



Bilkent University
Department of Computer Engineering

CS 491- Senior Design Project

Project Name: Papyrus



Papyrus

Final Report

Group Members: Ant Duru, Atay Kaylar, Enver Yiğitler

Supervisor: Fazlı Can

Jury Members: Shervin Arashloo, Hamdi Dibeklioğlu, Erhan Dolak, Tağmaç Topal

Innovation Expert: Murat Kalender

1.Introduction	4
2.Requirements Details	6
2.1 Functional Requirements	6
2.2 Non-functional Requirements	8
2.2.1 Usability	8
2.2.2 Security	8
2.2.3 Cost	8
2.2.4 Reliability	8
2.2.5 Performance	9
2.2.6 Accessibility	9
2.2.7 Compatibility	9
3.Final Architecture and Design Details	9
3.1 Data	9
Shelf	10
Database	10
User	10
Book	10
ShelfRepository	11
BookRepository	11
UserRepository	11
Settings	11
Flashcard	11
Deck	11
SettingsRepository	11
FlashCardRepository	11
DeckRepository	12
3.2 Library	12
LibraryViewController	12
LibraryModule	12
LibraryService	12
3.3 Reader	12
Reader Module	13
Reader Factory	13
EPUBModule	13
EPUBViewController	13
PopUpViewController	13
3.4 FlashCard	13
DeckCollectionViewController	14
FlashCardViewController	14
4.Development/Implementation Details	14
4.1 User Interface	14
4.2 Sentence Alignment	15

4.3 Forced Alignment for Audiobooks	15
4.4 FlashCard System	15
5. Testing Details	16
5.1 User Interface Testing	16
5.2 Sentence Alignment Testing	16
5.3 Forced Alignment Testing	17
6. Maintenance Plan and Details	17
7. Other Project Elements	17
7.1 Consideration of Various Factors in Engineering Design	17
7.1.1 Public Health	18
7.1.2 Public Safety	19
7.1.3 Public Welfare	19
7.1.4 Economic Factors	20
7.1.5 Social Factors	20
7.1.7 Cultural Factors	21
7.1.8 Global Factors	21
7.2 Ethics and Professional Responsibilities	21
7.3. Judgements and Impacts to Various Contexts	22
7.4 Teamwork Details	23
7.4.1 Contributing and Functioning Effectively in the Team	23
7.4.2 Helping creating a collaborative and inclusive environment	23
7.4.3 Taking lead role and sharing leadership on the team	24
7.4.4 Meeting Objectives	24
7.4.4.1 Functional Requirements	24
7.4.4.2 Non-functional Requirements	26
7.4.4.2.1 Usability	26
7.4.4.2.2 Security	26
7.4.4.2.3 Cost	26
7.4.4.2.4 Reliability	26
7.4.4.2.5 Performance	27
7.4.4.2.6 Accessibility	27
7.4.4.2.7 Compatibility	27
7.5 New Knowledge Acquired and Applied	27
8. Conclusion and Future Work	28
8.1 Conclusion	28
8.2 Future Work	28
9. User Guide	30

1.Introduction

Learning or mastering a new language is an important instrument for enhancing one's personal growth and has a number of pragmatic uses in intrinsic and extrinsic domains. It improves job opportunities, sets the stage for obtaining more complex relationships with foreign people or even providing a deeper understanding of self in a person[1]. One of the greatest authors Johann Wolfgang von Goethe would say "He who knows no foreign languages knows nothing of his own.", where studying language opens the door for deeper understanding of various cultures through its embeddedness into a nation's collective unconscious. With understanding of others, one can comprehend itself more profoundly. Hence we as a team knew the importance of language learning and opted to create an application that helps people to further train on a specific language. Duolingo is the most popular language learning application in the market[2], it helps people to learn new languages with a variety of game-like exercises. When it comes to learning words or fundamental structures, it is very useful, however it is not enough for mastery[3]. Kató Lomb is a Hungarian multilingual that has self-taught herself 16 languages. In order for her to master or even start to learn new languages, she insisted on learning the context of sentences, thereby the complex expressions, or the unknown words were redundant for her[4]. Papyrus provides a word learning tool, where the user defines flashcards, however we acknowledge the fact that learning a language comes from reading and understanding the context just like Lomb addressed, and we constructed our application according to it.

Papyrus is a mobile app that submits varied language learning and training tools and methods with the help of machine learning processes in a social-media like environment. Kató Lomb proposed that language mastery essentially comes from understanding a context without the details of convoluted expressions and it is redundant to check the dictionary every time an unknown word pops up. However, still we do think that one should have a rich vocabulary of words and one should train on the unknown words on a regular basis. Also we acknowledge that one's understanding of language greatly enhances when reading or hearing a book in a comprehended context. These arguments constitute the backbone of ways we intend our application will help people for language learning. In that way we aim to craft the optimal language setting for the end-user, with use of flashcards that exercises unfamiliar words on users, and machine-learning enhanced reading environment, where users can simultaneously read a book in selected multiple languages, for effective context understanding. Moreover we intend to implement audiobook and narration options into books, with the alignment of audios and texts. Papyrus has a number of functionalities other than previously explained ones, following are four headings for clearer explanation of our project's major features.

2.Requirements Details

2.1 Functional Requirements

- Users will be able to see the books that they saved.
- Users will be able to open a book.
- Users will be able to sort their books alphabetically or by their language.
- Users will be able to search for books, authors.

- Users will be able to create book collections.
- Users will be able to add books to their book collections.
- Users will be able to see flashcard decks.
- Users will be able to add or remove flashcard decks.
- Users will be able to edit flashcard decks by changing their name, adding or removing cards to/from a specific flashcard deck.
- Users will be able to sort flashcard decks.
- Users will be able to practice with their flashcard decks.
- Users will be able to declare their knowledge about a specific flashcard.
- Users will be able to edit a flashcard.
- Users will be able to see their progress for a flashcard deck.
- Users will be able to change the view of their library.
- Users will be able to open a dictionary.
- Users will be able to see detailed information about a book, author, collection, or genre.
- Users will be able to switch between menus.
- Users will be able to see the translated version of a passage or a sentence while reading the book.
- Users will be able to make a flashcard out of a word while reading a book.
- Users will be able to select definitions, example sentences from the dictionary they choose for a flashcard.
- Users will be able to add fields to both the front and back of a flashcard.

2.2 Non-functional Requirements

2.2.1 Usability

- The application can be used on iOS platforms.
- The application will provide an easy-to-use interface.

2.2.2 Security

- User information will not be shared with third parties.
- Publisher information will not be shared with third parties.

2.2.3 Cost

- Users will be charged for subscription to the app.
- Publishers will be paid for adding their books to the app with respect to reading time of their book contents.

2.2.4 Reliability

- The storage in the database should be reliable.
- The application will be stable.

2.2.5 Performance

- The app should switch between menus fast.

- Adding a flashcard should happen instantly.
- Changing pages should happen very fast.
- Aligned sentences should be displayed instantly.
- The Login process should happen very fast.

2.2.6 Accessibility

- The application should be downloadable for free.
- The application should be downloadable on AppStore.

