

Human Computer Interaction Project

Design of Literature Recommender Interface for Expats

Group 33

Student Name	Student Number
Matei Galesanu	5239435
Alexandra Ioana Neagu	5233194
Teodor Gabriel Oprescu	5320992
Răzvan Mihai Popescu	5280826
Alexandru Cătălin Turcu	5239451

Teaching Assistant: Jean-Paul Smit
Project Period: March-April, 2023
Faculty: Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS), Delft
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1

Introduction

In today's interconnected world, people are increasingly choosing to live and work in different countries. This global mobility movement has led to an increasing number of expats, who often face numerous challenges as they settle into a new environment. One of the biggest challenges that they face is cultural integration into the local community and getting insights into their new area of residence. To address this, we have designed a mobile application that serves as a user-friendly recommender system of books, literary works, and educational resources specific to the country in which our target group of users (expats) decide to settle. Our proposed and tested mobile application concept aims to help expats integrate more easily into their new community and feel more at home in their new country.

This report will offer an overview of the creative and design pipeline used to develop this software: from MoSCoW requirements gathering to evaluating different prototyping stages through interviews with various personalities within our target group of expats. It will present the research methods and user-centered design principles used to make a user-friendly and efficient platform. Additionally, we will outline the key features and functionality of the application and how they were designed to satisfy the needs of expats. Finally, we will discuss the results of user testing and feedback and give recommendations for future growth and improvement of the platform, which at its core, is a mobile application made by expats, for expats!

The structure of the report is organized chronologically, from the development process point of view. Chapter 2 describes the requirements elicitation process, while Chapter 3 explains how those were used in the design step of the system. Chapters 4 and 5 contain information about prototypes that were created, as well as their evaluation by various groups of users. Finally, the conclusion and discussions can be found in Chapter 6.

2

Requirements elicitation

This section contains the preamble of the design process, namely identifying the required functionalities of the system. A PACT analysis was performed by the team in order to correctly determine the essential characteristics of a system that recommends books for expats. Then the analysis was built upon by formulating a list of requirements following the MoSCoW prioritization method.

2.1. PACT Framework

PACT is an interaction design structure used to analyze with whom, what, and where a user interacts using a user interface^[2], with the purpose of designing and developing effective digital systems. It is based on the principle that successful software must consider the interplay between people, their actions, the context in which these actions occur, and the technology used to facilitate them. Our project utilizes the PACT method to ensure that our digital intervention is tailored to the specific needs and preferences of our target audience.

2.1.1. People

The identification of personas is an integral component of the framework, particularly given that the target user group comprises expats. Thorough research was undertaken to ensure that personas were credible and realistic, drawing on a range of characteristics specific to the expat community. The identified personas were based on factors that were deemed highly likely to occur, such as language barriers, cultural differences, and the difficulties associated with adapting to a new environment. Ultimately, five distinct personas were identified, each with its unique life story, ethnicity, needs, and other features. The accompanying documentation, found in Appendix A, provides comprehensive descriptions of each persona, ranging from a young Eastern Asian adult male of 28 years to a 45-year-old Eastern European woman working in the medical field.

2.1.2. Activities

In order to showcase the usage capabilities of our app, we elaborated on different activities for each persona. The first persona, Ventsislav Buchvarov, is looking to connect himself more with the local culture. The second persona, a single mother from Croatia, wants to help her child integrate into a new society. The third and fourth personas want to improve their skills as quickly as possible in order to get better job opportunities, and last but not least, the fifth persona dreams of opening up their own business - a restaurant - in a new country.

2.1.3. Context

The concept of the app came to light in the context of the 21st century, the age of international travel. With advances in transportation and communication technology, it has become easier than ever for people to relocate and settle in a foreign country as expats. The globalization of the economy, coupled with the rise of the digital age, has also contributed to the increasing trend of international mobility. As a result, cultures are becoming more diverse and international, with people from different backgrounds

living and working side by side. This has led to a richer and more complex cultural exchange, where individuals can learn from one another and embrace new ways of thinking and living. In this context, our app was created with the purpose of helping expats and people residing in culturally diverse societies better integrate into their newfound communities.

2.1.4. Technologies

The mobile application is a perfect fit for the current state of our digital age, where mobile apps are in higher and higher demand, as it enables users from different parts of the world to access it with ease. This makes it convenient for potential users to receive recommendations even when they are on the go. In this age of mobility, people are always traveling or commuting, and having access to books through a mobile application can greatly enhance their experience. With the international culture becoming more diverse, the demand for mobile applications that cater to the needs of individuals from different backgrounds is on the rise. The app is designed to be user-friendly and accessible, providing a seamless experience to users regardless of their location.

2.2. Requirements Gathering

Due to the project's extensive time constraints, along with the requirement of contacting potential users outside the academic scope, the team had to compromise and prioritize the tasks. The conclusion involved deriving an initial set of requirements within the developing team, as expats on our own, and then contacting and interviewing our target group for evaluation when required.

Before starting with the requirements elicitation, the principal stakeholders were identified:

- **Expats** - The *primary* target audience of the system. They will use the system to find book recommendations based on their domain of knowledge or interests
- **Authors** - As *secondary* stakeholders, the authors of the books recommended on the platform might benefit from the increased exposure of their publications.
- **Book publishers** - Same as the authors. Additionally, they might be interested in promoting their new publications.

The members of the team collaborated and adopted the perspective of the target group, namely expats trying to accommodate themselves in a new environment. Moreover, the team considered the potential lack of language proficiency, color blindness, or other impairments our primary stakeholders might present. In addition to the latter, the team performed the requirements elicitation in concordance with the PACT analysis defined in Section 2.1.

The list of requirements is attached in Appendix C and is structured based on the MoSCoW prioritization method. Considering the project is focused on the interaction between a user and the visual interface of a system, most of the requirements are centered around this idea, without any restriction on the server side of the system. To summarize the must-have requirements identified, the application will make use of an authentication system to synchronize the user preferences. During registration, users can specify their initial interests, as well as language proficiencies, country of origin, and residence. The main page of the system will show the most relevant book topics for the user, together with the option to search and visualize all the categories available. The user will be able to show interest in a book by adding it to their bookmarks, an option accessible from the detailed view of any publication. To adhere to GDPR [6] guidelines, a user can at any time review their shared information, edit it and completely delete their account.

3

Design

The design stage commenced after a thorough examination of the target user group and once their system requirements were identified. As part of our design, we must take into account the secondary stakeholders, and integrate them into the system explicitly by adding their information next to a publication.

3.1. Inclusivity Analysis

Inclusivity analysis is a process that ensures that a system promotes the participation of various groups of individuals of different ethnicities, genders, impairments, and cultural backgrounds^[1]. The team's goal is to develop a system that is accessible to a wide range of target individuals, independent of any discrimination, disability, or literacy level. We considered various impairments that would cause disturbance when a target user utilizes the system. In the case of a mobile application, one of the main tasks is to ensure that the content is readable by all parties involved.

Several common user impairments can affect accessibility on mobile applications. Below are some examples, along with ways in which these impairments can be alleviated. The features presented are either high-priority requirements or are already being taken care of by one of the main mobile operating systems on which the application will run (Android and iOS both have multiple accessibility features already included).

- **Visual Impairments:** This includes low vision, color blindness, and other visual disabilities. These issues are addressed by providing custom settings and options such as high contrast modes, larger font sizes, and audio descriptions for text found in the app.
- **Hearing Impairments:** This includes partial or complete deafness and other hearing disabilities. These issues can be addressed by making use of closed captions transcripts (from the developed application or through the phone's OS), or through the use of audio descriptions (already mentioned as a solution to the previously-mentioned visual impairment).
- **Motor Impairments:** This includes disabilities that affect mobility, dexterity, and motor control. This can be addressed by creating interfaces with larger buttons, voice commands, and gestures that can be executed with minimal physical effort.
- **Cognitive Impairments:** This includes impairment that affects cognitive functions such as attention, memory, and learning. These are addressed by making use of clear and concise language, logical layouts, and simple navigation to ensure that their mobile application is easy to read and use.
- **Neurological Impairments:** This includes impairments that affect the nervous system, such as epilepsy, migraines, tremors, or ADHD. Flashing lights, intense color patterns, or other triggers that could cause seizures or headaches are avoided.

The team's goal is to produce an accessible book recommendation app for expats that cater to a broad range of users, regardless of any discrimination, disability, or literacy level. To accomplish this, an

analysis of the target group is crucial, taking into account factors such as age, literacy, and gender, as well as cultural background and accessibility needs.

Expats belong to different age groups, from young adults to retirees, which calls for a user-friendly interface with larger font sizes for older users and interactive or gamified features for younger users. As for literacy, the app should be designed with simplicity in mind, using clear and concise language and audio descriptions or translations to cater to users who are not confident in their reading skills. Moreover, the app should avoid gender stereotypes and assumptions about gender preferences for book genres to be inclusive to users with diverse gender identities.

3.2. Information Architecture

Information architecture represents a method used in user experience research to design easy-to-use and intuitive interfaces. This ensures that a user, disregarding their level of expertise with computers or mobile devices, can access and utilize the features of the system that the team is building.

One of the main advantages of the selected architecture is that every page is easy to access regardless of the current location in the navigation tree. Each application screen is at most 2 interactions away, as can be seen in Figure 3.1. This builds on top of the overall usability of the system and translates into lower accommodation times for first-time or low-experienced users. Appendix D contains a complete overview of how a user would utilize the system.

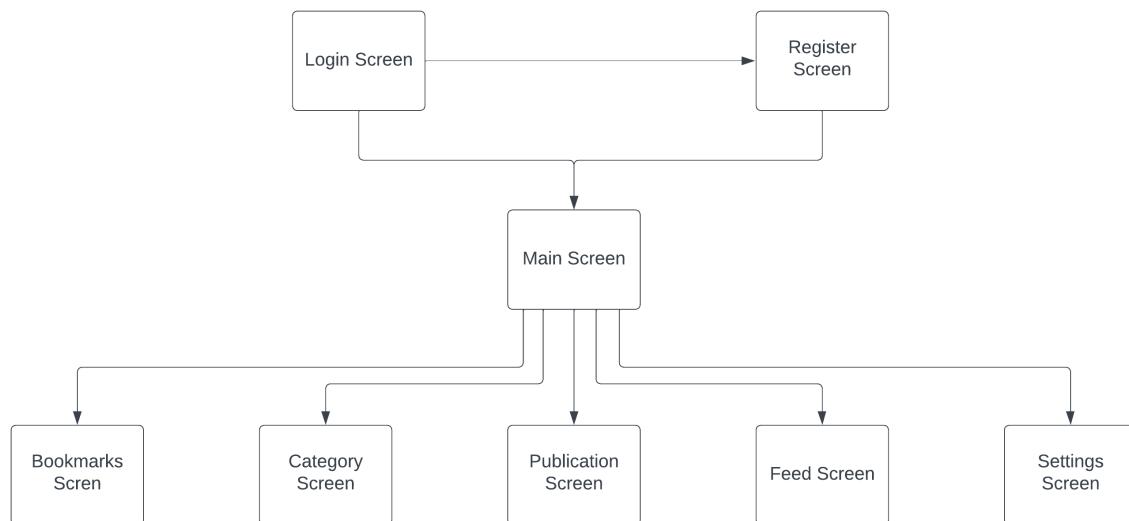


Figure 3.1: Low-level Information architecture

4

Prototyping

Following the requirements elicitation and architecture design steps, some prototypes were created to be used in subsequent user evaluations. The following chapter describes the development process and results of low and high-fidelity prototypes. Their purpose is to create a tangible concept that the stakeholders can assess and criticize, as well as one that the team can use to test out their ideas for the final product. User feedback is essential in improving these initial prototypes, but basic ones were needed to initiate the evaluation process.

4.1. Low-Fidelity

The first step in the prototyping process was to draw the basic layout of each application screen, including placeholders for important interactable elements. The technique used for this step was simple manual drawing on a digital tablet, as it had to be ready as soon as possible and only provide essential information for developing higher-fidelity prototypes later. An example can be seen in Figure 4.1, and the complete low-fidelity overview of the application is provided in Appendix E.1.

Figure 4.1 shows the initial design of the central page, which is intended to be the first screen the user will see when opening the application (given they have previously logged in). The main functional elements, which include the bookmarks page, the settings page, the scrollable feed, and the category selection elements, are visible in this preliminary design.

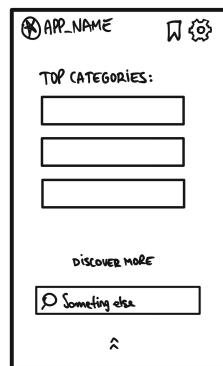


Figure 4.1: Example of low-fidelity prototype

4.2. High-Fidelity

Creating a high-fidelity prototype was the next step in the prototyping process, and it can be found in Appendix E.2. This was done using a collaborative interface design tool, namely Figma^[5]. This prototype allows for realistic user interactions along with navigation possibilities, all of which combine to create an aesthetically pleasing user interface. Moreover, in comparison to the low-fidelity prototype,

this one facilitates the testing and evaluation of more complex design features. For this prototype, a vertical design was chosen to meet the application's primary use case and to enhance usability and user experience.

The vertical design, as previously mentioned, gives a more responsive and dynamic feel to the prototype. In addition, it offers a better field of view that makes it simple for users to scroll up and down to view various literature recommendations. Also, it helps when reading book descriptions and reviews, because it is more similar to reading from an actual piece of paper. Lastly, the majority of mobile applications use a vertical design approach, thus most people are accustomed to it. As a result, having a vertical design enhances accessibility and makes the application easier to use for elderly people, persons with special needs, and inexperienced smartphone users because they are already familiar with this layout. The prototype gives convenient access to a wide range of settings in order to make the user experience more personal. The users can change their personal data by navigating to the account tab in case they made a mistake or if they want to receive different book recommendations. By selecting the appearance tab, users can also modify the language of the interface or enable dark mode. As can be observed in Appendix E.2, there are more settings available that enable users to customize the application to suit their needs.

The transition from the low-fidelity prototype to the high one was done by adding a color scheme, illustrations, shadows, gradient effects, icons, and many other changes. These additions will bring the user closer to the actual look of the final version of the application, thus making the evaluation more significant for further improvements. Because accessibility is crucial, the color scheme was chosen to create a strong contrast between the prototype's various parts. With this, people with disabilities such as color blindness would be able to see the differences between the components and effectively engage with the prototype. Additionally, there are special indicators that are used to highlight user selections while interacting with the prototype. For example, during registration, the user can clearly observe the selected category because of the checkboxes on the right side of the component. Similarly, users can see which page they are currently viewing when navigating a carousel tab of books in a particular category. This is emphasized by using a larger green circle to create contrast and draw attention. These examples can be seen in Figure 4.2.

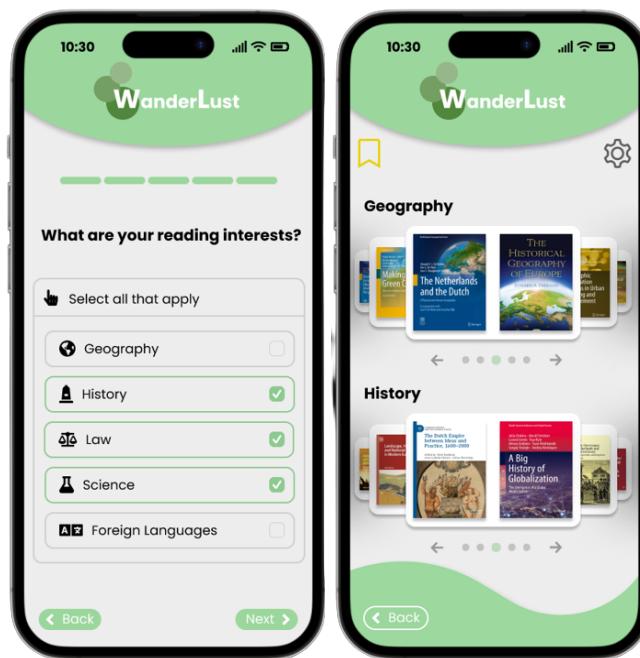


Figure 4.2: High Fidelity Prototype

The addition of these dynamic carousels to the prototype improves the visualization and enables users to browse a variety of books without having to navigate between pages. Swiping between carousel panels or pages is employed in the prototype since simplicity is crucial. Also, each button is clearly

labeled to enhance readability and inform users of what the system is intended to accomplish. In addition to the improvements the high fidelity prototype comes with, it also enables the users to perform certain actions and navigate the pages in order to test the system's functionality and identify more subtle issues. A wireframe that describes these interactions can be found in Appendix D.1.

