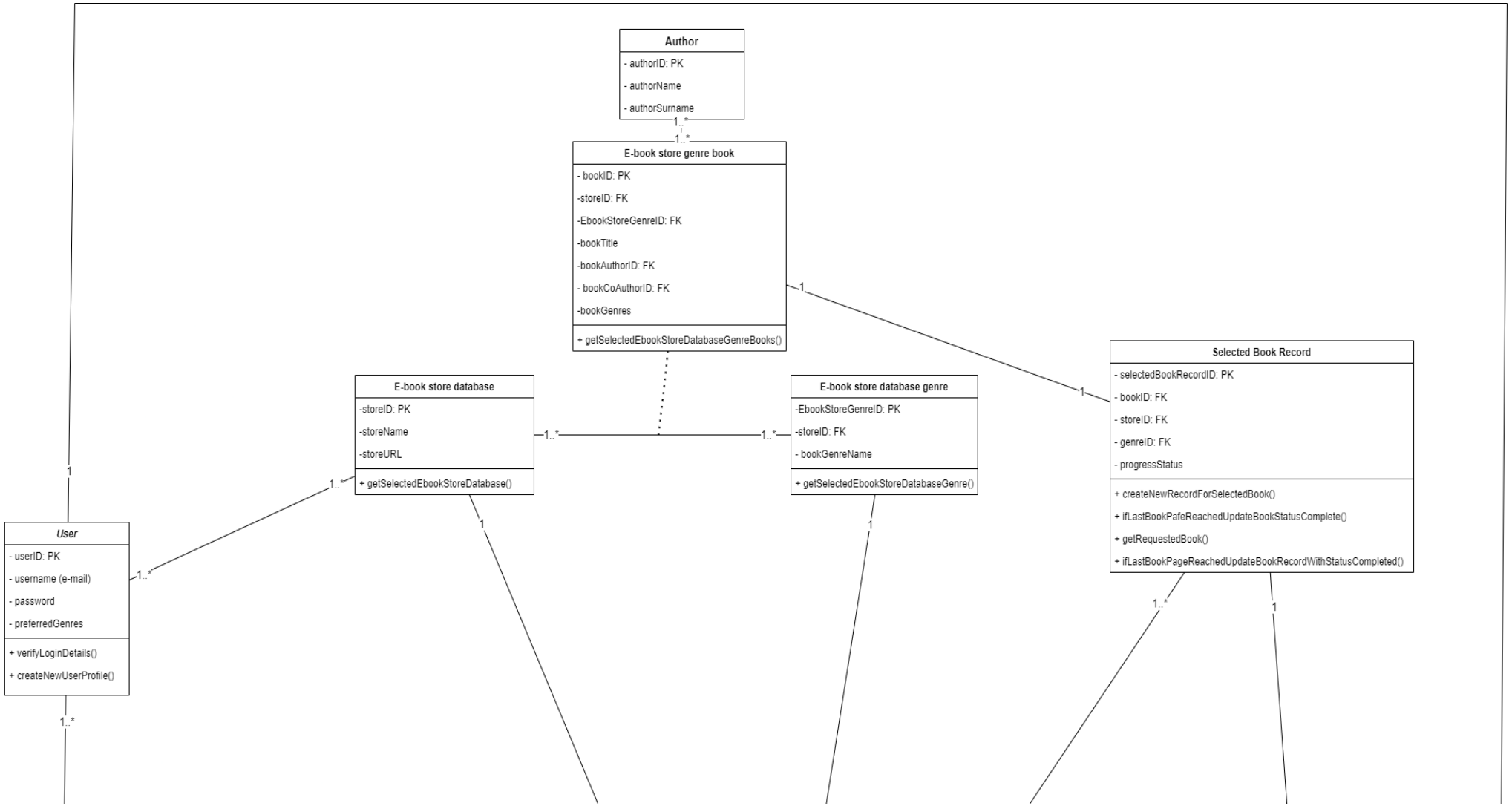


Sequence Diagram continued

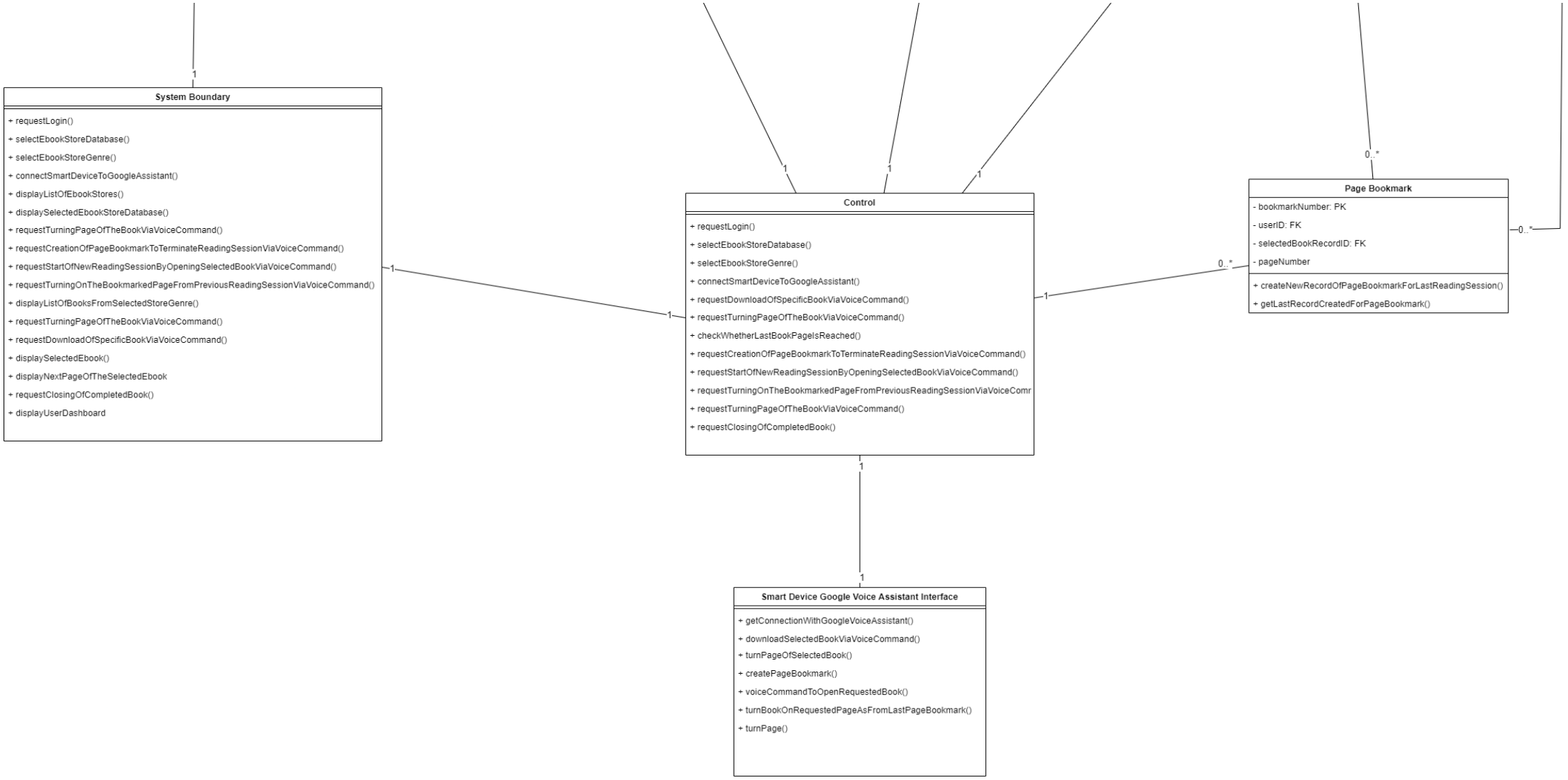


Conceptual Model:

Object Class Diagram



Object Class Diagram continued



Alternative Design Solutions

Low-End Solution	Mid-Range Solution	High-End Solution
• Login • Registration and profile creation • Election of book genre • Browse external e-book database • Select a book to download • Open e-book from within app • Turn to next or previous page with voice command through device	**All functionalities from Low-end, plus:** • Placing and removing bookmarks in reading session • Open book and go to bookmarked page with voice command	**All functionalities of the Mid-Range, plus:** • Track number of pages turned per hour • Calculate estimated time to finish the book • Recommend new books of preferred genre