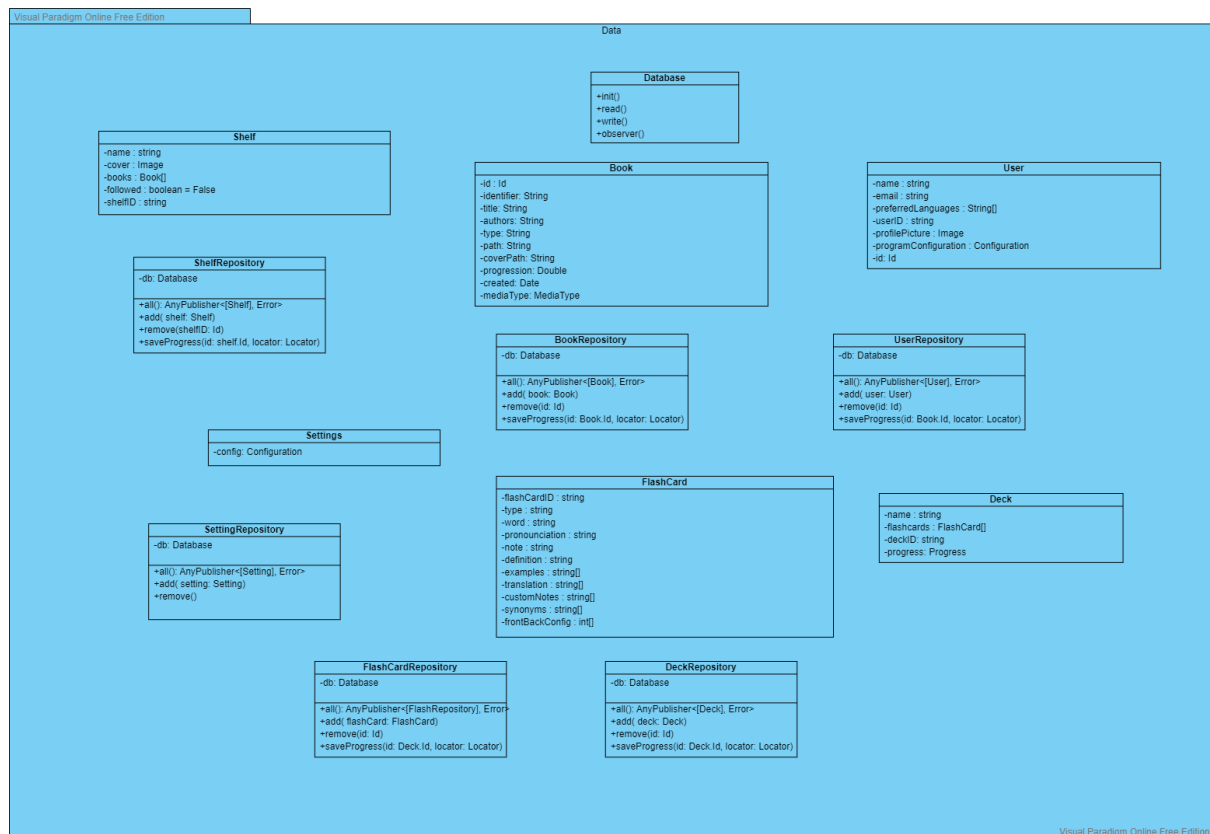
2.2.7 Compatibility

- Since we use Swift language and SwiftUI, the system should run in iOS 7 or a higher version.

3.Final Architecture and Design Details

3.1 Data

This subsystem manages the local subsystem, in that way it manages the operations within the program's properties (Eg. User data, book data, shelf data...).



Shelf

This class is responsible for holding the user's books, which is one of his/her personal bookshelves. It holds the information about the books.

Database

This package is the client database of the application. Therefore we need an intermediary class to communicate with the database. This class is simply named database, which has few functions to communicate with databases.

User

This class is responsible for holding the users' information.

Book

This class is responsible for holding individual book's necessary information.

ShelfRepository

This class wraps the database and its functions, so that the program can use the database operations on the shelf objects.

BookRepository

This class wraps the database and its functions, so that the program can use the database operations on the book objects.

UserRepository

This class wraps the database and its functions, so that the program can use the database operations on the user objects.

Settings

This class holds the program settings information via the configuration class.

Flashcard

The class is responsible for holding the information of the flashcard objects, holding its desired data members.

Deck

This class holds the information of the deck, which holds the number of flashcards inside it.

SettingsRepository

This class wraps the database and its functions, so that the program can use the database operations on the shelf objects.

FlashCardRepository

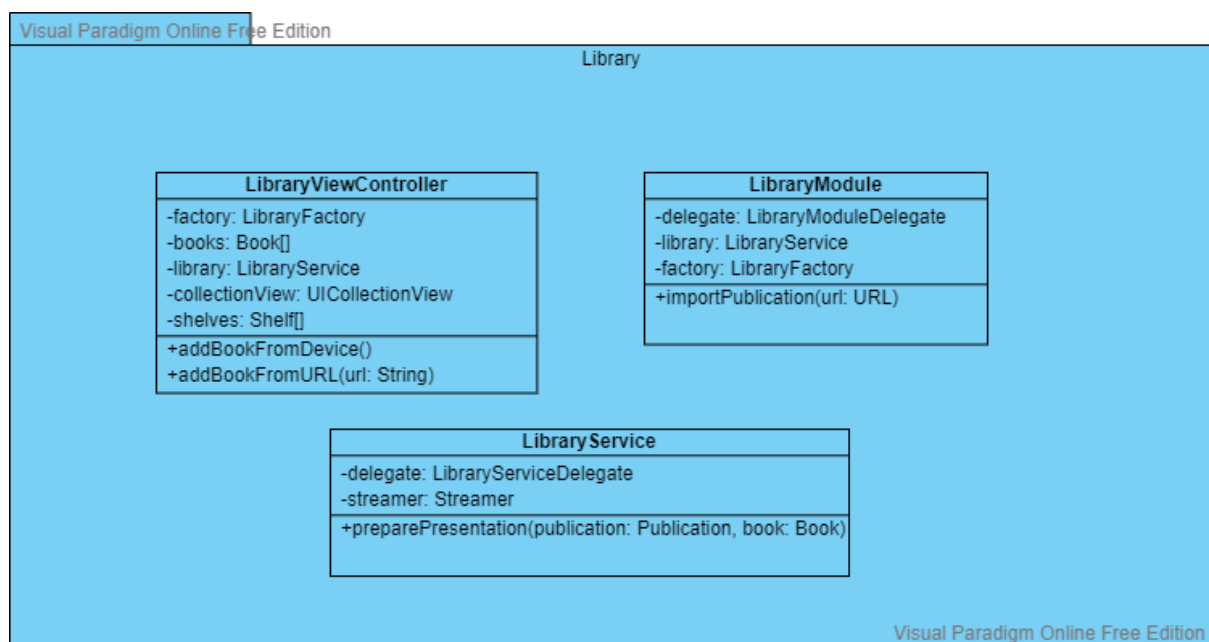
This class wraps the database and its functions, so that the program can use the database operations on the flashcard objects.

DeckRepository

This class wraps the database and its functions, so that the program can use the database operations on the deck objects.

3.2 Library

This package manages the user's books, audiobooks and shelves, by using the information from the database it visualizes the properties with using view controller.



LibraryViewController

Presents the library and in the models shows the audiobooks and book using the library service

LibraryModule

It is wrapper class of the other library classes, that is used for constructing the library

LibraryService

The class is used for the logic of the library

3.3 Reader

The model and the view controller part of the program that shows the user, audiobooks, books and the narration mode, with the additional UIKit features.