Users can log in or register, enter personal information, and receive recommendations for books based on their interests. They can customize the settings, add books to their bookmarks page, look up specific works of literature, or even find new book categories. Also, individuals have the ability to review, rate, and share books with others. Lastly, every page is simple to reach regardless of where you are in the navigation tree, which is one of the architecture's key benefits. As a result, users can navigate through the prototype more easily, quickly, and responsively because the information they need is right around the corner. The final application's behavior and appearance are closely resembled by all the described features and the ability to interact with and move between pages. All of this combined into a high-fidelity prototype will be presented to the users, in order to test the system's functionality, evaluate its performance, and make additional improvements to bring it in line with the users' viewpoints.

5

Evaluation

This chapter describes the various evaluation steps conducted in a controlled environment with members of the target group, having a diverse level of technology literacy, as well as domain experts. During the evaluation process, only the primary stakeholders were considered, since they will directly benefit from the enhancement of the system. The team would have appreciated feedback from secondary stakeholders as well, but due to the tight schedule of the project, this was postponed for future iterations in the design cycle.

5.1. Ethical Considerations

Before moving forward, it is essential to take into account the ethical implications of the planned series of user and expert evaluations. Due to the nature of our project, we were not able to identify any major problems in conducting the intended interviews. Personal information and sensitive data collection about the participants is strictly limited because the evaluations only relate to the high-fidelity prototype and the experiences of the people interviewed with it. The only Personally Identifiable Information collected, which is the participants' full names, will be deleted at the end of the project. In addition, the amount of Personally Identifiable Research Data (PIRD) collected (including participant age and languages spoken) makes the likelihood of participant re-identification very close to zero. As a result, the team's evaluation procedure complies with all GDPR requirements since participants are free to stop participating at any time and request that any data they have provided be deleted. Additionally, because the evaluations were conducted in person, the team would give face masks upon request from the participants.

By completing the TU Delft Human Research Ethics Checklist (HREC), which was used to check all potential risks that interview participants could be exposed to, all of the issues mentioned above have been officially taken into account. Overall, despite the low risks associated with our study, we still awaited the approval of this document before beginning our interviews. The HREC has been specifically created to cover and address all of the evaluations that our team planned to conduct (and will be covered in this chapter). The single, complete, and approved HREC document can be found in Appendix F.

5.2. User Evaluation

The user evaluation was the true test that the application had to pass in order to determine whether the target users would find the current design and prototype appealing and simple to use. If not, the user feedback would show where the application needs to be improved to succeed. The recommender system algorithm that the application is based around was mocked for the interviews. Thus, the users were able to make new accounts, explore the main screens of the application and search for specific books, although the results of the queries were hard coded.

5.2.1. Evaluation Method

The team decided on the following evaluation structure: 30-minute physical interviews consisting of 2 parts. The first part was a 20 minutes presentation, semi-formal discussion, and a demo of the presently

available prototype. The second part consisted of a 10 minutes end-of-the-interview survey that aimed to synthesize the users' feelings and opinions and to verify if their thoughts matched with the notes taken by the team in the first part of the interview. The full survey can be found in Appendix I.2.

A total of 18 expats from various regions of the Netherlands were asked to provide feedback about the design of the application. Every participant was presented with an Information sheet (Appendix G) and a Consent form (Appendix H) before partaking in the interview. The purpose of these two documents was to first inform the participant about the interview procedure, as well as the potentially involved risks, and then allow them to express their consent officially.

5.2.2. Results

The results of the interviews were generally positive, confirming the good design of the application. It looks modern and on par with the current design trends. However, some issues and oversights that needed to be addressed have been revealed to the design team. One main aspect that was overlooked was that the interface was designed under the assumption that all users would have the same level of digital awareness as the designers. From interpreting icon buttons to navigating the application, the interview helped bring the main usability issues to light. The complete list will be skipped for brevity but can be found in Appendix I.1.

5.3. Expert Evaluation

A *Heuristic Usability Evaluation* is a method of evaluating the user experience of an application by which a group of experts reviews the application according to a list of usability criteria, or heuristics^[4]. The main goal of the assessment is to identify any shortcomings in our User Interface and User Experience. We aim to use the received feedback to improve any aspect that falls short of our expectations. By subjecting our high-fidelity prototype to the scrutiny of experts, we can ensure that the front end is both user-friendly and easy to navigate. The Heuristic Evaluation, which involves testing the application in real-life conditions, will be an invaluable tool for us. Although our application layout is not yet fully functional, we believe that the Heuristic Usability Evaluation is still an appropriate method for testing it. Our primary objective is to uncover any potential issues with the user interface and make the necessary fixes before implementing any related functionality. By doing so, we can avoid the high costs associated with making changes at later stages of development.

5.3.1. Procedure and Data Collection

We recruited 15 experts with previous proven experience in UI and UX design. The experts fall into the 25-40y age group and come from diverse cultural backgrounds, comprising both expats from outside and inside Europe, as well as native Dutch people. Due to their familiarity with UI/UX design principles, they were able to provide detailed feedback regarding the expected behavior of the application. The experts were asked to go through our high-fidelity prototype individually, and were asked to compile a list of discovered problems based on the following format:

- **Problem Description:** a brief description of the problem they identified
- **Likely/Actual difficulties:** problems the experts encountered and/or common users will face as a consequence of the lacking aspect
- **Specific context:** where did the expert find the problem, or when will the user encounter it
- **Assumed causes:** what do the experts think is the cause of such a problem

The experts received an introduction to this format and an introduction to how to navigate through our app. After that, they were presented with our high-fidelity prototype, with a short description attached to each screen so that they will be able to navigate effectively through the different elements. We believe these details will help the evaluators with properly reporting the exact location of the identified problems. Finally, they will fill in the format document based on *Nielsen's 10 Usability Heuristics*^[3], which we believe are fundamental to a modern-day, adequate UI.

5.3.2. Results and conclusions

After having received the evaluations from the experts, our team utilized an *Impact-Frequency Chart* to assign a rating to each issue. The format used (X, Y), represented the probable frequency of an

encounter (X) and the gravity of the impact they might have on the user's experience (Y). The ratings were charted on the figure available below, based on which prioritization of the issues was established. To determine the ratings, we took into consideration the perceived impact and frequency of the issues, as well as the severity and frequency of reports by the experts. The results have been reformatted to present the issues and ratings in a clear and concise manner.



Figure 5.1: Impact-Frequency Chart

As a result of the heuristic evaluation, a list of issues has been gathered, in their prioritized order based on the aforementioned process. This prioritization is also used to determine the order in which the issues should be improved, based on the severity they have on the user's experience. Alongside the issue, we also present potential ways to solutionize it. An example can be found below, while the complete list is provided in Appendix J.

1. **Problem description:** The interface does not include a back button for the "Settings" and "Bookmark" screens.

Rating: (5, 5)

Related to heuristic: #3: User control and freedom

Likely/actual difficulties: When the user reaches the "Settings" or "Bookmarks" page, they might not know how to go back to the main screen.

Specific context: The users will encounter this when they reach the "Settings" or the "Bookmarks" page.

Proposed solution: Include a back button on the "Settings" and "Bookmark" pages. The button could be added in the lower left corner (the "Delete Account" button on the "Settings" page will have to be moved further up to make space for the back button).

In conclusion, most of the identified issues were related to heuristic #8, Aesthetic and minimalist design, and more specifically to inconsistencies in the UI quantity and quality between the different screens. Despite their frequency, these issues were determined to have a medium to low impact. On the other hand, our highest prioritized issues were related to User control and Recognition, as our most serious problems included dead ends in the system due to concealed back buttons and counter-intuitive navigation within pages. This heuristic evaluation has helped us identify a high number of impactful problems in our prototype and gave us a chance to address them and improve the UI for the final version of the application.

5.4. Cognitive Walkthrough

The *Cognitive Walkthrough* method is used to assess the usability of a system. This evaluation strategy helps us in determining how easily the users are able to carry out certain tasks within our system, with little or no formal instruction or coaching. This approach significantly relies on the expertise of a group of specialists who test the user interface and perform particular tasks inside the system to simulate the viewpoint of a brand-new user. In comparison to other evaluation methods, the cognitive walkthrough is reasonably fast and affordable to conduct. Moreover, it can also be employed during the design process, which will help us in detecting possible issues that the users might face while interacting with the system. In addition, the early deployment of this evaluation method will shape the development process in order to create a system that meets all the objectives and needs of the users. The preparation for this evaluation strategy is split into two parts. The first one contains the description of the task and a list of valid actions that the user is expected to take in order to complete this task. The second part talks about the anticipated users and their initial goals. Once the preparation is done, the walkthrough is conducted by performing all the actions within a given task process and posing a set of questions that will shed light on the user's potential behavior.

Two main categories of usability issues were identified by analyzing the results of this activity. The first one, which also covers the majority of the problems, comes from the reality that any user is prone to make small mistakes when using such a system. Some examples from our analysis include mistyping the email or the password or accidentally tapping on something else than intended. We do not interpret these as weak points of the application, but rather as a margin of acceptable human error. The other type of difficulty the participants encountered was caused by arguably misleading pieces of UI, the most obvious being the similarity between the 'See more' button and the option to swipe up from the main screen. When asked to search for a specific publication, the participants were unsure which option of the two would take them toward their goal. The full list and description of other sets of actions are available in Appendix K.

5.5. Controlled Experiment

In a controlled experiment, independent variables are manipulated to test their effects on dependent variables. Furthermore, it allows us to focus on specific parameters, and identify critical relationships between components, in order to build a valid system that can enhance the user experience and account for a broad range of stakeholder viewpoints. One of the main issues that emerge from the feedback received on the previous evaluation methods states that the interface does not include a back button for the "Settings" and "Bookmarks" screens, thus making the interaction less intuitive. In order to address this issue, and improve our system, we will conduct a controlled experiment and compare the obtained results with the current information we have. Figure 5.2 contains a side-by-side comparison of both, old and new, versions of the "Bookmarks" screen.

As it can be observed, the yellow bookmark button was replaced with a back button, which represents the independent variable in this experiment. This back button is only enabled once the users access the "Bookmarks" screen, in order to make the navigation easier and more intuitive. The same applies to the "Settings" screen, as can be seen in Figure 5.3. On the other hand, the dependent variable is represented by the number of user clicks on the newly added back button. This will be used in the assessment process, namely in comparison to the number of user interactions with the built-in backward navigation of their device. Moreover, the number of user clicks on the yellow bookmark button (which had double functionality, that is going back and forth) from the older version of the screen will also be used to evaluate the effects of the changes made in the system. Lastly, the confounding variable that might influence the dependent variable is represented by the position of the back button. In some cases, the built-in back button from the users' devices might be located at the bottom of the screen, which is handier for certain users.

We have selected a total of 16 people willing to participate in the controlled experiments. This number has been chosen to strike a balance between having enough data for making relevant conclusions, and the difficulty in finding enough people for all of the anticipated evaluations. The following inclusion and exclusion criteria guided the selection process:

- **Inclusion criteria:** Participants must be willing to participate in the study, mostly be from the

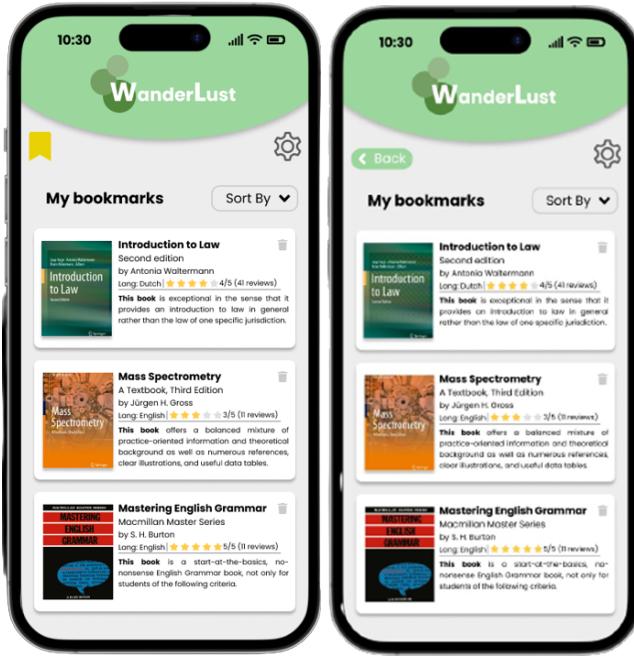


Figure 5.2: Evolution of Bookmarks Screen

expat user target, have an affinity for reading, know to speak either English or Romanian, and have basic knowledge of smartphones.

- **Exclusion criteria:** People that participated in prior evaluations conducted by the team (thus eliminating all possible sources of bias).

As previously mentioned, the controlled experiment aims to analyze whether the introduction of a go-back button on the interface would alleviate the confusion regarding this self-explained action. As a result, the 16 participants who agreed to take part in the experiment were divided into two equal groups. One group was shown the standard prototype interface, while the other was shown the interface with the newly added go-back button. In order to simulate how an application might be used naturally, participants had to spend several minutes navigating it without a specific objective.

To measure the success of this feature, we tracked all of the users' screen touches related to the go-back action and analyzed the results. Moreover, the time spent on each screen in the application (excluding scrolling) was also tracked to see if any abnormalities occur in the users' behavior.

In the first group, which was given the original prototype, there was a small degree of confusion for a majority of participants regarding this go-back action (mostly occurring for slightly-inexperienced smartphone users). Only two of the eight participants ultimately understood that pressing the bookmarks and settings icons again was the proper way to complete the go-back operation, thus validating the negative feedback of this feature arising from previous evaluations. One person discovered the "pressing of the icons again" functionality only midway through the navigation process, while the other five users relied on the mocked operating system's back button (before that only using the OS buttons).

The navigation process has slightly improved for the second group since they were provided with an explicit back button. All potential uncertainty was avoided because everyone involved was aware of how the button was supposed to be used and what it would do. Six out of eight participants actively used the button, while the remaining participants opted to use the built-in go-back buttons of the mocked OS, primarily due to convenience and familiarity.

The results of the trial are rather mixed: adding the go-back feature did not have an impact on the number of user's screen touches (difference in average close to 0), but it indeed redirected the source of the touches from the OS button to our button. The decrease in time spent on the bookmarks or settings screens, although small, indicates a reduction in the users' level of confusion. Since the modifications

did not prove to be time-consuming or require large efforts, this experiment was marked as successful, resulting in the future integration of the feature in the final version of the system.