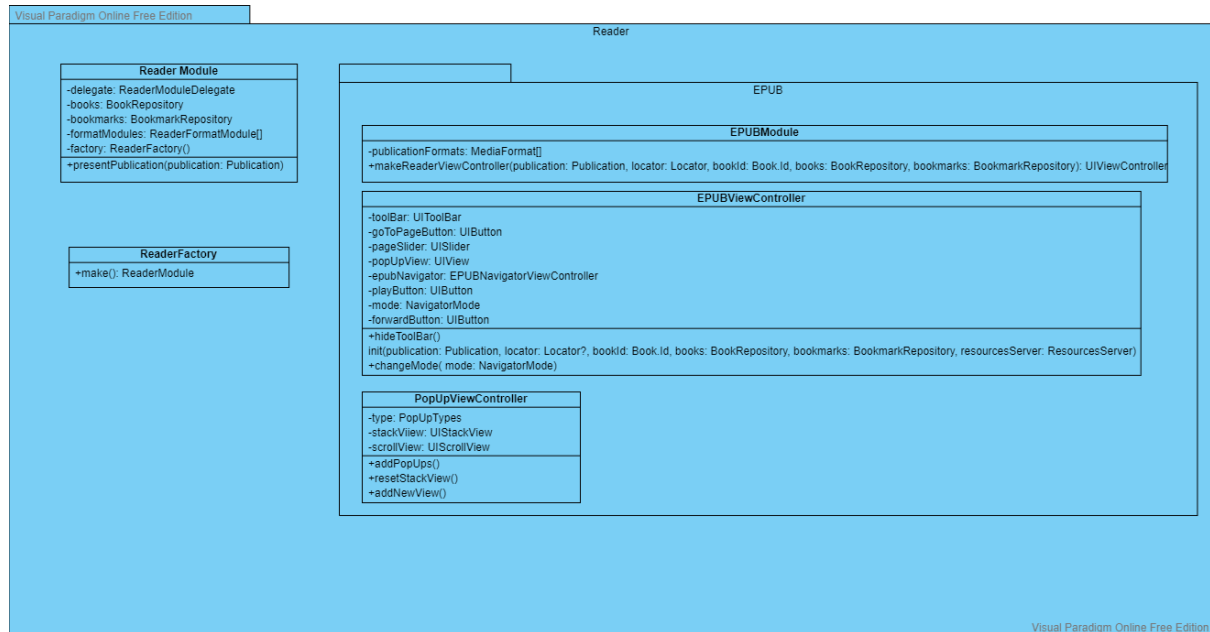


Figure 4: Reader Package

Reader Module

The logic of the reader package

Reader Factory

Creates the reader module

EPUBModule

Creates the viewcontroller for the operations of the delegate objects.

EPUBViewController

Presents the books and the audiobook and in the model shows the audiobooks and books using the library service.

PopUpViewController

Presents the popups and with a model. views the popups.

3.4 FlashCard

ViewController package that manages the visualizing and the logic behind flashcards and the decks, which are composed of flashcards.

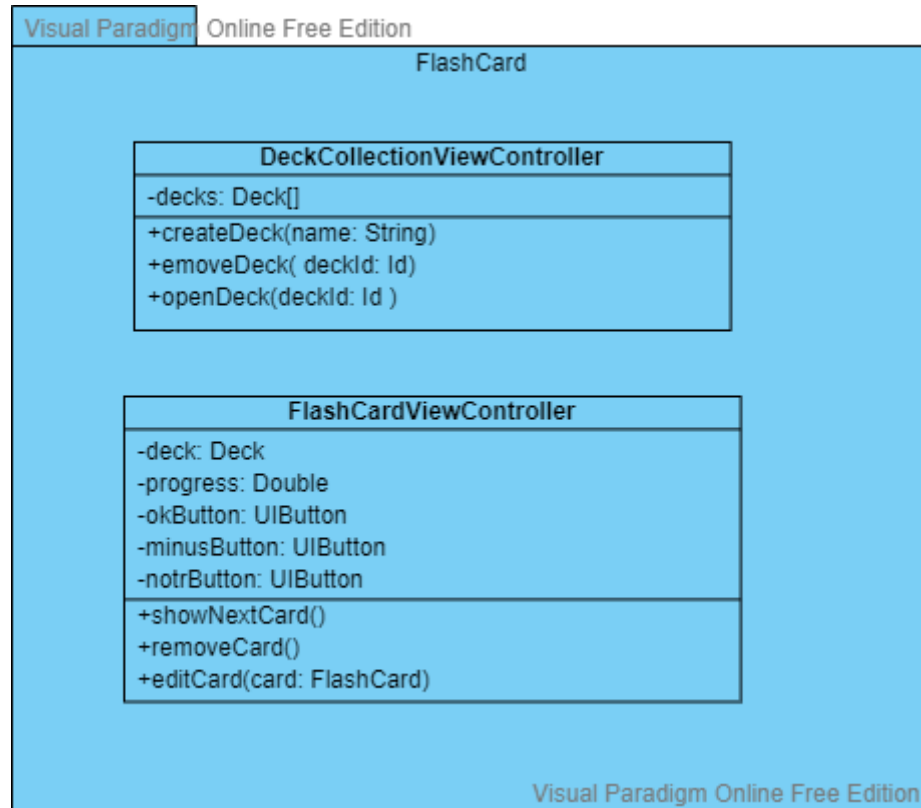


Figure 5: FlashCard Package

DeckCollectionViewController

Models and views the decks

FlashCardViewController

Models the logic behind it and views the flashcards

4.Development/Implementation Details

4.1 User Interface

We implemented the user interfaces using Swift UIKit. We implemented a user-friendly and easy-to-use interface since we think these are the most important

aspects of an e-reading platform. We store the user information, such as email, password etc. as well as the information about books in our database.

4.2 Sentence Alignment

The most significant feature of Papyrus is that a user can read a book in its original language and the translated version of it concurrently. A user can switch from a sentence in the original language to the matching sentence in the translated version in an instant and vice-versa. To match these sentences we use a sentence alignment algorithm. This algorithm, simply, finds the probability for a sentence to match each sentence in the translated version and match the sentence with its counterpart, which has the highest possibility. By this feature, a user can see the whole sentence in different languages to understand the whole context of a sentence rather than just a word in a sentence.

4.3 Forced Alignment for Audiobooks

Papyrus supports audiobooks as well. We used forced alignment algorithms to match the sentence and the narration of an audiobook in order for the user to follow the narration by looking at the screen. This will help the user to create a listening understanding of the target language and to learn pronunciations of the words.

4.4 FlashCard System

FlashCards are very popular among language learners. They are used to learn new words and to memorize them by studying the flashcards consistently. A flashcard has the word in its target language on one side, it can also include other properties of that word such as definition, an example sentence etc. and on the other side there

is the word in the learner's native language and the learner makes a collection of these cards and trying to memorize them by looking at each card one by one and trying to guess the other side. In Papyrus, we implemented a flashcard system where the user can create card decks. The user can create a flashcard manually or they can select a word while reading a book to add its flashcard to their deck. Flashcard decks can be studied by the user with saveable training sessions.

5. Testing Details

5.1 User Interface Testing

Since we aimed to have an easy-to-use interface, we consistently used the application to improve the interface. We discussed our ideas for the best choice and implemented the most logical idea. We, also, asked our friends to think about them as users and tell their ideas on specific choices and we moved accordingly.

5.2 Sentence Alignment Testing

Even though we had trust in the algorithm, we constantly read aligned books and passages to see if there were mistakes when the sentences were aligned. Even a minor mistake can ruin the user experience and satisfaction. Therefore, we double checked on our algorithm to prevent any such failure.

5.3 Forced Alignment Testing

We tested our forced alignment algorithm by constantly checking the match between the narration and text. Like the sentence alignment algorithm, this algorithm is also very crucial for our application since any minor inconvenience may affect user experience significantly. Therefore, we checked on our algorithm consistently to avoid any problems.

6.Maintenance Plan and Details

- Papyrus is an iOS application. In the future, we aim to deploy our application into the Android environment.
- We want to provide the best e-reading experience to our users. Therefore, constant updates on UI and features will be handled
- We would like to switch from mobile database to server database in the future.

7.Other Project Elements

7.1 Consideration of Various Factors in Engineering Design

Factors	Effect Level	Effects
Public Health	7/10	Decreasing stress, alleviating depression

		symptoms. Assisting dyslexic people.
Public Safety	2/10	Confidentiality of user information
Public Welfare	6/10	Subscription model is good for the end-user for users to predict their monthly spending.
Economic Factors	6/10	Subscription model is good for the publisher and us, because monthly revenue is more easily predicted
Social Factors	7/10	Built-in social media features have a way for people to socialize.
Environmental Factors	8/10	Less trees will be cut, because books are electronically published.
Cultural Factors	9/10	Learning new languages has a way of expanding the other cultures' knowledge in individuals.
Global Factors	9/10	Papyrus is a language learning tool that can be used globally.

7.1.1 Public Health

One of our intentions of creating *Papyrus* imbue reading and learning language habits to people, which has a number of advantages. Other than intellectual benefits, reading books also has several health benefits to individuals. It decreases age related cognitive diseases, such as Alzheimer's disease, thanks to increased

cognitive activation in the brain. Also it reduces stress, which is good for heart related illnesses and helps to alleviate depression symptoms.[5]

Dyslexic people have a hard time reading text based books, in that way our application has the audiobook feature, which is proven to be an easier method for absorbing the book for dyslexic people.[6] Furthermore, our application has audiobook features, so that users can listen and read the book at the same time, to their liking. It is also proven that reading and listening are a great way to study books for dyslexic people.[7]

7.1.2 Public Safety

For the safety of the public, user's information, such as their credit card information will be confidential and will not be shared with any of the third parties.

7.1.3 Public Welfare

Our model uses a subscription model for user payment plans. Subscription plans are great for keeping users in their monthly budget, because subscription cost is always consistent and predictable, making the application more convenient to access. Users will pay for the subscription to the application. Yet, e-books will be cheaper than hard copy books. Therefore, users will not be affected negatively in terms of economic issues.

7.1.4 Economic Factors

If the business is suitable for the mode, the subscription model can be great for the business owner, in our case publishers and us. Publishers can calculate the predicted revenue more easily, due to the recurrent nature of the subscription model. John Warrilow says, creator of the Value Builder System, “The more guaranteed revenue you can offer a potential acquirer, the more valuable your business is going to be, because a high percentage of the revenue of a subscription-based business is recurring, its value will be up to eight times that of a comparable business with very little recurring revenue.” [8]. Therefore, our intentions of using a subscription based model, is suitable for both the users(the public) and the money earners from the application(us and publishers).

7.1.5 Social Factors

Papyrus aims to create communities of language learners with respect to their favorite authors, genres, books, etc. Furthermore, since people will be able to share their notes and annotations for a book, their book collections, and their flashcard decks; social interaction will be affected positively.

7.1.6 Environmental Factors

According to Cleantech, a single hard-copy book generates about 7.5 kg of carbon dioxide, while this value is doubled for a textbook. However, an iPad generates 130 kg of carbon dioxide in its lifetime. Therefore, having an iPad neutralizes its harm when the user reads approximately 18 e-books.[9]

Consequently, e-books are much more nature-friendly than hard-copy books. By digitalizing the libraries as we aim with PAPYRUS, readers’ carbon footprints will also reduce by a significant amount

7.1.7 Cultural Factors

Papyrus aims to broaden the cultural perspective of people by offering the opportunity to learn a new language by reading books of that language. Since literature is a significant field to represent a culture, users will encounter new cultures and gain knowledge of the cultures as well.

7.1.8 Global Factors

Papyrus can be used globally. Language learners from all around the world will be able to enter the application to read books written in a specific language. Also, languages in the application will be updated regularly to present more languages to learn.

7.2 Ethics and Professional Responsibilities

- All books used to demonstrate our project have a public domain. No book without a permission is used. In other words, the project is against pirating.
- The decisions regarding the project have been taken as a group.
- Everyone attended regular meetings and contributed to the project as expected.
- KVKK (Kişisel Verileri Koruma Kanunu) have been applied. User information and publisher information will not be shared with third parties.

7.3. Judgements and Impacts to Various Contexts

Impact	Point (Out of 10)	Explanation
Impact in Societal Context	7	Built-in social media features have a way for people to socialize.
Impact in Economic Context	6	Subscription model is good for the publisher and us, because monthly revenue is more easily predicted
Impact in Environmental Context	8	If e-books are used more frequently, hard copy books will be produced less which causes for the trees to be cut less.

Impact in Global Context	9	Papyrus can be used worldwide and it may connect people through language learning
--------------------------	---	---

7.4 Teamwork Details

7.4.1 Contributing and Functioning Effectively in the Team

Member	Contribution
Enver	Worked on UI design, sentence alignment, audiobooks, user profile, reports
Atay	Worked on dictionary connections, UI design, audiobooks, reports
Ant	Worked on UI design, sentence alignment, flashcards, UML diagrams, reports

7.4.2 Helping creating a collaborative and inclusive environment

Member	Contribution
Enver	Set up group meetings, helped other group members through the process of learning Swift UIKit.
Atay	Installed MacOS for himself and Ant, created meeting notes before and after

	each meeting.
Ant	Set up GitHub repository and project website, handled communication between the group and our supervisor Fazlı Hoca.

7.4.3 Taking lead role and sharing leadership on the team

Topic	Leader
Documentation	Ant
UI Development	Atay
Backend Development	Enver
Decision-Making	Atay
Research	Ant
Additional Algorithms' Development	Enver

7.4.4 Meeting Objectives

7.4.4.1 Functional Requirements

- Users can sign up via Google, Facebook, or Apple.
- Users can change their passwords.

- Publishers can publish new books.
- Users can see the books that they saved.
- Users can open a book.
- Users can sort their books alphabetically or by their language.
- Users can search for books, authors, genres, collections.
- Users can create book collections.
- Users can add books to their book collections.
- Users can sort books in a collection alphabetically or by their language.
- Users can see shared annotations for a book.
- Users can share their annotations for a book.
- Users can see flashcard decks.
- Users can add or remove flashcard decks.
- Users can edit flashcard decks by changing their name, adding or removing cards to/from a specific flashcard deck.
- Users can sort flashcard decks.
- Users can search for shared flashcard decks.
- Users can share their flashcard decks with other users.
- Users can practice with their flashcard decks.
- Users can declare their knowledge about a specific flashcard.
- Users can edit a flashcard.
- Users can see their progress for a flashcard deck.
- Users can change the view of their library.
- Users can open a dictionary.
- Users can see detailed information about a book, author, collection, or genre.
- Users can switch between menus.