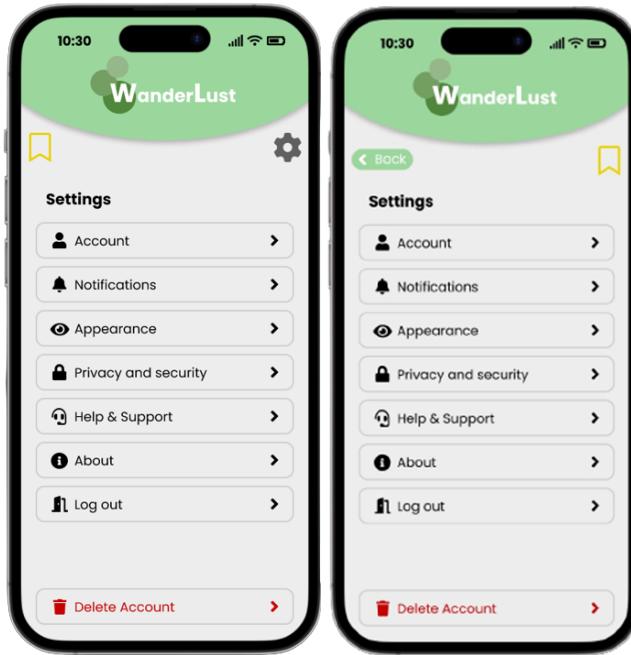


Figure 5.3: Evolution of Settings Screen

6

Conclusion

To summarize this report, the team started by building a requirements list for a system that could recommend books for expats, such that they can integrate into a new society, and followed by designing an initial sketch of the application, taking into account possible impairments or needs that could arise from the selected target group. Once these steps culminated, we started to prototype an initial model for the desired user experience that we wanted to deliver. The report's finale is formulated based on feedback received from both the primary stakeholders, as well as experts in the field of UI/UX.

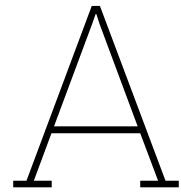
Due to the narrow timeframe of the research conducted on the target group, not all points of improvement suggested during the evaluation process had the chance to be implemented. As a consequence of mocking the principal screens, instead of building a fully-fledged application, some of the users experienced difficulties in understanding how the navigation between screens would occur. Additionally, the wireframes of the system do not provide details for each accessibility setting that the team was looking to provide for the users.

Throughout the process, the team communicated clearly and contributed equally to the research, encountering no unresolvable issue that would have perturbed the workflow.

The main goal of the team in the short term is to upgrade the system to match the needs of the users, by implementing their suggestions and feedback. For further evaluation processes, we are looking into improving the wireframes, adding multiple renders of setting screens and making the UI interactive. The addition of tooltips during the registration process would represent a useful progression to make this step more straightforward for new users and would encourage them to continue using the application, as pointed out during the evaluation process. Moreover, in the long run, the team is keen on deploying an initial prototype of the system on platforms such as Android and iOS.

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- [5] *The Collaborative Interface Design Tool*. URL: <https://www.figma.com/> (visited on 03/24/2023).
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Personas

A.1. Ventsislav Buchvarov

Sex: Male

Age: 36

Occupation: Software Engineer

Status: Single

Location: Amsterdam

Personality: Slightly introvert, Ambitious, Tech-savvy

Bio: Ventsislav is a Bulgarian software engineer who has been living in the Netherlands for the past 9 years. He has built a successful career but has always felt a bit disconnected from the local culture. He has been looking for ways of getting accustomed to it but has not yet found a working solution.

Needs:

- Find reading recommendations based on his background and interests.
- Have access to reviews and comments from people in similar situations.
- Access everything from a simple and responsive mobile application.

Challenges:

- Doesn't always feel like he properly settled in his new country.
- Cannot find a centralized source of information.
- Has bad opinions about poorly designed user interfaces.

A.2. Mladenka Marjanović

Sex: Female

Age: 45

Occupation: Nurse

Status: Single mother

Location: Utrecht

Bio: Mladenka is a Croatian single mother of a 7-year-old boy. She recently moved to The Netherlands to reorganize her life after a failed marriage. She also wants to offer her child opportunities in a more developed country. Both she and her child have an intermediate level of English.

Needs:

- Gather book recommendations that would help her child to integrate into society and also learn the local language.
- In the future, Mladenka wants to apply for Dutch citizenship, so she is looking for collections of books that would help her pass the Dutch Civic Integration Exam.
- Since Mladenka has a low technology literacy, she is looking for a simple-to-use application that would suit her needs.

Challenges

- Local language barrier. Even though she can communicate in English, she is yet to learn any Dutch words. This limitation can also have a consequence in finding a suitable job.
- Find a local community in which Mladenka and her son would be able to integrate themselves.

A.3. Jacek Ivor

Sex: Male

Age: 33

Occupation: Construction worker

Status: Married with kids

Location: Rotterdam

Bio: Jacek is a middle-aged man from Poland who is working in the construction field. He made the decision to move to the Netherlands in order to provide for his family and give them the opportunity to live a better life. Since he does not know any Dutch and barely speaks English, Jacek wants to improve his skills as quickly as possible in order to get better job opportunities.

Needs:

- Look for book recommendations to learn Dutch at a fast pace and integrate easily into the community.
- Have access to relevant materials in order to apply for Dutch citizenship, and get more benefits.
- With a user-friendly mobile application, gain access to important information everywhere they go.

Challenges

- Employment prospects are severely restricted by a lack of Dutch fluency.
- The process of integration into the community, and adaptation to a new lifestyle, will be delayed by a lack of basic knowledge about the Netherlands and its native language.

A.4. Lidiya Borysivna Voznyuk

Sex: Female

Age: 41

Occupation: Sales Manager

Status: Married with kids

Location: Maastricht

Bio: Lidiya is a Ukrainian married woman that had to flee her country when the war began in 2022. She used to have a pretty successful career in sales working for a luxurious brand of cars in Kharkiv, but she left Ukraine together with her children while her husband had to stay behind and join the army. Lidiya speaks fluently both Ukrainian and Russian, but she's only a beginner in English and doesn't speak Dutch at all. She wants to improve her language skills so that she can find a job. Her favorite genre of books is self-improvement books.

Needs:

- Improve her language skills (with an emphasis at first on English, and then on the Dutch language)
- Find a job in her field: Lidiya had a successful career in sales in Ukraine, but finding work in her field in Maastricht may be challenging due to language barriers and the need to build a new professional network.
- Access to literature in her preferred genre (self-improvement books): Lidiya enjoys reading self-improvement books, which may help her cope with the challenges of adapting to a new culture and life.
- Adjust to a new culture and way of life: Lidiya's relocation to Maastricht represents a major life change, and she may struggle to adapt to the new culture, norms, and lifestyle. She may need to learn new customs, social norms, and ways of living to integrate into her new community.

Challenges

- Limited proficiency in English and no knowledge of Dutch.
- Isolated from her former community and struggling to connect with new people: Lidiya's relocation may cause her to feel disconnected from her former community, making it difficult to adjust to her new life. She may need to actively seek out social opportunities, such as joining clubs or attending events, to build new friendships and connections.
- Limited to no access to literature in her native language, she may need to explore digital options, such as e-books or online communities, to find resources to her liking.

A.5. Katsuki Kenpachi

Sex: Male

Age: 28

Occupation: Restaurant chef

Status: Single

Location: Arnhem

Bio: Katsuki Kenpachi is a young Japanese man who works as a restaurant chef in the Netherlands. Growing up in Japan, he wanted to follow in his father's and grandfather's footsteps and become a renowned chef, for which reason he attended culinary school. After finishing it, he decided to move to Europe to gain more experience in his craft. Working in a foreign country hasn't been easy for Katsuki, but he is determined to succeed and build a better life for himself. He hopes to someday open his own restaurant and share his love of food with the world. To achieve this goal, he has been working hard to improve his language skills and connect with other chefs and food lovers in the Netherlands.

Needs:

- Have easy access to book recommendations that would help him improve his English, and preferably also be cooking related (e.g. recipe books).
- Since he wants to open a restaurant in the Netherlands at some point, he would also like to apply for Dutch citizenship. He would like easy access to material that would help him in this regard.
- Have all these documents and information in one place, in an app that is easy to use and portable.

Challenges

- Networking within the Dutch chef community is hard to achieve because he doesn't speak Dutch.
- With his English skills also not that good, he is having a hard time dealing with the logistics and governmental side of life, especially in the context of opening his own business.

B

Scenarios

B.1. Scenario 1

Ventsislav gets up at 7 AM to get ready for work, as he has done for the past few years. He lives alone in an apartment on the outskirts of Amsterdam. He mounts his bike and begins his 40-minute ride to the office. Once there, he greets his colleagues and proceeds to handle the latest tasks. Lunchtime comes and he moves to the cafeteria to have lunch with a couple of colleagues from Eastern Europe he befriended when first getting the job. Although he enjoys their company, Ventsislav cannot help but notice the other groups having lunch, most of them solely composed of Dutch people. At this moment, he realizes he has been working for such a long time in the Netherlands, but it still does not quite seem like home. He presents this concern to his friends and they tell him about a newly launched app that is supposed to help people better integrate into their new country of residence. He decides to install it and give it a try. By using it on a daily basis, he finds out that with a little guidance towards relevant literature, it is much easier than he thought to get acquainted with the Dutch culture and learn its basics. He also decides to apply for citizenship, since he found lots of helpful materials and he is amazed by how simple and intuitive the app interface is. He feels more confident in his ability to understand and embrace his new country and is relieved that even with future possible uncertain situations - like getting married or raising a child - he has an up-to-date platform to help him.

B.2. Scenario 2

Mladenka has been a nurse at a local hospital in her native city of Split for over 25 years, however for the last 3 months she has moved to the Netherlands with the savings that she gathered over the years. Since then she has been unemployed due to the language barrier. She learned about a mobile application that can help expats to integrate into Dutch society at a monthly Croatian people gathering. Starting slowly, but steadily, she began to learn the language together with her little boy and now they can communicate with the locals. The child began attending a new school and Mladenka is now getting prepared for an interview at a General Practitioner's office. The recommendation system of the software, together with an accessible user interface facilitated Mladenka when learning a new language, applied to the domain that she wants to work in.

B.3. Scenario 3

Jacek got his first position as a construction worker in the Netherlands. For this job, a new office building in the center of Rotterdam has to be built by a large team of workers, including him. All the team members received the building plan with detailed instructions, a list with all the necessary materials and tools needed, and also some guidelines they should follow to meet the client's requirements. By

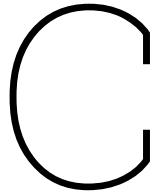
using the mobile app, Jacek started learning Dutch and he managed to form the necessary basis, in a short time, in order to be able to communicate with other people. This not only helped him land this job, but it will also help him to understand his team members during the meetings and on the work site. Furthermore, he has access to construction industry-specific books, which he will use to comprehend specific terms used in this field that are uncommon in Dutch. Lastly, in the event of a possible communication breakdown, during a conversation with his coworkers, Jacek can get all the needed information directly on his phone in order to overcome any issue. This recommendation system has made Jacek extremely happy because it is simple to use, portable, and gives him all the information he needs to integrate with the new community and pursue a career in the Netherlands.

B.4. Scenario 4

Lidiya wakes up early in the morning, still feeling quite restless and anxious about her new life in Maastricht. After getting her kids ready for school, checking Telegram to see if any new messages from her husband remained to fight in Ukraine, and setting up some more their new apartment in which she and her kids just moved in (they recently left the refugee camp), she sits down at her desk and opens the app on her phone. She writes the keywords "English Language Learning" and the app recommends a list of books that she starts to browse. She adds books such as "English for Business Communication" and "The Ultimate English Vocabulary Guide" to her reading list, hoping they will help her improve her English skills for her job search. After adding books on English language learning and self-improvement (her favorite genre) to her reading list, Lidiya decides to search for "Dutch Language Learning" books in the app. She types in "Beginner Dutch" as her keywords and the app recommends her books such as "Dutch for Beginners" and "Complete Dutch: A Teach Yourself Guide". Excited about the prospect of learning Dutch, Lidiya adds these books to her reading list and starts to browse for "Dutch Culture" books. Here she is being recommended books such as "Discovering the Dutch: On Culture and Society of the Netherlands" and "The Little Orange Handbook: Holland for Newcomers". Lidiya adds these books to her already quite long reading list, thinking they will help her learn more about Dutch culture and customs and give her a better understanding of her new home. She does this very eagerly since she is not really sure if she wants her family to go back to their home country after the war ends. Moreover, besides her fascination with the Netherlands, Lidiya wants to reach a B1 level of proficiency in Dutch, since she has to get a job before her saved-up money runs out. Thus, she joins a Dutch language learning group on Facebook, where she likes to promote this app that she's been using to recommend books and learning resources to her fellow expat friends. With a renewed sense of purpose, Lidiya closes the app and begins her day with a newfound sense of determination to learn both English and Dutch and to integrate into her new community in Maastricht.

B.5. Scenario 5

Katsuki Kenpachi has been working as a chef in the Netherlands for over a year now. Despite his passion for cooking, he's found it challenging to communicate with his Dutch colleagues and customers due to his limited language skills. He's tried taking language classes, but with his busy schedule, it's been hard to find the time. One day, a fellow expat suggested an app for expats that recommends books, and Katsuki decided to give it a try. He downloaded the app and was pleasantly surprised to find a wide selection of books available in Japanese, his native language. He started reading books about Dutch culture and history, which helped him better understand the customs and traditions of his new home. But the real breakthrough came when he discovered a cookbook written by a Dutch chef in Japanese. The book not only had delicious recipes but also included cultural notes and tips on how to communicate with Dutch suppliers and customers in the kitchen. Katsuki eagerly tried out some of the recipes and was thrilled to see that they were a hit with his customers. Thanks to the app for expats that recommends books, Katsuki was able to improve his language skills, learn more about Dutch culture, and expand his culinary repertoire. He now recommends the app to all his fellow expat friends and has even started recommending it to his Dutch colleagues as a way to learn more about Japanese cuisine.



Requirements

C.1. Functional Requirements

MUST Haves

1. The user must be able to log in with their credentials to access the application.
2. The user must be able to create an account.
3. The user must be able to specify their age or have the option to not provide it.
4. The user must be informed that recommendations will be less relevant if they decide to omit their age.
5. The user must be able to specify their fields of interest or learning goals.
6. The user must be able to specify their country of origin.
7. The user must be able to specify their country of residence.
8. The user must be able to indicate their proficiency in any language.
9. The user must be able to access their profile page to modify any personal information.
10. The user must be able to delete their account and all associated data.
11. The user must be able to see the main page of the application after authenticating.
12. The user must be able to see the main literature categories on the welcome page.
13. The user must be able to click on one of the main categories to see relevant entries related to it.
14. The user must be able to see the search bar on the welcome page.
15. The user must be able to search for specific literature.
16. The user must be able to scroll down from the main view to see daily recommendations.
17. The user must be able to click on an entry to see a more detailed description.
18. The user must be able to add or remove bookmarks for entries.
19. The user must be able to access their bookmark list on a separate page.
20. The user must be able to select the language in which the application is displayed.
21. The user must be able to change the theme of the application to either light or dark mode.

SHOULD Haves

1. The user should be able to rate a certain entry with a score between 1 and 10 for different aspects like difficulty and usefulness.
2. The user should be able to write comments for the entries.
3. The user should be able to see reviews and comments from other users.
4. The user should be able to see all publications from a specific author.
5. The user should be able to add or remove bookmarks for specific authors.
6. The user should be able to change the font size of the application.
7. The user should be able to change the color theme to adapt to certain visual difficulties.
8. The user should be able to reset their preferences, so they can get new recommendations.

COULD Haves

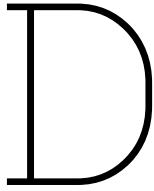
1. The user could be able to see relevant hyperlinks or references about a certain entry.
2. The user could be able to use a talk-back feature to navigate the application.
3. The user could be able to disable the application's animations.
4. The user could be able to switch the layout to a simplified one.

WON'T Haves

1. The user won't be able to privately chat with other users.
2. The user won't be able to access the personal information of other users.

C.2. Non-Functional Requirements

1. The system must be functional on most mobile devices available to the public.
2. The system must adhere to all 8 Rights of the Data Subject granted through the GDPR legislation.
3. The codebase must be made open-source with an MIT License
4. The codebase and the resulting application must be extensible (this requirement implies that our codebase should be well-commented and with a smart design that allows for further development of the application)



Information Architecture

Login Screen: Represents the welcome page when the system is first used. On this page, if an individual already had an account they can log in straight into the system, or in case they forgot their password, the 'Forgot password' functionality can be used.

Sign Up Screen: Represented by images 'Sign Up Screen 1' to 'Sign Up Screen 6' in Figure D.1. The user first enters details regarding the email, the password of choice, as well as a public username which is displayed when reviewing a book. After this step, questions regarding age, country of origin, country of residence, languages spoken, and interests are asked to construct a virtual profile used for an initial set of recommendations for the given user, such that a cold start is avoided to the greatest extent.

Main Screen: Contains multiple tiles with top trending books that match the profile of the consumer. From here the user can select to navigate to either Bookmark, Category, Publication, Feed, and Settings Screens, with their corresponding buttons or interactions. From each page, the user can select to return to the previous screen visualized.

Bookmark Screen: Contains all the books that a user found interesting and decided to save for either searching, reading, sharing, or reviewing later. A book can be deleted from this list at any moment. Another feature of this page is to sort the books based on the date added, the date released, the topic of the book, and other criteria that will be found helpful during the evaluation process.

Category Screen: Accessed by pressing the 'See more' button on the main page. Here, all books that are recommended to the consumer are directly grouped based on their topic. The list of topics is displayed in a scrollable list, such that only a limited number of categories are shown on screen at any time is limited such that the user can focus on each of them.

Publication Screen: Accessible by pressing on a book tile on any page. This contains the book rating and the option to rate or review the book, the option to bookmark, share, or mark a book as being already read, a short description of the volume, and detailed user reviews from fellow consumers.

Feed Screen: By swiping up on the main page, the user can access this screen, where new releases, top picks, and books that could be read again are displayed. This page depends on the preferences of each user, with higher-rated books appearing on top.

Settings Screen: Can be used to manage both account (privacy options, resetting recommendations) and appearance (font of the text, color scheme of the system) preferences. The user can also decide to delete their account forever, together with all their associated data.