- Users can see the translated version of a passage or a sentence while reading the book.
- Users can make a flashcard out of a word while reading a book.
- Users can select definitions, example sentences from the dictionary they choose for a flashcard.
- Users can add fields to both the front and back of a flashcard.
- Users can end flashcard practice at any moment after starting.

7.4.4.2 Non-functional Requirements

7.4.4.2.1 Usability

- The application can be used on iOS platforms.
- The application provides an easy-to-use interface.

7.4.4.2.2 Security

- User information is not shared with third parties.
- Publisher information is not shared with third parties.

7.4.4.2.3 Cost

- Users are charged for subscription to the app.
- Publishers are paid for adding their books to the app with respect to reading time of their book contents.

7.4.4.2.4 Reliability

- The storage in the database should be reliable.
- The application is stable.

7.4.4.2.5 Performance

- The app should switch between menus fast.
- Adding a flashcard should happen instantly.
- Changing pages should happen very fast.
- Aligned sentences should be displayed instantly.
- The Login process should happen very fast.

7.4.4.2.6 Accessibility

- The application should be downloadable for free.
- The application should be downloadable on AppStore.

7.4.4.2.7 Compatibility

- Since we use Swift language and SwiftUI, the system should run in iOS 7 or a higher version.

7.5 New Knowledge Acquired and Applied

There were many technologies and ideas that we were not familiar with when we started doing our project. These technologies and ideas were:

- Swift (UIKit)
- OS X booting
- XCode
- JSON Format
- Language Embedding Models
- RNNs

For all of these concepts, we used online materials to gain knowledge. For language embedding models and RNNs, we read several papers on these concepts. We tried to get familiar with JSON Format and the usage of it and the same applies to the

Swift UIKit. We watched YouTube videos and looked at slides of courses from other universities to understand the Swift Language. For hardware and environmental issues, we watched YouTube videos to boot MacOS to our computers and to learn how to use XCode.

8. Conclusion and Future Work

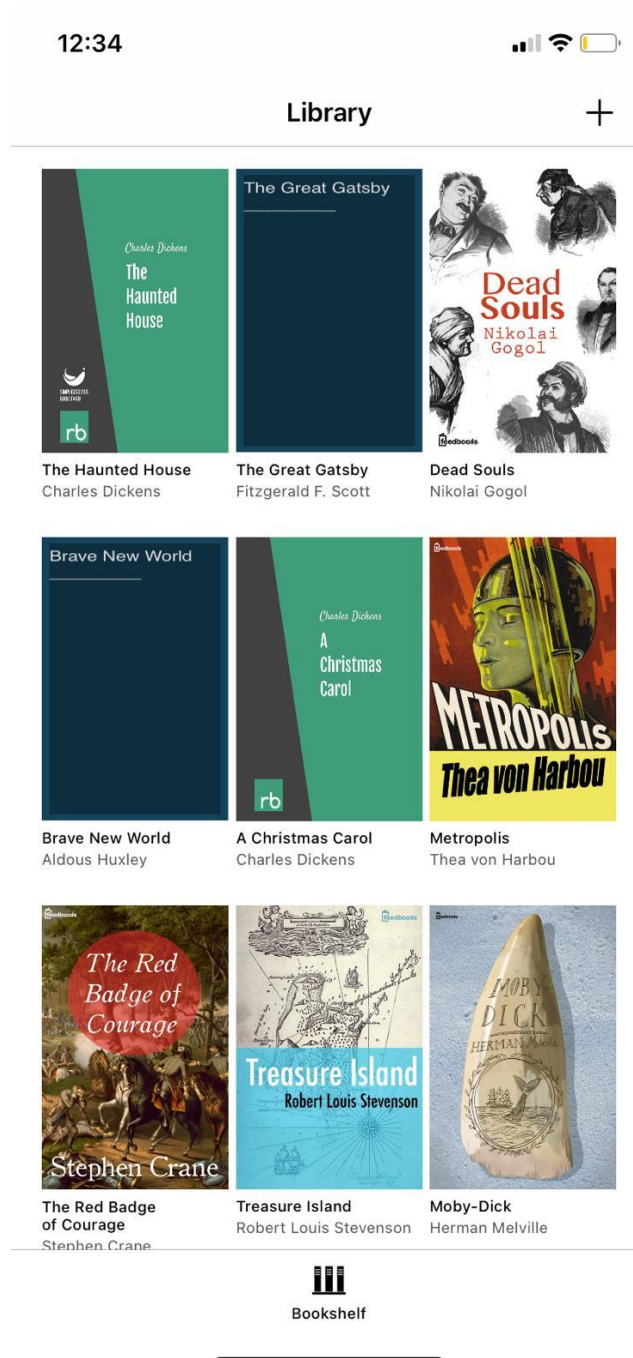
8.1 Conclusion

Consequently, we developed an e-reading platform, designed explicitly for language learners, where they can read the original and translated versions of a book concurrently, look up any word in a dictionary as they read and create flashcards to enhance their vocabulary. We have many ideas to improve our application, all of which are stated in the next section.