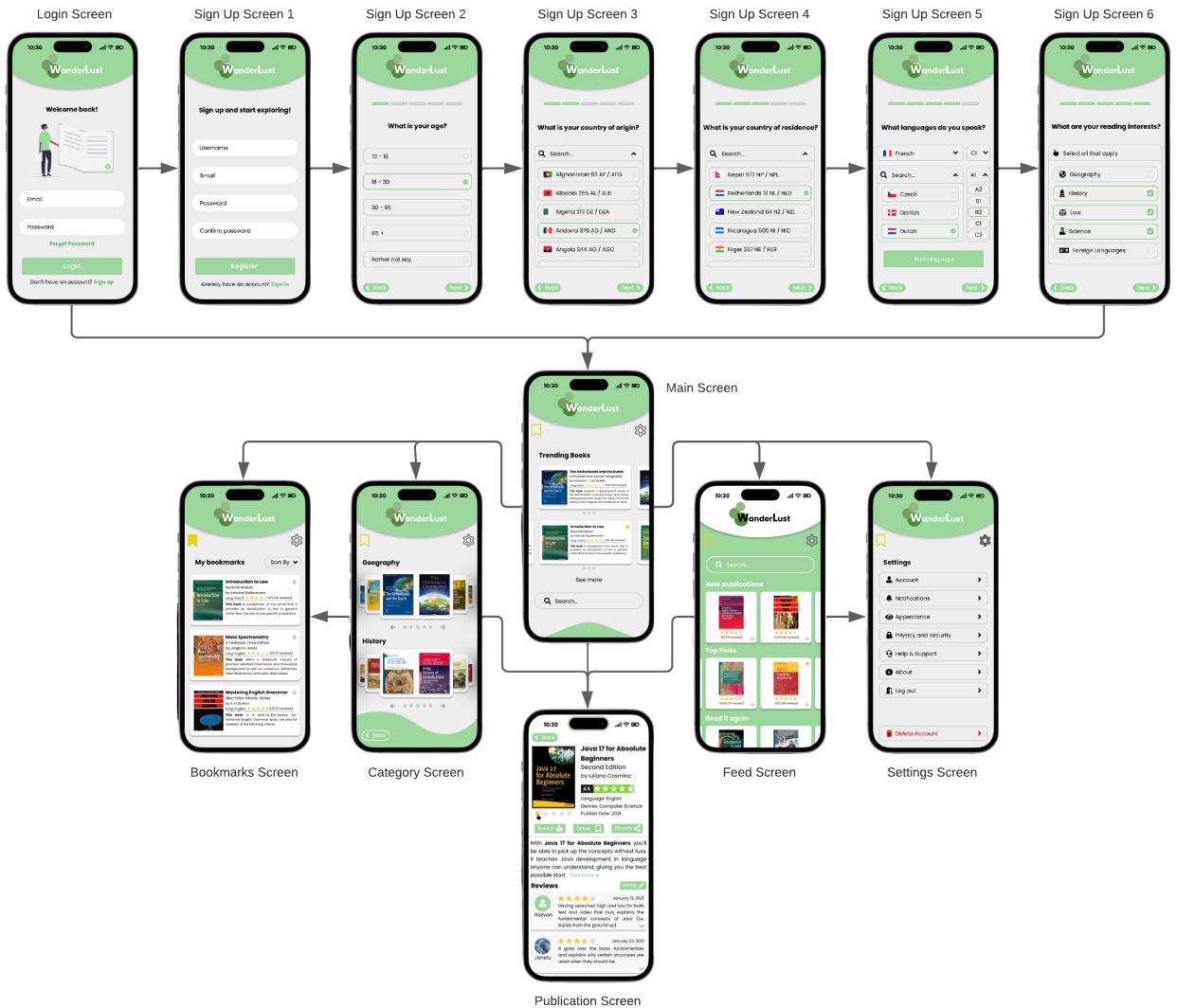


Figure D.1: Information architecture using medium-fidelity prototypes

E

Prototypes

E.1. Low-Fidelity Prototype

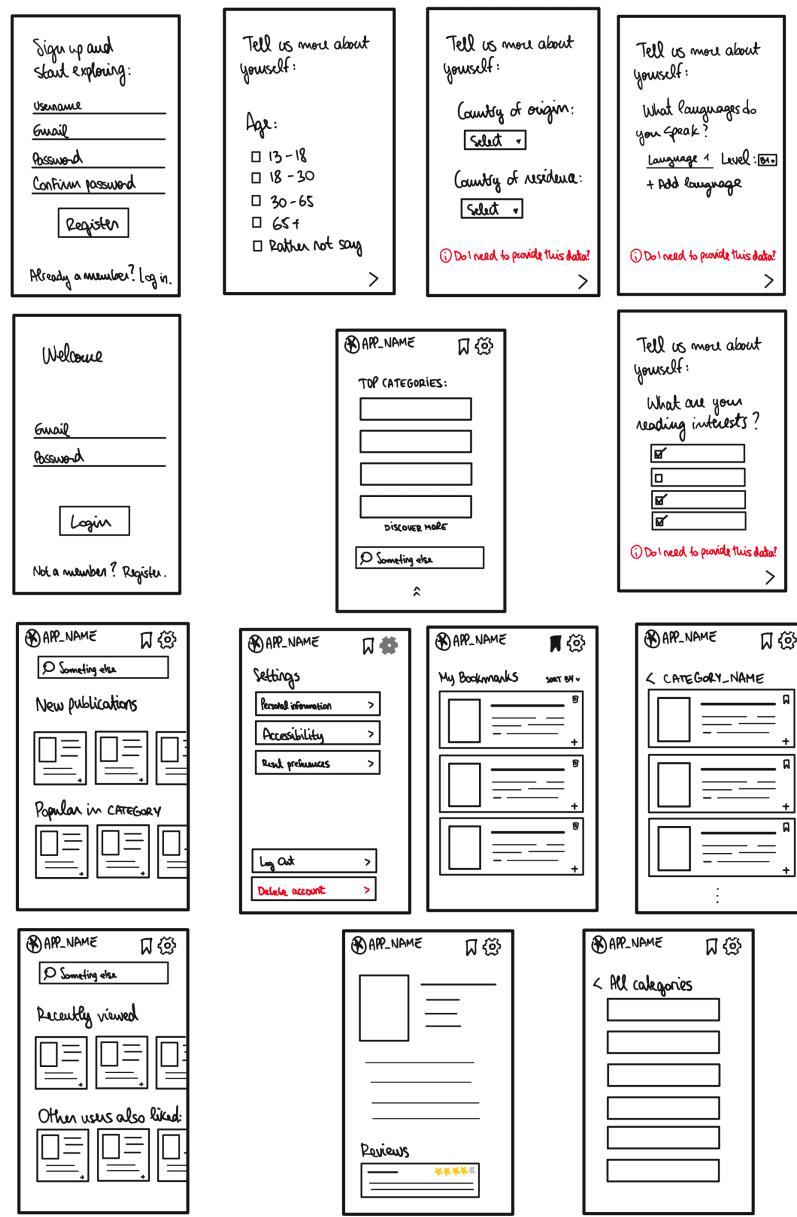


Figure E.1: Low-Fidelity Application Screens

E.2. High Fidelity Prototype

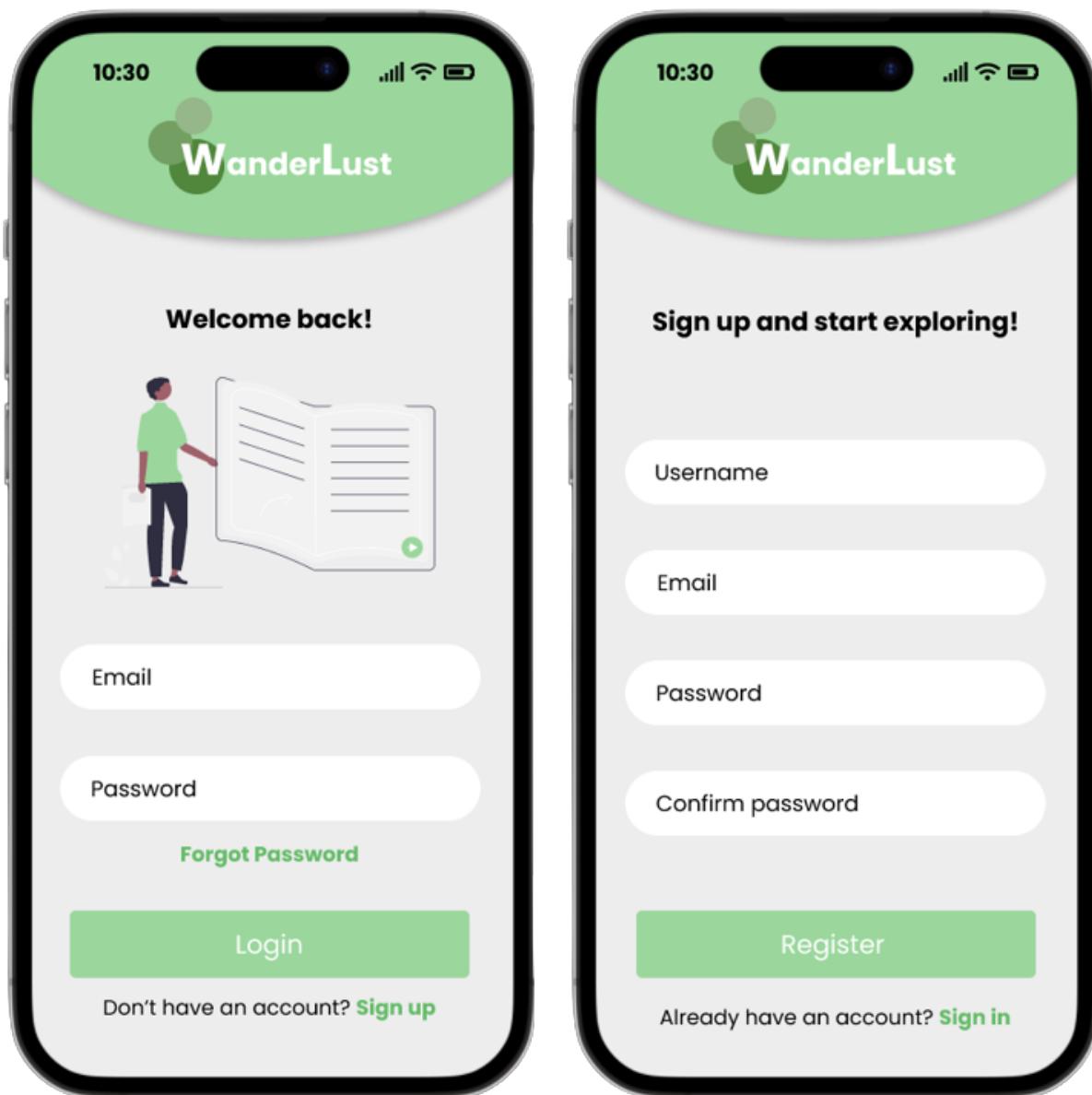


Figure E.2: High Fidelity Prototype

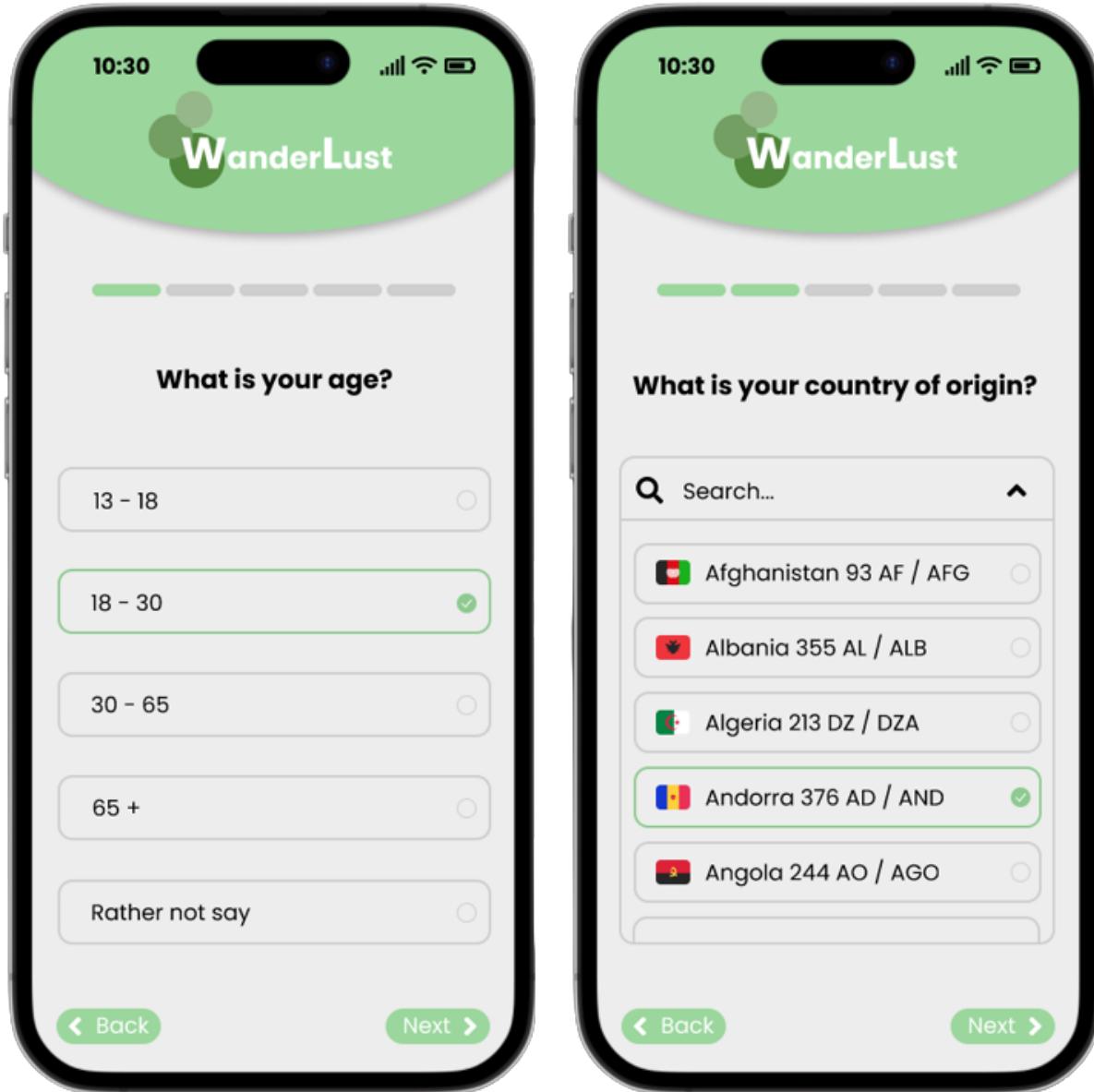


Figure E.3: High Fidelity Prototype



Figure E.4: High Fidelity Prototype

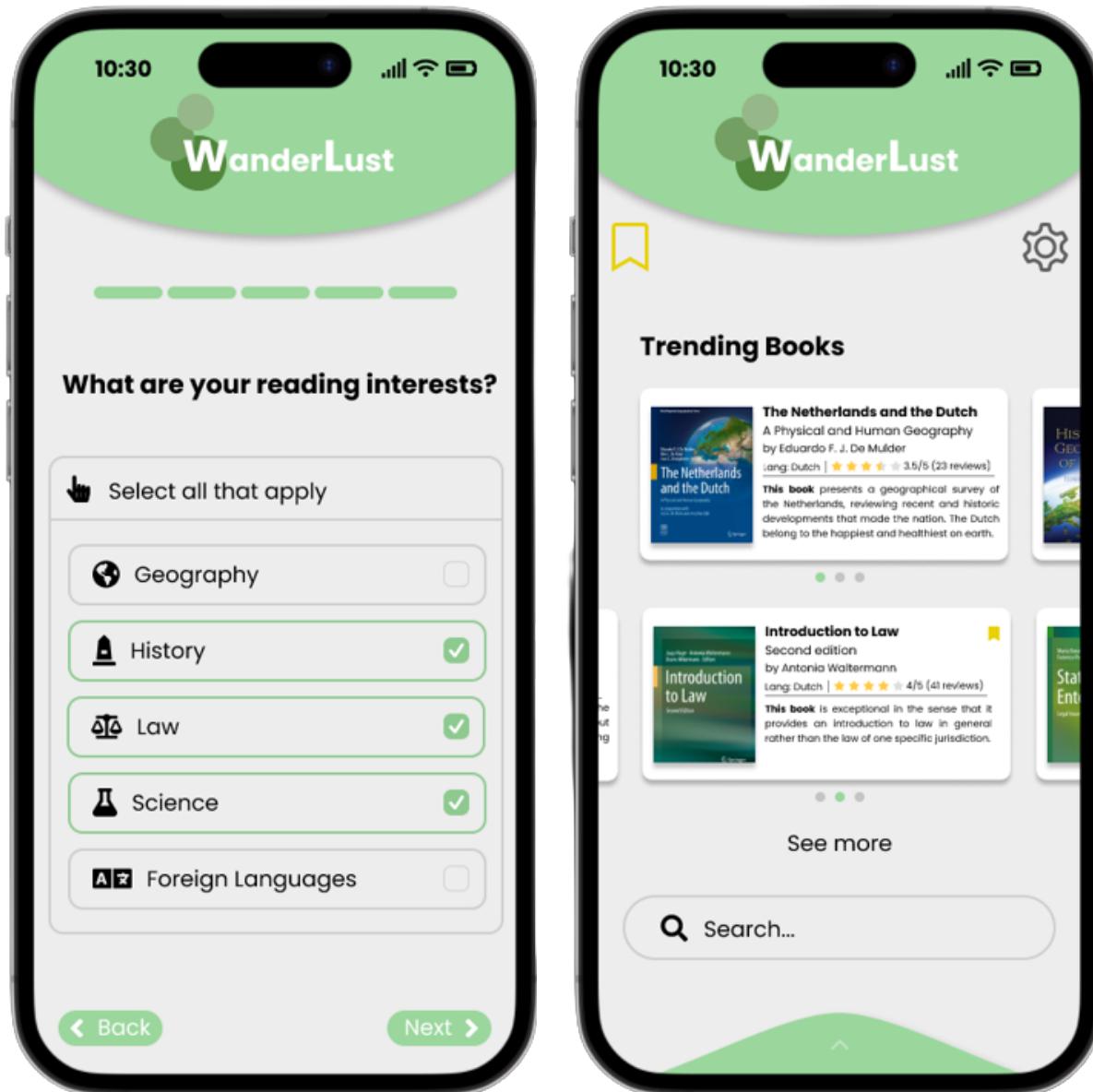


Figure E.5: High Fidelity Prototype

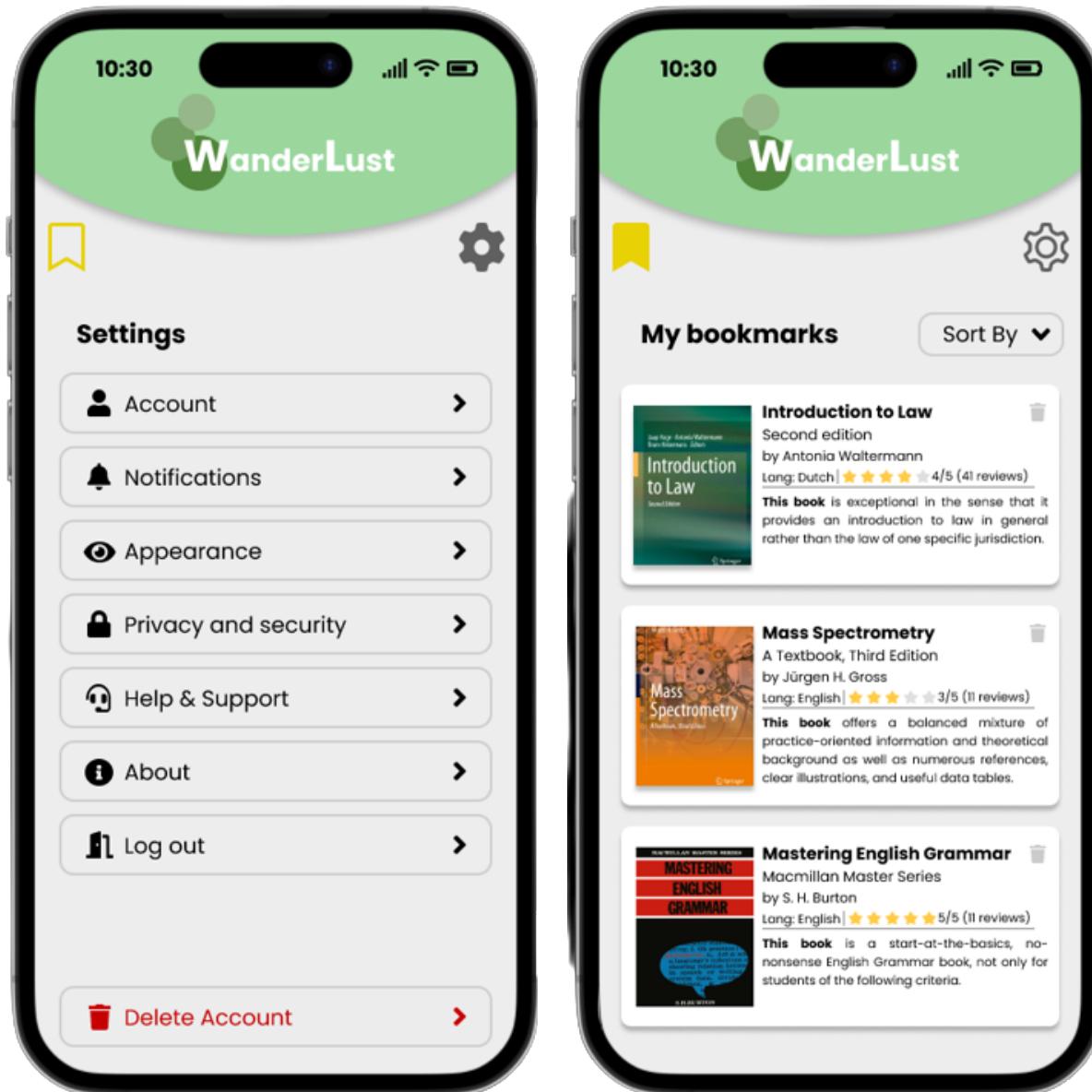


Figure E.6: High Fidelity Prototype

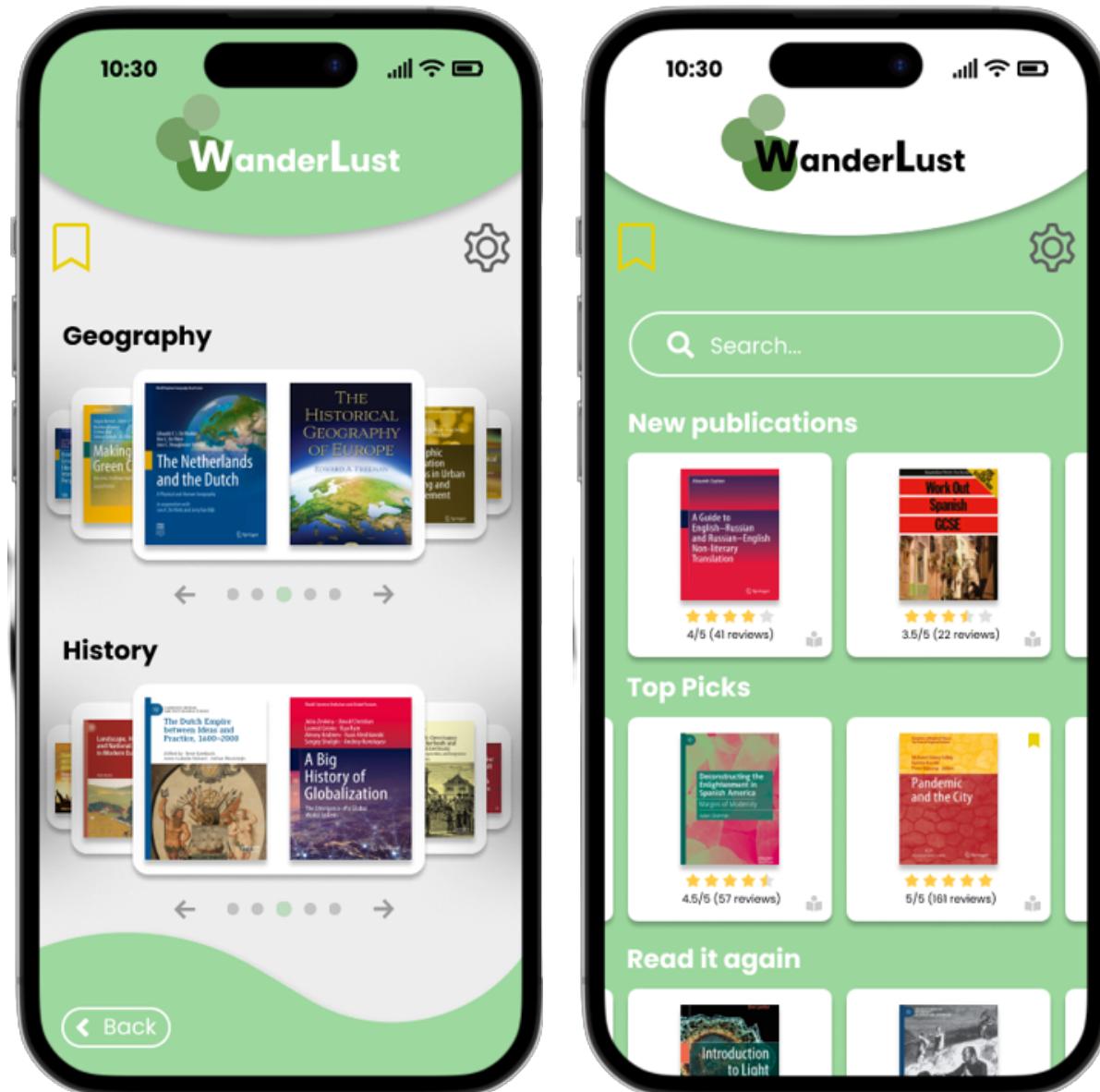


Figure E.7: High Fidelity Prototype



Figure E.8: High Fidelity Prototype

F

HREC Form

Delft University of Technology

ETHICS REVIEW CHECKLIST FOR HUMAN RESEARCH

Version adapted for CSE35000, for course use only!

I. Research Overview

NOTE: You can find more guidance on completing your HREC application (including tips for completing this checklist) [here](#)

a) Please summarise your research very briefly (100-200 words)

What are you looking into, who is involved, how many participants there will be, how they will be recruited and what are they expected to do?

Add your text here – (please avoid jargon and abbreviations)

We are planning to conduct a study to evaluate the usability of our application, as well as to determine what type of content the service should provide. We will interview 20 participants which will be selected from our group of acquaintances that we think fit our user profile. The participants will be given a broad overview of the application and questioned about their initial impressions as well as their needs for adjusting to and becoming accustomed to a new culture. This includes a set of diagrams representing the layout of the application, accompanied by a series of questions where the participants are asked to give a score based on whether they agree with the statement or not. Finally, there will be some open questions about their personal needs regarding this type of software. Only with their agreement, the participants will also be encouraged to give details about their financial, economic, or social situation, which should help us determine special characteristics or requirements for certain groups of users. Personal sensitive data like age, gender, or disabilities would also be recorded with the participant's consent, as those would also help us better target each group.

III. Risk Assessment and Mitigation Plan

NOTE: You can find more guidance on completing your HREC application (including tips for completing this checklist) [here](#)

Please complete the following table in full for all points to which your answer is “yes”. Bear in mind that the vast majority of projects involving human participants as “Research Subjects” also involve the collection of **Personally Identifiable Information (PII)** and/or **Personally Identifiable Research Data (PIRD)** which may pose potential risks to participants as detailed in Section G: Data Processing and Privacy below.