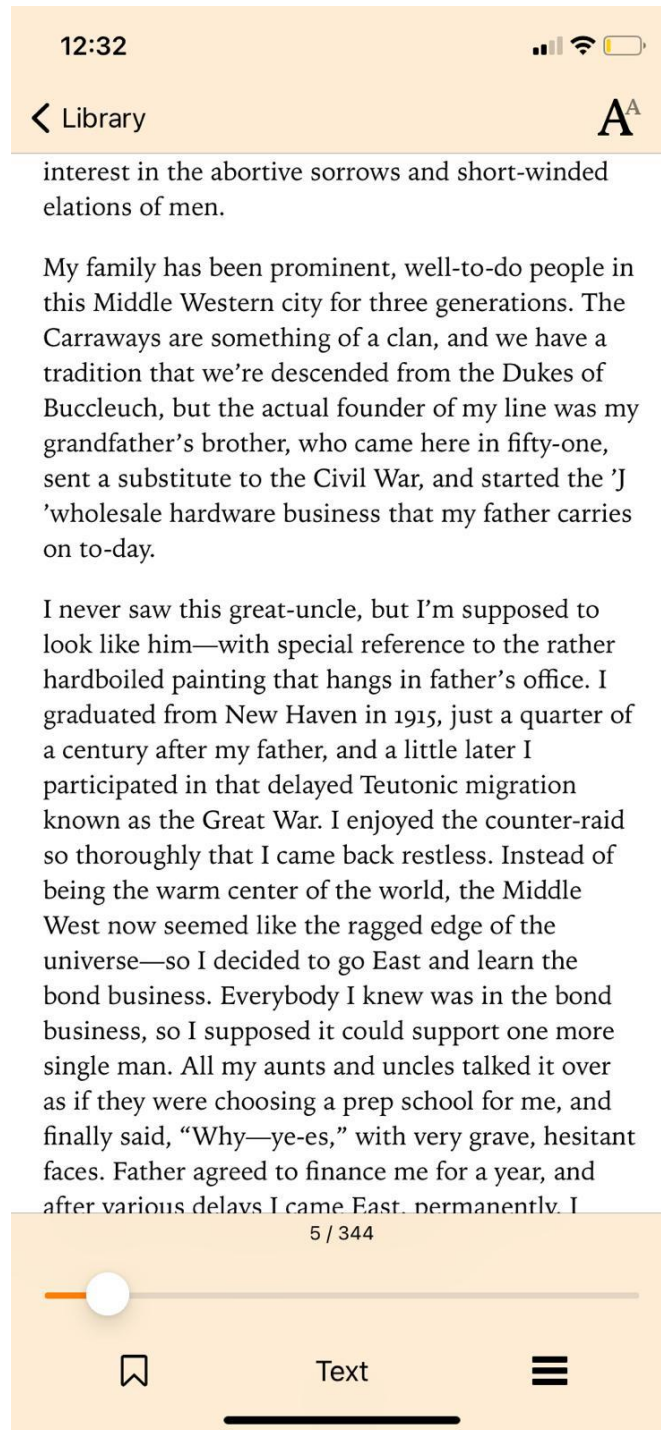
8.2 Future Work

Papyrus is not just a senior year project but it is also something we find very useful for language learners and we want to continue developing the app after the course. We want to convert it to a social media app where there would be different communities for genres or languages and people can share their thoughts or tips globally. To achieve this, we may create a broader server and add several features such as reading groups or language groups or chat options.

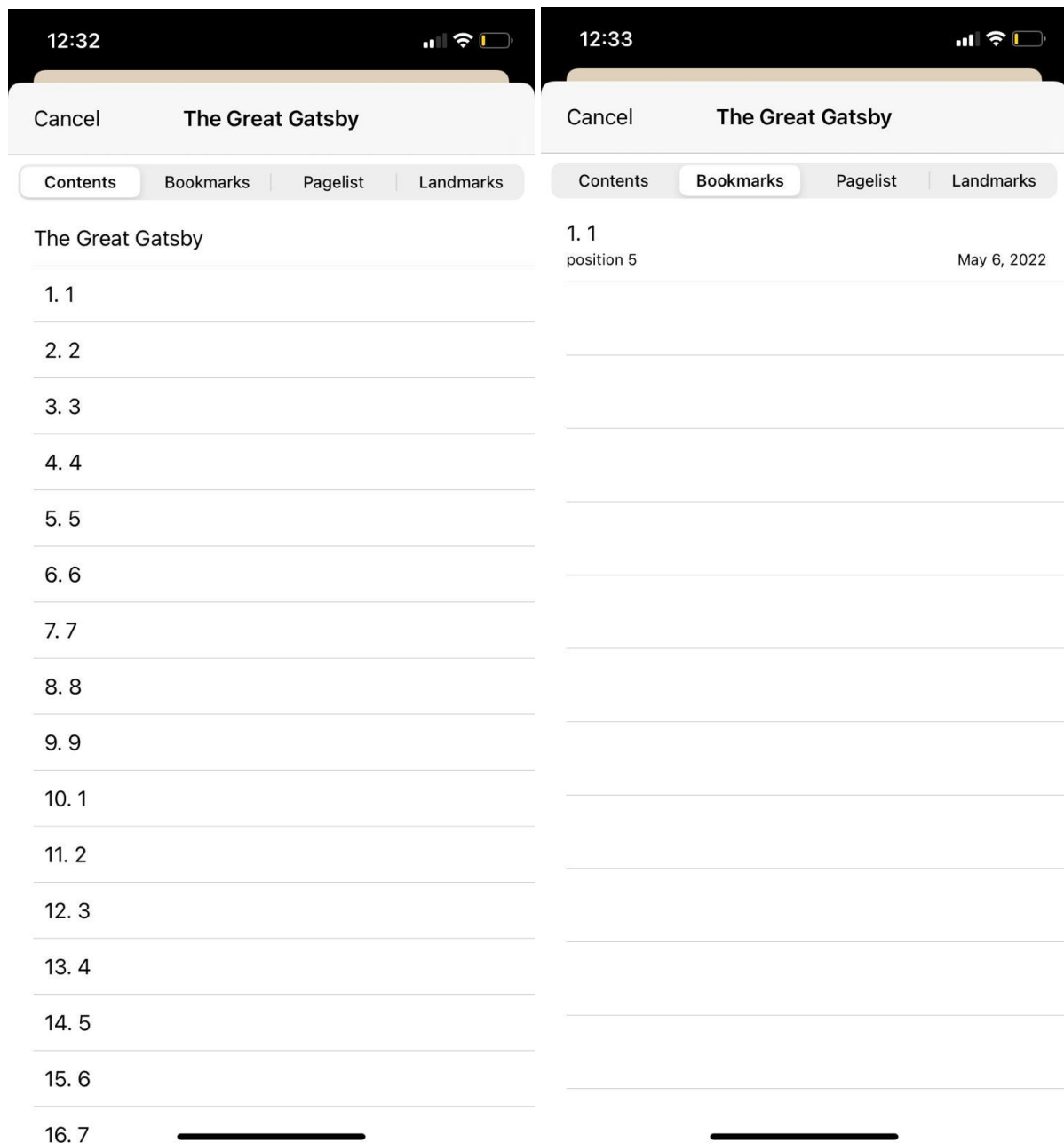
9. User Guide



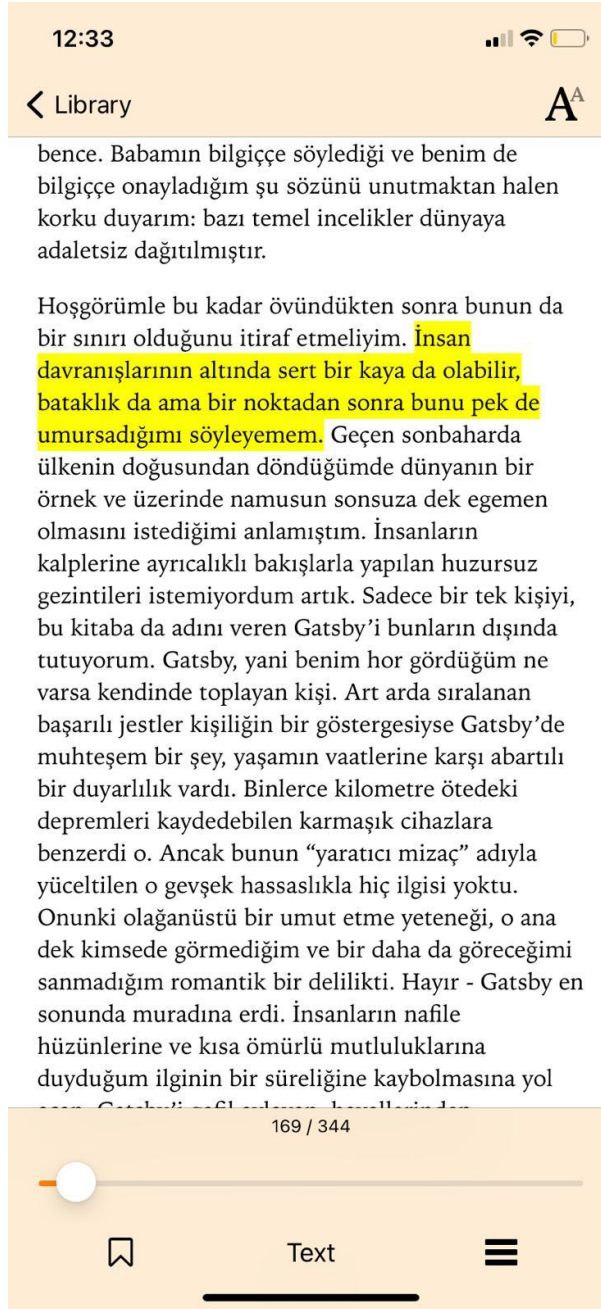
Bookshelf is the place where all of the books of the user are kept. The user can select any book from their bookshelf to read. Books are displayed by their cover page, title and their author's name.