ISSUE	Ye s	N o	<i>If YES please complete the Risk Assessment and Mitigation Plan columns below.</i>	
			RISK ASSESSMENT	MITIGATION PLAN
B: Location				
4. Will the research take place in a country or countries, other than the Netherlands?		x		
6. Will the research take place in a place/region or of higher risk – including known dangerous locations (in any country) or locations with non-democratic regimes?		x		
C: Participants				
7. Will the study involve participants who may be vulnerable and possibly (legally) unable to give informed consent? (e.g., children below the legal age for giving consent, people with learning difficulties, people living in care or nursing homes.).		x		
8. Will the study involve participants who may be vulnerable under specific circumstances and in specific contexts, such as victims and witnesses of violence, including domestic violence; see workers; members of minority groups, refugees, irregular migrants or dissidents?		x		
9. Are the participants, outside the context of the research, in a dependent or subordinate position to the investigator (such as own children, own students or employees of either TU Delft and/or a collaborating partner organisation)? <i>It is essential that you safeguard against possible adverse consequences of this situation (such as allowing a student's failure to participate to your satisfaction to affect your evaluation of their coursework).</i>		x		
10. Is there a high possibility of re-identification for your participants? (e.g., do they have a very specialist job of which there are only a small number in a given country, are they members of a small community, or employees from a partner company collaborating in the research? Or are they one of only a handful of (expert) participants in the study?)	x		The possibility of re-identification cannot be overlooked, as the study focuses on a certain group of people, and there may be a way of tracing interviews back towards certain individuals.	This study addresses a considerably large number of people who fall into the target user group and who share common principles, needs, and traits. Therefore, the re-identification of individuals is nearly impossible.
D: Recruiting Participants				

<i>If YES please complete the Risk Assessment and Mitigation Plan columns below.</i>				
ISSUE	Ye s	N o	RISK ASSESSMENT	MITIGATION PLAN
11. Will your participants be recruited through your own, professional, channels such as conference attendance lists, or through specific network/s such as self-help groups	x		Since the participants will also be selected from our acquaintances, one risk could be represented by an obligation to complete the survey that the interviewed people might feel.	Any participant is allowed to withdraw from the study at any point, with the guarantee that all acquired data about them will be safely disposed of.
13. Will you be recruiting your participants through a crowd-sourcing service and/or involve a third party data-gathering service, such as a survey platform?	x			
14. Will you be offering any financial, or other, remuneration to participants, and might this induce or bias participation?	x			
E: Subject Matter <i>Research related to medical questions/health may require special attention. See also the website of the CCMQ before contacting the HREC.</i>				
16. Will drugs, placebos, or other substances (e.g., drinks, foods, food or drink constituents, dietary supplements) be administered to the study participants? <i>If yes see here to determine whether medical ethical approval is required</i>	x			
18. Does the study risk causing psychological stress or anxiety beyond that normally encountered by the participants in their life outside research?	x			
19. Will the study involve discussion of personal sensitive data which could put participants at increased legal, financial, reputational, security or other risk? (e.g., financial data, location data, data relating to children or other vulnerable groups) <i>Definitions of sensitive personal data, and special cases are provided on the TUD Privacy Team website.</i>	x			
20. Will the study involve disclosing commercially or professionally sensitive, or confidential information? (e.g., relating to decision-making processes or business strategies which might, for example, be of interest to competitors)	x			
23. Does your research involve observing illegal activities or data processed or provided by authorities responsible for preventing, investigating, detecting or prosecuting criminal offences <i>If so please confirm that your work has been discussed with the appropriate legal advisors and approved by your Department/Faculty.</i>	x			
F: Research Methods				
24. Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g., covert observation of people in non-public places).	x			
25. Will the study involve actively deceiving the participants? (For example, will participants be deliberately falsely informed, will information be withheld from them or will they be misled in such a way that they are likely to object or show unease when debriefed about the study).	x			
26. Is pain or more than mild discomfort likely to result from the study? And/or could your research activity cause an accident involving (non-) participants?	x			

ISSUE			<i>If YES please complete the Risk Assessment and Mitigation Plan columns below.</i>	
	Ye s	N o	RISK ASSESSMENT	MITIGATION PLAN
27. Will the experiment involve the use of devices that are not 'CE' certified? <i>Only, if 'yes': continue with the following questions:</i>		x		
• Was the device built in-house?				
• Was it inspected by a safety expert at TU Delft?				
<i>If yes, please provide a signed device report</i>				
• If it was not built in-house and not CE-certified, was it inspected by some other, qualified authority in safety and approved?				
<i>If yes, please provide records of the inspection</i>				
28. Will your research involve face-to-face encounters with your participants and if so how will you assess and address Covid considerations?	x		Covid infection poses a risk when considering face-to-face encounters.	Participants will be asked if such a risk is relevant to them. If yes, the team will follow safety precautions for in-person interviews.
29. Will your research involve either: a) "big data", combined datasets, new data-gathering or new data-merging techniques which might lead to re-identification of your participants and/or b) artificial intelligence or algorithm training where, for example biased datasets could lead to biased outcomes?		x		
G: Data Processing and Privacy				
30. Will the research involve collecting, processing and/or storing any directly identifiable PII (Personally Identifiable Information) including name or email address that will be used for administrative purposes only? (eg: obtaining Informed Consent or disbursing remuneration)	x		Collecting the names of the participants on the consent form as proof of the document's validity might represent a potential risk.	All personally identifiable information (PII) obtained through the interviews will be deleted and discarded at the end of the project. Throughout the project, each interviewed person will be assigned false and random identities. The name and signature will be solely used for validating the consent form.
31. Will the research involve collecting, processing and/or storing any directly or indirectly identifiable PIRD (Personally Identifiable Research Data) including videos, pictures, IP address, gender, age etc	x		From the PIRD data, only gender and age statistics will be collected and used for studies regarding the use of the application. However, these sets of data can be used to construct a profile of the users and then directly identify them.	All such data will be uncorrelated with the person's identifiers.
32. Will this research involve collecting data from the internet, social media and/or publicly available datasets which have been originally contributed by human participants	x			
33. Will your research findings be published in one or more forms in the public domain, as e.g., Masters thesis, journal publication, conference presentation or wider public dissemination?	x			
34. Will your research data be archived for re-use and/or teaching in an open, private or semi-open archive?	x			

IV. Signature/s

Please note that by handing this checklist list you are providing approval of the completeness and quality of the submission. This includes making sure that whatever you report in this application is the same as what you actually (plan to) do in your experiment. The content of this submission needs to align with the corresponding methodology sections in your report! Misreporting about human research ethics is a serious breach of integrity (even when accidental due to miscommunication within a group).

Names of Students in group

Group number: 33

Names: Matei Galesanu, Alexandra Neagu, Teodor Oprescu, Răzvan Popescu, Alexandru Turcu

Date: 16.03.2023

Name of Responsible TA Jean-Paul Smit

This document has been checked and approved by the responsible TA:

yes no



Date: 16.03.2023

G

Information Sheet

User Evaluation of Recommender System

Information Sheet

Purpose of the Research

Conduct a study to evaluate the usability of a literature recommender system application and determine what type of content the service should provide. The participants of the study will be given a broad overview of the application and questioned about their initial impressions as well as their needs for adjusting to and becoming accustomed to a new culture. This includes a set of diagrams representing the layout of the application, accompanied by a series of questions where the participants are asked to give a score based on whether they agree with the statement or not. Finally, there will be some open questions about their personal needs regarding this type of software. Only with their agreement, the participants will also be encouraged to give details about their financial, economic, or social situation, which should help us determine special characteristics or requirements for certain groups of users. Personal sensitive data like age, gender, or disabilities would also be recorded with the participant's consent, as those would also help in better targeting each group.

Benefits and Risks of Participation

The main and only benefit of participating in the study is the opportunity to contribute to the development of the application and to ensure an enhanced personalized user experience for the participant and other users.

One risk to which the participant can be exposed is represented by a small chance of reidentification based on the information provided during the evaluation. The team conducting the interview guarantees that the data will be strictly confidential and properly handled, so this risk is reduced to a minimum.

The second risk involved in the study is related to collecting PIRD (Personally Identifiable Research Data) such as age, occupation, or gender, although their provision is not mandatory. If, however, they are provided, they will be securely stored for the entire duration of the study and safely deleted afterward.

The participants will be asked to provide a written indication of their acknowledgment and agreement on the consent form.

Collection and Processing of Personal Information

Personal information such as gender, name, age, and occupation of each individual will be collected in the form of a written interview. The collected data will be digitally stored in a locally secured dataset format to be further used for the development and improvement of the application. Moreover, the provided information will also be used to improve the user experience when interacting with the application. A safety net for personal information will be provided by anonymizing the data and removing any connection to a specific person. This is accomplished by just using the participants' names to solicit their agreement and not for the objectives of processing and analyzing the data. This will maintain confidentiality and prevent the re-identification of possible individuals.

The participants have the right to request access to their personal data after the submission. Furthermore, they can request the rectification or erasure of their data if necessary.

The retention period is represented by one cycle of usability improvement for the application, which can last up to two weeks. Once a cycle is complete and a new set of requirements is determined, all personal data will be safely discarded. Lastly, contact details for the researcher can be found at the end of the provided consent form.

Interview Structure and Approach

Each participant will be briefed about the system's functionality and study procedure, either verbally by the interviewer or in writing in the form of this document. All participants will be asked to sign and date a consent form that proves the eligibility and the validity of the study.

The study will begin with a short introductory interview meant to acquire background information about the participant. This will be composed of a series of questions about personal information about the participant, as well as expectations regarding the functionality of the described system.

The next section of the interview will consist of a usability study, made on a medium-fidelity prototype of the system. The participant will be asked to navigate the interface freely and to notice any characteristics that stand out. Following this activity, a set of statements will be provided, and the participant will be asked to indicate their level of agreement regarding each of them. These will focus on the usability of the application and the general impression after the first interaction.

The last section will consist of an open discussion that should identify the personal opinions or comments of the participants that could not be elicited from the standardized questions.

Procedures for Withdrawal from the Study

At any point during the study procedure or after its completion, the participant can reach out to either the contact person or the researcher with whom they interacted to demand the process of invalidating and discarding all data collected throughout the interview process.

Developing Team**Date**

Matei Galesanu

22.03.2023

Răzvan Mihai Popescu

Alexandra Ioana Neagu

Teodor Gabriel Oprescu

Alexandru Cătălin Turcu

H

Consent Form

User Evaluation of Recommender System

Consent Form

Please tick the appropriate boxes

Yes No

Taking part in the study

I have read and understood the study information dated _____, or it has been read to me. I have been able to ask questions about the study, and my questions have been answered to my satisfaction.

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

I understand that taking part in the study involves a written-notes interview.

Risks associated with participating in the study

I understand that taking part in the study involves the following risks:

1. There is a small chance of reidentification based on the information provided in the evaluation. The team conducting the interview guarantees that data will be strictly confidential, so this risk is reduced to a minimum.
2. The interview involves collecting PIRD (Personally Identifiable Research Data) such as age, occupation or gender, but their provision is not mandatory. If however provided, they will be securely stored for the entire duration of the study and safely deleted afterwards.

Use of the information in the study

I understand that the information I provide will only be used for studies to further develop the application.

I understand that personal information collected about me that can identify me, such as [e.g., name, gender, occupation, and age], will not be shared beyond the study team and will be disposed of at the end of the study.

I agree that my information can be quoted in research outputs, without any kind of reference to personal information.

Future use and reuse of the information by others

I acknowledge that all information will be stored digitally in a locally secured dataset format. All data will be anonymized by not associating it with an actual individual. This means that the names of the participants are strictly and only used for recording their consent and not for data processing and interpretation. The information will not be preserved for any future use.

Signature

Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Researcher name

Signature

Date**Contact details:**

Matei Galesanu

m.galesanu@student.tudelft.nl

+31649181817

I

Usability Study

I.1. User Evaluation Results

- The sign-up & log-in processes are clear and easy to understand for everybody interviewed. However, the language of the interface is by default English, which is an issue for expats without any knowledge of English. A future version of the design will make sure that a selection screen for the language of the application will be the first screen that a new user sees.
- The age-selection step of the registration process has some age categories unclear for people having an age at the borders of the age intervals.
- Not every user is aware of the CEFR for languages (assigning a knowledge level like A2, B1, etc), so multiple tooltips could be added throughout the registration process, to explain what and why a certain action is needed to proceed.
- Navigation to the bookmark page is easy for adult users that have had extensive contact with technology. Older users however do not instantly associate the bookmark icon shown on the application with the action of going to the bookmark page. The team is currently exploring whether a design fix would alleviate this problem or if a small tutorial for first-time users would be a more appropriate solution.
- It needs to be more explicit to the users the fact that they cannot use the application to read books, only to get good recommendations and links to third parties that they can use to buy the books.
- The publication screen might be a bit too cluttered. The team has decided to fix this by moving the comments to a separate screen, accessible by pressing a comments icon.
- There is no clear way to go back to the home page from the publication feed. Moreover, there has been some confusion regarding the navigation between pages.
- Additional features that have been requested include a spoiler filter for reviews and comments, manual upload for authors, a button for recommending similar books to the book currently in view, dark mode, and a list of already-read books.

I.2. User Evaluation Interview

Literature Recommender System - Usability Study

5 PM, Apr 4, 2023



* Required

Before we start

We appreciate you taking the time to respond to our questionnaire about a mobile application that recommends literature to expat users!

We estimate that the survey will not take longer than 10 minutes. Your comments will be anonymously and securely saved. All the information gathered through this survey will only be utilized to further develop and enhance the application in-question as part of the Delft University of Technology's Human-Computer Interaction course.

The purpose of the survey is to gather a fair assessment from prospective users (expats) regarding the design, accessibility, and usability of the application's currently available high fidelity prototype. By offering an application that recommends local books, literature, language resources, and much more, the application aims to support and assist expats in integrating in their new environments. Your input will be helpful in ensuring that the application meets the needs of all types of expats, regardless of their backgrounds, ages, genders, etc.

Please get in touch with us at the following email address if you have any questions or concerns about this survey or the interview process as a whole:
T.Oprescu@student.tudelft.nl

High Fidelity Prototype

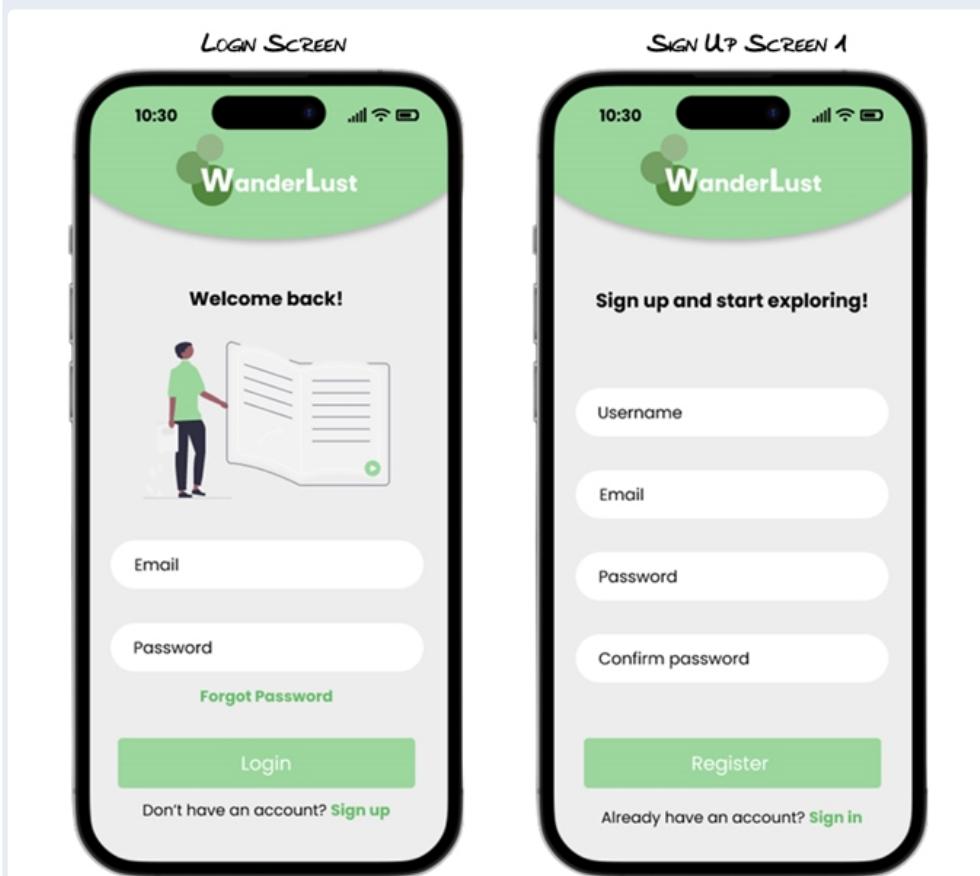
You can use the images below in order to support your answers! However, if you want to see the prototype in high quality, you can access it through the following link:

<https://www.figma.com/proto/LxUV3xG9vsjjanibBitv5Q/HCI-APP-DESIGN?node-id=1-2&scaling=scale-down&page-id=0%3A1>

Here you can also access the navigation wireframe: <https://www.figma.com/proto/VZ7AkzVskRic88qHR8nUL7/Untitled?node-id=1-16&scaling=min-zoom&page-id=0%3A1>

1

Login Screen & Sign Up Screen 1



Sign Up Screen 2 & Sign Up Screen 3

SIGN UP SCREEN 2

A smartphone screen displaying the 'WanderLust' app. The title 'WanderLust' is at the top. Below it is a horizontal progress bar with several segments. The question 'What is your age?' is displayed. A list of age ranges is shown in rounded rectangular buttons: '13 - 18', '18 - 30' (which is highlighted with a green border and a green checkmark icon), '30 - 65', '65 +', and 'Rather not say'. At the bottom are 'Back' and 'Next' buttons.

SIGN UP SCREEN 3

A smartphone screen displaying the 'WanderLust' app. The title 'WanderLust' is at the top. Below it is a horizontal progress bar with several segments. The question 'What is your country of origin?' is displayed. A search bar with a magnifying glass icon and the placeholder 'Search...' is at the top. Below it is a list of countries with their codes: 'Afghanistan 93 AF / AFG', 'Albania 355 AL / ALB', 'Algeria 213 DZ / DZA', 'Andorra 376 AD / AND' (which is highlighted with a green border and a green checkmark icon), and 'Angola 244 AO / AGO'. At the bottom are 'Back' and 'Next' buttons.

Sign Up Screen 4 & Sign Up Screen 5

SIGN UP SCREEN 4

What is your country of residence?

Search...
Nepal 977 NP / NPL
Netherlands 31 NL / NLD
New Zealand 64 NZ / NZL
Nicaragua 505 NI / NIC
Niger 227 NE / NER

Back Next

SIGN UP SCREEN 5

What languages do you speak?

French C1
Search...
Czech A1
Danish A2
Dutch B1
B2 C1 C2

Add language Back Next

Sign Up Screen 6 & Main Screen

SIGN UP SCREEN 6

What are your reading interests?

Select all that apply

- Geography
- History
- Law
- Science
- Foreign Languages

MAIN SCREEN

Trending Books

- The Netherlands and the Dutch
- Introduction to Law

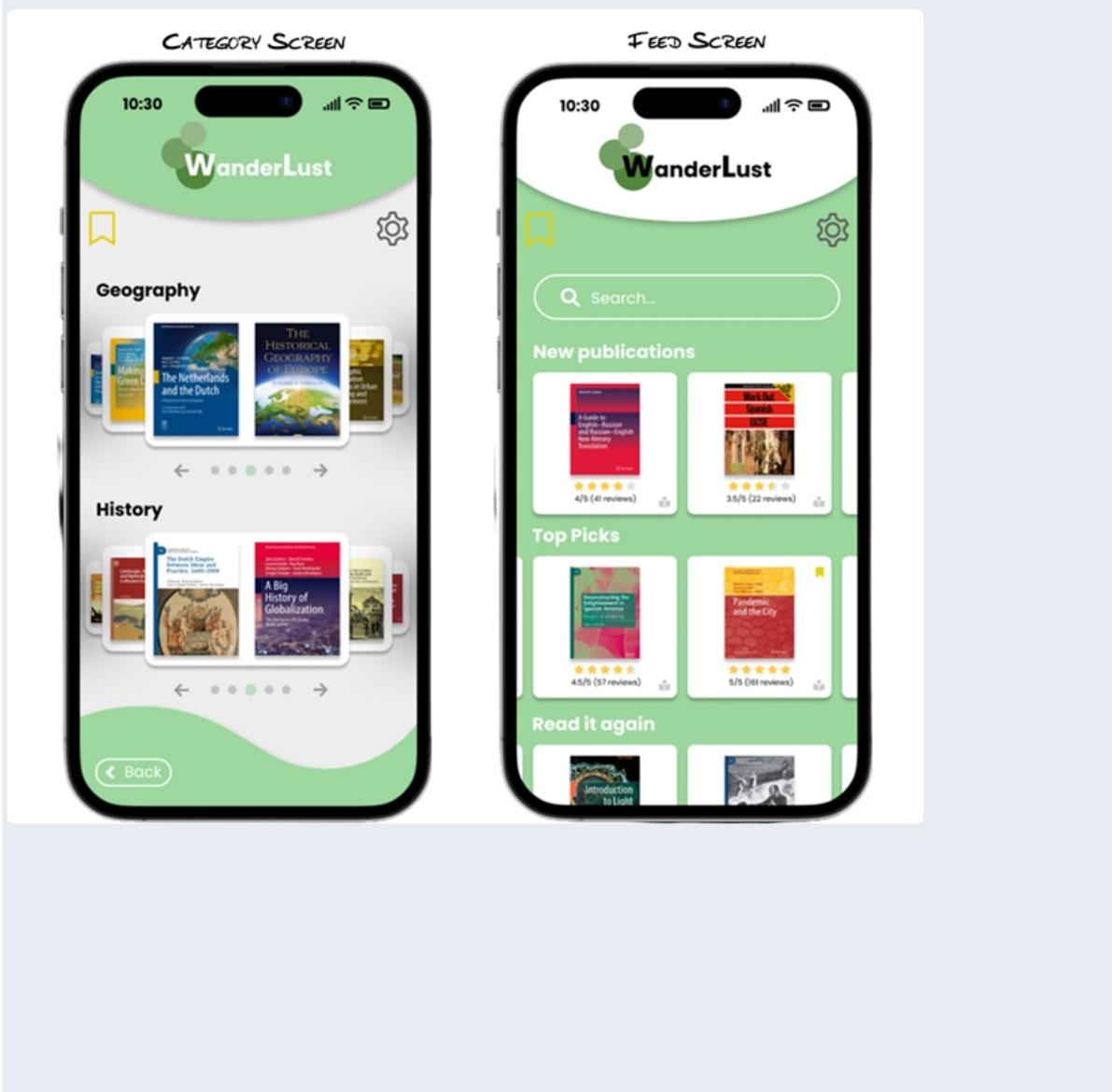
See more

Search...

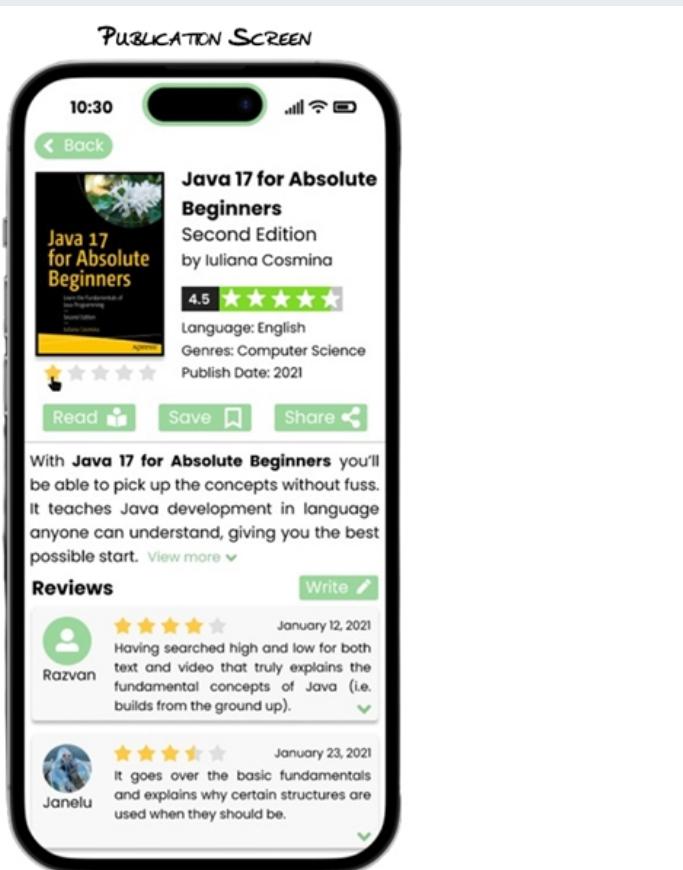
Settings Screen & Bookmarks Screen

The image displays two side-by-side screenshots of the WanderLust mobile application. Both screenshots show a smartphone interface with a light gray header bar at the top containing the time (10:30), signal strength, and battery level. The left screenshot, titled "SETTINGS SCREEN", shows a list of settings options: Account, Notifications, Appearance, Privacy and security, Help & Support, About, and Log out. A yellow bookmark icon is located in the top left corner of the screen, and a gear icon is in the top right corner. The right screenshot, titled "BOOKMARKS SCREEN", shows a list of three bookmarked books: "Introduction to Law" by Antonia Waltermann, "Mass Spectrometry" by Jürgen H. Gross, and "Mastering English Grammar" by S. H. Burton. Each book entry includes a small thumbnail image, the title, author, edition, rating (e.g., 4/5 stars), and a brief description. A yellow bookmark icon is in the top left corner, and a gear icon is in the top right corner. A "Sort By" dropdown menu is visible at the top of the bookmark list.

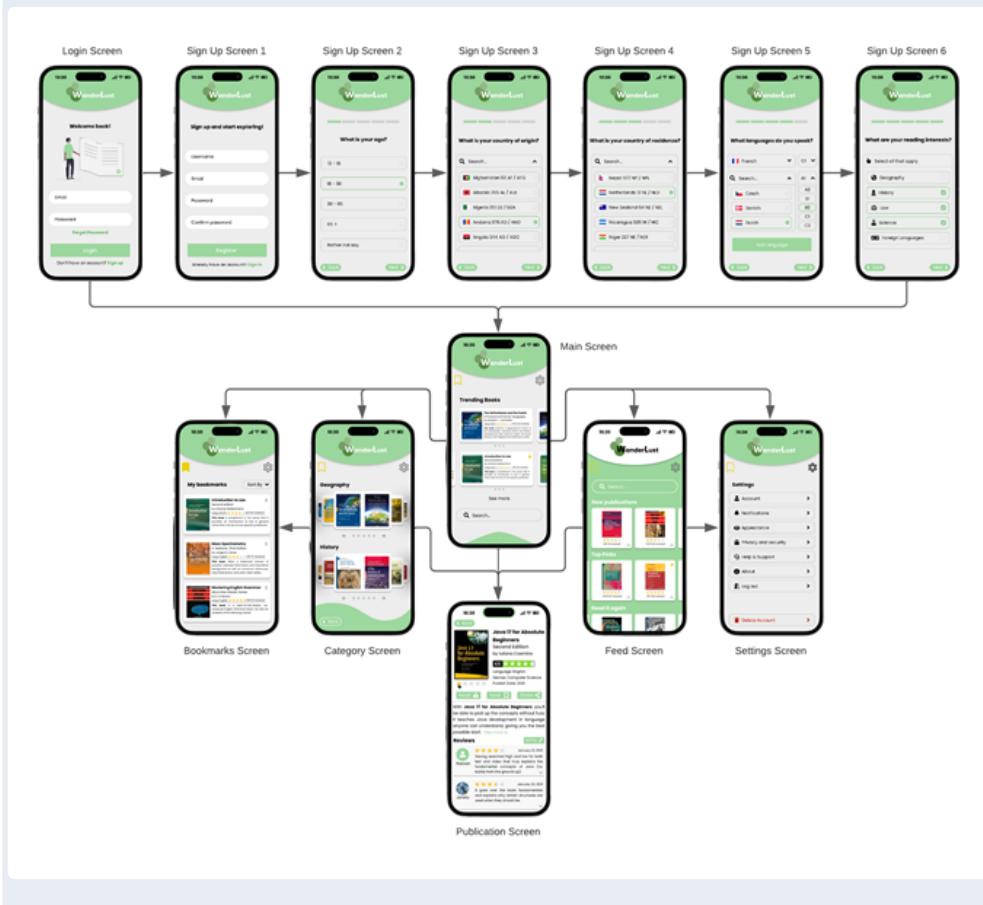
Category Screen & Feed Screen



Publication Screen



High Fidelity Prototype Navigation



8

What is your first and last name? *

9

What is the current date? *

10

How easy is it to log in into the system? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

11

Is it clear what to do in case you forget your account password? *

- Yes, it is clear!
- It took me some time!
- I have no idea what to do!

12

How easy is it to register on the platform? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

13

How easy is it to select your age category? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

14

How easy is it to search for and choose your country of origin? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

15

How easy is it to search for and choose your country of residence? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

16

How easy is it to search for and choose the languages you speak? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

17

How easy is it to select the language level? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

18

How easy is it to select your reading interests? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

19

Is it clear how many stages there are in the registration process and what stage you are currently at? *

- Yes, it is clear!
- It took me some time!
- I have no idea!

20

How easy is it to go back to a previously answered question or move to a new question? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

21

Is it clearly displayed when you make a selection? *

- Yes, it is clear!
- I cannot see my selection!

22

How easy is it to navigate to the bookmark page? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

23

How easy is it to navigate to the settings page? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

24

How easy is it to search for a certain literature/category? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

25

Is it clear how you can see more book categories and navigate to that page? *

- Yes, it is clear!
- It took me some time!
- I have no idea!

...

26

Is it clear how you can visualize the recommended trending books? *

- Yes, it is clear!
- It took me some time!
- I have no idea!

27

How easy is it to navigate from the main page to the feed page? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

28

Is it clear from where you can delete your account or change your account information? *

- Yes, it is clear!
- It took me some time!
- I have no idea!

29

How easy is it to remove a book from your bookmarks? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

30

How easy is it to sort your bookmarks by a specific field? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

31

How easy is it to visualize all the books from a certain category? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

32

How easy is it to search for a specific book on the feed page? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

33

Is it clear how you can visualize all the books from the feed page? *

- Yes, it is clear!
- It took me some time!
- I have no idea!

34

How easy is it to navigate to the page of a specific book? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

35

How easy is it to view the entire description of a book? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

36

How easy is it to rate a book? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

37

How easy is it to add a book to your bookmarks? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

38

How easy is it to share a book with other users? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

39

How easy is it to read and write book reviews? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

40

How easy is it to gain access to resources from where you can read a book? *

- Extremely easy
- Somewhat easy
- Neutral
- Difficult
- I couldn't do it

Is it clear what each button does? *

- Very clear
- Somewhat clear
- Neutral
- Unclear

Open questions

42

What are your initial impressions of this application? *

43

What is the most confusing/frustrating feature of our current design? *

44

Which feature(s) of our application is the least important to you?

*

45

What is your favorite feature? *

46

What is the most important feature you think we should add to the application? *

47

What score would you give our application on a scale from 1 to 10 stars? *



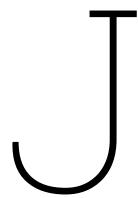
48

What is the primary reason for your score? *

Which adjectives would you use to describe our application better? (1 means strongly in favour of the left adjective, 6 means strongly in favour of the right adjective) *

	1	2	3	4	5	6
Annoying / Enjoyable	<input type="radio"/>					
Creative / Dull	<input type="radio"/>					
Easy to learn / Difficult to learn	<input type="radio"/>					
Uninteresting / Interesting	<input type="radio"/>					
Organized / Cluttered	<input type="radio"/>					
Attractive / Unattractive	<input type="radio"/>					
Conservative / Innovative	<input type="radio"/>					
Meets expectations / Doesn't meet expectations	<input type="radio"/>					
Unpredictable / Predictable	<input type="radio"/>					
Clear / Confusing	<input type="radio"/>					

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Heuristic Analysis Results

1. **Problem description:** The interface does not include a back button for the "Settings" and "Bookmark" screens.

Rating: (5, 5)

Related to heuristic: #3: User control and freedom

Likely/actual difficulties: When the user reaches the "Settings" or "Bookmarks" page, they might not know how to go back to the main screen.

Specific context: The users will encounter this when they reach the "Settings" or the "Bookmarks" page.

Proposed solution: Include a back button on the "Settings" and "Bookmark" pages. The button could be added in the lower left corner (the "Delete Account" button on the "Settings" page will have to be moved further up to make space for the back button).

2. **Problem description:** When entering the Main page, a user might not understand how to reach the page with "Geography" or "History", for example, or how to reach the page with "New publications", "Top Picks", and "Read it again". The exact sequence of buttons to reach this destination is unclear.

Rating: (5, 4)

Related to heuristic: #6: Recognition rather than recall

Likely/actual difficulties: New users might not know how to reach certain pages of the application.

Specific context: When a user opens the app and is on the main screen.