This interface is what reading a book in Papyrus is. When the user selects a book from their bookshelf, the book is opened. The user can see the number of pages and scroll through the pages, create bookmarks etc.



When the user clicks on the information button while reading a book, the user can see the contents of the book, their bookmarks, pagelist and landmarks.



One of the most important features of Papyrus is sentence alignment. Above interface displays what a sentence looks like and is highlighted when the user selects a sentence. The sentence is highlighted with yellow.



Chapter 1. 1

In my younger and more vulnerable years my father gave me some advice that I've been turning over in my mind ever since.

"Whenever you feel like criticizing any one," he told me, "just remember that all the people in this world haven't had the advantages that you've had."

He didn't say any more, but we've always been unusually communicative in a reserved way, and I understood that he meant a great deal more than that. In consequence, I'm inclined to reserve all judgments, a habit that has opened up many curious natures to me and also made me the victim of not a few veteran bores. The abnormal mind is quick to detect and attach itself to this quality when it appears in a normal person, and so it came about that in college I was unjustly accused of being a politician, because I was privy to the secret griefs of wild, unknown men. Most of the confidences were unsought—frequently I have feigned sleep, preoccupation, or a hostile levity when I realized by some unmistakable sign that an intimate revelation was quivering on the horizon; for the intimate revelations of young men, or at least the terms in which they express them, are usually plagiaristic and marred by obvious suppressions. Reserving



When the user clicks on the sentence they selected again, it will switch to the translated version from the original version or vice-versa. The sentence keeps being highlighted when the language is switched.

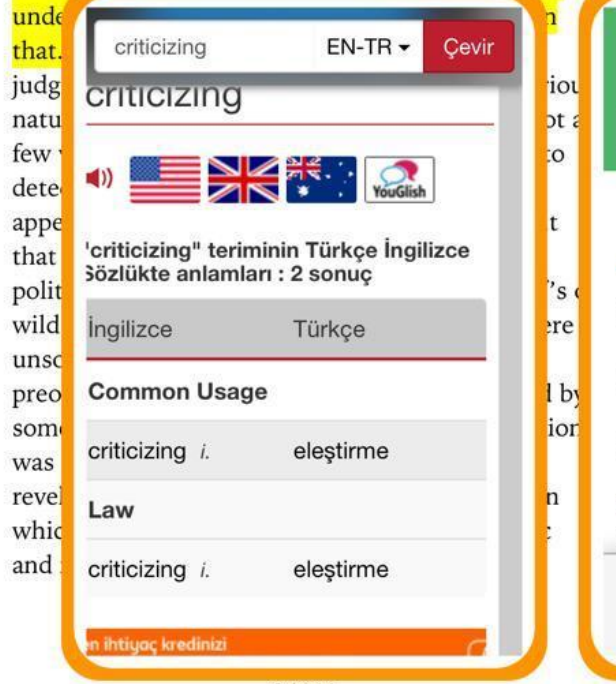


Chapter 1. 1

In my younger and more vulnerable years my father gave me some advice that I've been turning over in my mind ever since.

"Whenever you feel like criticizing any one," he told me, "just remember that all the people in this world haven't had the advantages that you've had."

He didn't say any more, but we've always been unusually communicative in a reserved way, and I



3 / 344

When a specific word is selected instead of a full sentence, the user can look up the meaning of the word from online dictionaries by pop-ups.

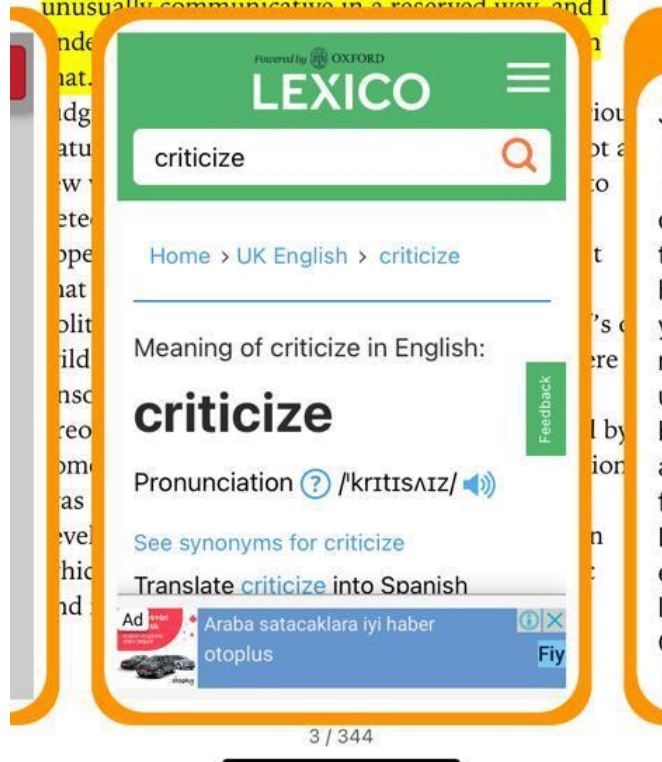


Chapter 1. 1

In my younger and more vulnerable years my father gave me some advice that I've been turning over in my mind ever since.

"Whenever you feel like criticizing any one," he told me, "just remember that all the people in this world haven't had the advantages that you've had."

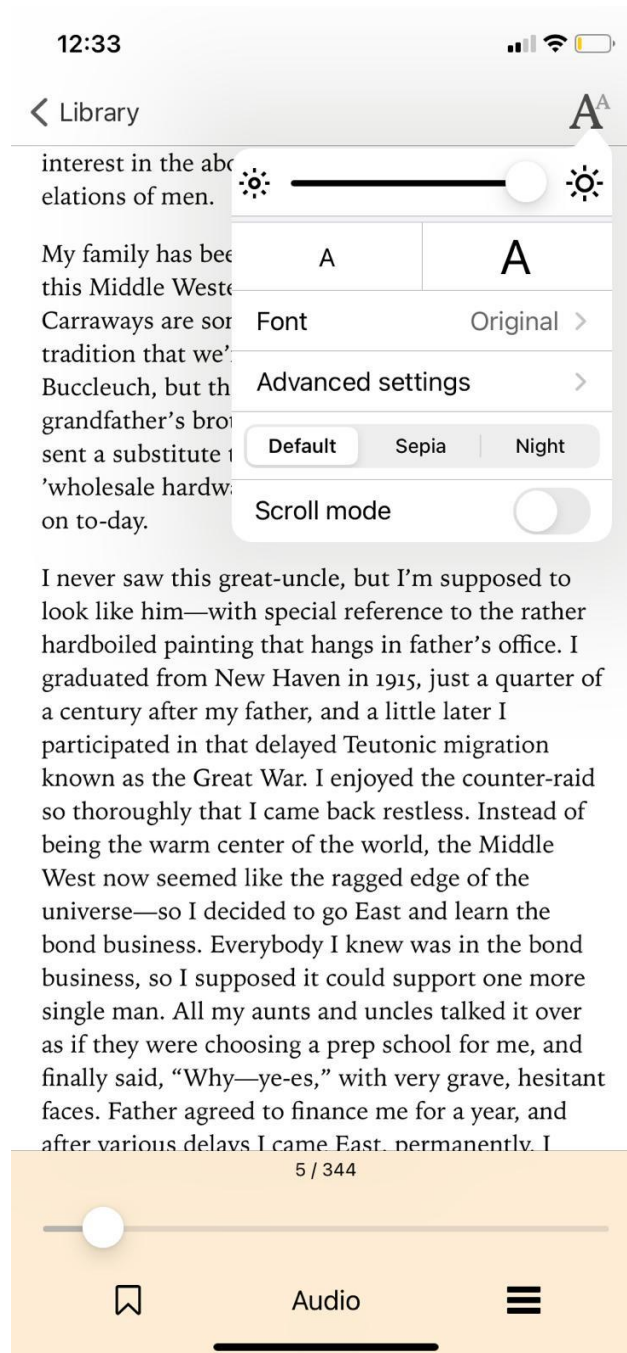
He didn't say any more, but we've always been unusually communicative in a reserved way, and I



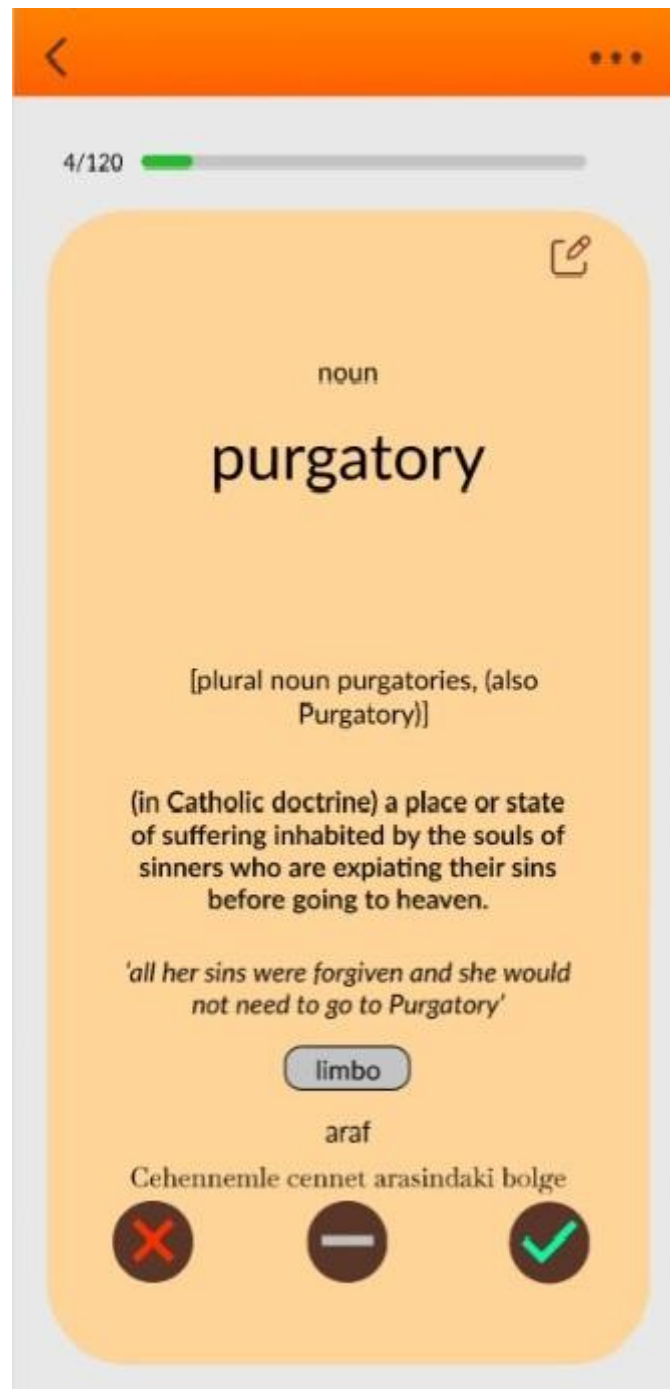
The user can also switch between dictionaries to check the meaning of a word from multiple dictionaries. Also, the user can see the definition of the word from these dictionaries.



The Audiobook interface is very similar to the text interface. The user can switch between these.



The user can change the settings while reading or listening to a book. This settings page includes brightness, font size, font type, advanced settings, light modes and scroll mode.



This is a flashcard. It contains information on it Here, it contains the word, definition, and an example sentence as well as the translation of the word. There are 3 buttons at the bottom to indicate whether the user remembers the word or not. There is an edit button on the top-right to edit the flashcard.



This is the UI of flashcard creation. Users can look up the meaning of a word from dictionaries while creating the flashcard.

10. References

- [1] Institute, Mpower A.S.C.E.R.T. "Language Learning Leads to Improved Personality." ASCERT, ASCERT, 29 Jan. 2020, <https://www.ascertinstitute.org/post/language-learning-leads-to-improved-personality>.
- [2] Gobler, E., 2021. Best language learning app 2021: Top 7 apps compared | ZDNet. [online] ZDNet. Available at: <https://www.zdnet.com/article/best-language-learning-app/#:~:text=Duolingo%20has%20become%20the%20most,methods%20to%20help%20you%20learn.>> [Accessed 20 December 2021].
- [3] "Why I'm Quitting the Japanese Duolingo Course (an Honest Review)." www.youtube.com, www.youtube.com/watch?v=jf-SbSfiXn4&t=480s&ab_channel=Livakivi. Accessed 20 Dec. 2021.
- [4] Wikipedia contributors. "Kató Lomb." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 15 Nov. 2021. Web. 20 Dec. 2021.
- [5] Stanborough, Rebecca Joy. "Benefits of Reading Books: For Your Physical and Mental Health." Healthline, Healthline Media, 15 Oct. 2019, <https://www.healthline.com/health/benefits-of-reading-books#alleviates-depression>.
- [6] "Keep Em Reading: The Importance of Audiobooks for Dyslexics." Keep Em Reading! The Importance of Audiobooks for Dyslexics | Dyslexia Help at the University of Michigan, <http://dyslexiahelp.umich.edu/answers/ask-dr-pierson/keep-em-reading>.
- [7] ReadBeyond, Padova. What Is an Audio-Ebook?, 15 Apr. 2014, <https://www.readbeyond.it/audioebooks.html>.
- [8] Longanecker, Chuck. "Why You Should Use a Subscription Business Model." Entrepreneur, Entrepreneur, 19 Mar. 2015, www.entrepreneur.com/article/243573.
- [9] Rich, Emma. "The environmental impact of Amazon's Kindle" CleanTech Group, LLC, 2009, https://gato-docs.its.txstate.edu/jcr:4646e321-9a29-41e5-880d-4c5ffe69e03e/thoughts_ereaders.pdf