Proposed solution: When new users enter the app, they will be presented with a short visual hands-on tutorial that takes them through a guided tour of the layout and different screens of the app. Additionally, we will add more visual elements on the Main page, such as a list on the left side of the screen, that can be minimized or maximized at will, that contains all the important pages a user might want to quickly jump to from the Main page, such as the "Categories" and "New publications", "Top Picks", and "Read it again" page.

3. **Problem description:** On the "Categories" page, there is no search button to reach other categories, and the page seems to be missing a scroll bar, implying that there are no categories other than "Geography" and "History".

Rating: (5, 4)

Related to heuristic: #3: User control and freedom

Likely/actual difficulties: If users want to search for other categories or for a specific category, they would not be able to.

Specific context: When a user is on the "Categories" page.

Potential solution: Add a search bar on the bottom of the page, as is on the "Trending" page,

to help users search for their desired category and keep consistent with the design of the other pages. Also add a scrollable element on the right of the categories list, to make it more visually clear that "Geography" and "History" are not the only 2 categories available, and that other categories can be viewed by scrolling down the list.

4. **Problem description:** The user may accidentally press the bookmark button on a saved book and un-save it.

Rating: (5, 3)

Related to heuristic: #5: Error prevention

Likely/actual difficulties: Although the button is small, any user may accidentally touch it and, thus remove a bookmark. There are no safety nets for this scenario, and a bookmark can be permanently removed consequently. This can be recovered by searching for the book and saving it again, but it is not always possible.

Specific context: When looking at the bookmarks of the user, they have the option to remove said bookmark from their list.

Potential solution: When a user presses the bookmark button of a saved book to un-save it, have a pop-up that shows up to confirm the un-selection of the book, so that error prevention is introduced in case the user accidentally presses the button.

5. **Problem description:** When creating a new account and selecting their preferences, users might not have their preferences in the provided list

Rating: (4, 4)

Related to heuristic: #7: Flexibility and efficiency of use

Likely/actual difficulties: Users can not select anything from the list because they are not interested in anything from the list.

Specific context: When creating an account and selecting the preferences.

Potential solution: We can do more research to gather more preferences that our target users might have and add them to the pre-selected list. On top of this, we can let the users add their own preferences if they are not part of the pre-selected list, and have them be included dynamically into the recommender system.

6. **Problem description:** There is an inconsistency between the different screens in regard to the amount of information and UI elements present.

Rating: (4, 3)

Related to heuristic: #8: Aesthetic and minimalist design

Likely/actual difficulties: When it comes to the book cards, the screens that contain them are minimalist and well-designed in terms of aesthetics, but they themselves, contain a lot more text than the rest of the application. This is due to the necessity to include the title, author, language, rating, and short description for the represented book, but it still creates a contrast between the outer areas of the mentioned screens/pages and the intended center of attention, the books. Secondly, this is even more drastic when you take into consideration the detailed book page, which is, compared to the rest of the application, filled with the most information. It has a lot of buttons and text to describe the book, an extension of what can be found on the cards mentioned above.

Specific context: When using the app in general and switching between differently clustered screens.

Potential solution: As a solution, we consider separating the detailed view of the book into a rating + reviews and just book details (e.g. description, author, date, etc.) views. Moreover, an argument can be made to push the 3 buttons to a collapsible pop-up with all the options together (on both screens) to further remove the clutter.

-
7. **Problem description:** On the page with “New publications”, “Top Picks” and “Read it again”, the button on the bottom right and the text on a book UI element are quite small. Additionally, having the full cover of the book big enough to be able to read the title from it makes all items in the individual boxes become smaller.

Rating: (4, 3)

Related to heuristic: #3: User control and freedom

Likely/actual difficulties: Users with bad vision will have a problem reading the text, or pressing the button.

Specific context: When a user is on the page with “New publications”, “Top Picks” and “Read it again”.

Potential solution: There is clutter on that page, even though the page appears quite simple, and some items, such as the logo, occupy a lot of space and make all other items smaller. Additionally, having the full cover of the book big enough to be able to read the title from it makes all items in the individual boxes become smaller. A solution might be, instead of having the entire book cover, to have a zoomed-in version of it (which is zoomed in only on the title) and have the other text bigger. Another solution might be to make the logo smaller and the other elements bigger.

8. **Problem description:** The interface contains irrelevant information on the page where the user should select the country of origin.

Rating: (4, 2)

Related to heuristic: #8 - Aesthetic and minimalist design

Likely/actual difficulties: Users might get confused by the prefix code and/or the initials of the country.

Specific context: The user will encounter this when it must select the country of origin during account creation.

Potential solution: Remove the UI elements that clutter the page and represent irrelevant information.

9. **Problem description:** The interface contains irrelevant information on the page where the user should select the country of residence.

Rating: (4, 2)

Related to heuristic: #8 - Aesthetic and minimalist design

Likely/actual difficulties: Users might get confused by the prefix code and/or the initials of the country.

Specific context: The user will encounter this when it must select the country of residence during account creation.

Potential solution: Remove the UI elements that clutter the page and represent irrelevant information.

10. **Problem description:** The interface contains irrelevant (or rarely needed) information on the page where the user should select the languages that they speak.

Rating: (4, 2)

Related to heuristic: #8 - Aesthetic and minimalist design

Likely/actual difficulties: Users might get confused by the language level they need to choose. Not all users actually know their real level for some foreign languages.

Specific context: The user will encounter this when they must select the languages that they speak during account creation.

Potential solution: Remove the UI elements that clutter the page and represent irrelevant information.

-
11. **Problem description:** The "Trending" page has 2 rows of trending books

Rating: (4, 2)

Related to heuristic: #4: Consistency and standards

Likely/actual difficulties: Having 2 separate rows for trending books makes it confusing to understand if both rows are for trending or if they are separate in topics.

Specific context: When a user is on the "Trending" page.

Potential solution: Remove the second "Trending" row, and include those books into the first (and now only) row.

12. **Problem description:** The app lacks shortcuts, that more experienced users could use for a more efficient app flow experience.

Rating: (3, 2)

Related to heuristic: #7: Flexibility and efficiency of use

Likely/actual difficulties: For example, sharing and bookmarking functions for a book can only be accessed by entering the detailed view for that book. Adding these buttons on the initial category or list view for these books would not be of use either, as it can reduce the visibility and minimalist aspect of the application, therefore clustering too much information on a small card. Another aspect of flexibility that is not being used at its fullest is providing a list of personalized books for each user. While this does not affect the efficiency of navigating the application, it could drastically decrease the time a user needs to spend browsing for books that are interested in.

Specific context: When using the app in general, experienced users might find themselves wanting to use shortcuts for better use of the app.

Potential solution: This can be fixed by adding the function to hold over the intended book and make the mentioned options appear over the screen (in a pop-up), thus providing the user with faster access to the app's functions.

13. **Problem description:** On the page of an individual book, there are 2 sets of stars, one that shows the rating and one that lets you rate it. Users might get confused about which one is used to give a rating. Also, the yellow stars are quite small and directly under the image.

Rating: (3, 2)

Related to heuristic: #4: Consistency and standards

Likely/actual difficulties: If a user would want to rate the book, they might accidentally press on the image and open the image, as opposed to rating the book, or they might press on the green one, thinking that it is the one used to give ratings, as opposed to clicking on the yellow one.

Specific context: When a user is on the page of an individual book.

Potential solution: As a solution, we could remove the yellow ones, and keep the rating as only a number, as opposed to both a number and stars. As for the green stars, we would make them be used for rating the book, as opposed to displaying the book's rating.

14. **Problem description:** On the page of an individual book, the important information that a user will likely want to focus on, such as the author's name, genre, language, and year of publication, is not highlighted in any way.

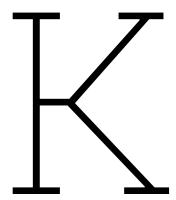
Rating: (3, 2)

Related to heuristic: #8: Aesthetic and minimalist design

Likely/actual difficulties: The UI elements that convey important information to the user are lost within the page, and the user might take longer to identify them and find what they need.

Specific context: When a user is on the page of an individual book.

Potential solution: To rectify this, we can use different fonts/font colors/font sizes/font settings such as bold or italic to highlight the important information that a user will most likely want to focus on (the author's name, genre, language, year of publication).



Cognitive Walkthrough

Cognitive Walkthrough

Preparation 1

1. Task Description

Task: Log in to the system.

Initial State: The application is installed on the device. An account for this application already exists.

2. Action Sequence

Correct action sequence:

- Tap on the application icon
- Tap on the email field and write your email
- Tap on the password field and write your password
- Tap on “Login” button
- Wait to be redirected to the main page

3. Anticipated Users

The target group consists of expats who already have some experience with the system.

4. User's Initial Goals

Log in to the system

- Open the application
- And then enter the email
- And then enter the password
- And then press the “Login” button
- And then wait to be redirected to the main page

Analysis 1

Main goal: Log in to the system

- **Action 1:** Tap on the application icon

Goals: Open the application

Problem: No problem

- **Action 2:** Tap on the email field and write your email

Goals: Enter the email

Problem: 15% will mistype their email account

- **Action 3:** Tap on the password field and write your password

Goals: Enter the password

Problem: 10% will write a weak password

- **Action 4:** Tap on “Login” button

Goals: Press the “Login” button

Problem: No problem

- **Action 5:** Wait to be redirected to the main page

Goals: Wait to be redirected to the main page

Problem: No problem

Preparation 2

1. Task Description

Task: Sign up for the system.

Initial State: The application has just been installed on the device.

2. Action Sequence

Correct action sequence:

- Tap on the application icon
- Go to the registration screen
- Tap on the username field and write your username
- Tap on the email field and write your email
- Tap on the password field and write your password
- Tap on the confirm password field and re-write your password
- Tap on the “Register” button
- Wait to be redirected to the information page

3. Anticipated Users

The target group consists of expats who do not have any knowledge of this system.

4. User's Initial Goals

Sign up for the system

- Open the application
- And then find the registration tab
- And then enter the username
- And then enter the email
- And then enter the password
- And then confirm the password
- And then press the “Register” button
- And then wait to be redirected to the next page

Analysis 2

Main goal: Sign up for the system

- **Action 1:** Tap on the application icon

Goals: Open the application

Problem: No problem

- **Action 2:** Go to the registration screen

Goals: Find the registration tab

Problem: 10% will stay on the login tab

- **Action 3:** Tap on the username field and write your username

Goals: Enter the username

Problem: 20% will write an already existing username

- **Action 4:** Tap on the email field and write your email

Goals: Enter the email

Problem: 10% will mistype their email account

- **Action 5:** Tap on the password field and write your password

Goals: Enter the password

Problem: 10% will write a weak password

- **Action 6:** Tap on the confirm password field and re-write your password

Goals: Confirm the password

Problem: 5% will mistype the password

- **Action 7:** Tap on the “Register” button

Goals: Press the “Register” button

Problem: No problem

- **Action 7:** Wait to be redirected to the information page

Goals: Wait to be redirected to the next page

Problem: No problem

Preparation 3

1. Task Description

Task: Provide personal information to receive better recommendations.

Initial State: The initial registration has already been done.

2. Action Sequence

Correct action sequence:

- Select an age group
- Tap on the “Next” button
- Select the country of origin
- Tap on the “Next” button
- Select the country of residence
- Tap on the “Next” button
- Select the language you speak
- Select the language level
- Tap on the “Add language” button (optional, and it includes the above 2 actions)
- Tap on the “Next” button
- Select the reading interests
- Tap on the “Next” button
- Wait to be redirected to the main page

3. Anticipated Users

The target group consists of expats who do not have any knowledge of this system.

4. User's Initial Goals

Provide personal information to receive better recommendations

- Enter the age
- And then move to the next step
- And then enter the home country
- And then move to the next step
- And then enter the living country
- And then move to the next step
- And then enter the native language

- And then enter the language level
- And then repeat these last 2 steps for other languages (if needed)
- And then move to the next step
- And then select the occupation
- And then move to the next step
- And then wait to be redirected to the main page

Analysis 3

Main goal: Provide personal information to receive better recommendations

- **Action 1:** Select an age group

Goals: Enter the age

Problem: No problem

- **Action 2:** Tap on the “Next” button

Goals: Move to the next step

Problem: 5% will go back to the previous step

- **Action 3:** Select the country of origin

Goals: Enter the home country

Problem: 10% will press on the wrong country

- **Action 4:** Tap on the “Next” button

Goals: Move to the next step

Problem: 5% will go back to the previous step

- **Action 5:** Select the country of residence

Goals: Enter the living country

Problem: 10% will press on the wrong country

- **Action 6:** Tap on the “Next” button

Goals: Move to the next step

Problem: 5% will go back to the previous step

- **Action 7:** Select the language you speak

Goals: Enter the native language

Problem: 10% will press on the wrong language

- **Action 8:** Select the language level

Goals: Enter the language level

Problem: 5% will press on the wrong language level

- **Action 9:** Tap on the “Add language” button (optional, and it includes the above 2 actions)

Goals: Repeat these last 2 steps for other languages (if needed)

Problem: No problem

- **Action 10:** Tap on the “Next” button

Goals: Move to the next step

Problem: 5% will go back to the previous step

- **Action 11:** Select the reading interests

Goals: Select the occupation

Problem: 10% will press on a wrong interest

- **Action 12:** Tap on the “Next” button

Goals: Move to the next step

Problem: 5% will go back to the previous step

- **Action 13:** Wait to be redirected to the main page

Goals: Wait to be redirected to the main page

Problem: No problem

Preparation 4

1. Task Description

Task: Search for a specific piece of literature and rate it.

Initial State: Just logged into the application, and the feed screen is open.

2. Action Sequence

Correct action sequence:

- Write the name of the book in the search field
- Wait for the page to load until the book was found
- Tap on the book cover which is most representative
- Wait for the book screen to load
- Tap on the stars below the book cover

3. Anticipated Users

The target group consists of expats who already have experience with the system.

4. User's Initial Goals

Search for a specific piece of literature and rate it

- Write the book name in the search field
- And then wait for it to load
- And then press on the correct book
- And then wait for the book screen to open
- And then press on the rate button

Analysis 4

Main goal: Search for a specific piece of literature and rate it

- **Action 1:** Write the name of the book in the search field

Goals: Write the book name in the search field

Problem: 20% will write the wrong book name

- **Action 2:** Wait for the page to load until the book was found

Goals: Wait for it to load

Problem: No problem

- **Action 3:** Tap on the book cover which is most representative

Goals: Press on the correct book

Problem: 15% will press on a wrong book

- **Action 4:** Wait for the book screen to load

Goals: Wait for the book screen to open

Problem: No problem

- **Action 5:** Tap on the stars below the book cover

Goals: Press on the rate button

Problem: 25% will press on the average rating of the book

Preparation 5

1. Task Description

Task: Write a comment on the first book from the geography category.

Initial State: Just logged into the application, and the main screen is open.

2. Action Sequence

Correct action sequence:

- Tap on the “See more” button
- Wait for the category screen to load
- Scroll until the geography category is found
- Tap on the first book cover from this category
- Wait for the book screen to load
- Tap on the “Write” button

3. Anticipated Users

The target group consists of expats who already have experience with the system.

4. User's Initial Goals

Leave a comment on the first book from the geography category

- Press on the “See more” button
- And then wait for the category screen to load
- And then look for the geography category
- And then press on the first book
- And then wait for the book screen to load
- And then press on the “Write” button

Analysis 5

Main goal: Write a comment on the first book from the geography category

- **Action 1:** Tap on the “See more” button

Goals: Press on the “See more” button

Problem: 25% will go to the feed screen instead

- **Action 2:** Wait for the category screen to load

Goals: Wait for the category screen to load

Problem: No problem

- **Action 3:** Scroll until the geography category is found

Goals: Look for the geography category

Problem: No problem

- **Action 4:** Tap on the first book cover from this category

Goals: Press on the first book

Problem: No problem

- **Action 5:** Wait for the book screen to load

Goals: Wait for the book screen to load

Problem: No problem

- **Action 6:** Tap on the “Write” button

Goals: Press on the “Write” button

Problem: No problem