Designing and Implementing Voyager - an Intelligent Travel Companion

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Abstract

This paper explores the development of a user-friendly mobile application that combines travel planning and itinerary management. By comparing existing apps on the market and conducting user research, we identify user needs and ways to differentiate our app from competitors. Our app incorporates state-of-the-art AI technology to generate personalized itineraries for users visiting Copenhagen.

We present the results of user involvement, including user interviews and usability tests, and analyze their feedback. In addition, we compare similar apps on the market and discuss design choices for our app's user interface. We provide detailed information on the technical implementation of our app and explore future possibilities for development and integration with AI.

Overall, this paper provides insights into the creation of a travel planning and itinerary management app that offers a unique and user-friendly experience for travelers. Our approach combines user research, innovative technology, and thoughtful design choices to create an app that stands out in a competitive market.

Contents

Glossary

API stands for application programming interfaces. The interface allows two apps to communicate, and enables developers to access certain functionalities of a system by writing code that interacts with the API, without needing to know the underlying code or technology. 59

Cross-platform Cross-platform refers to the ability of software applications to run on multiple platforms or operating systems, such as iOS, and Android, with minimal modifications or adaptations. 31, 44

Enum Class An enum class, is a data type that consists of a set of named values or constants. It allows developers to define a fixed set of values that can be used as options or choices in their code. 48, 49, 55

Experience An Experience refers to a restaurant, cafe, or tourist attraction located in Copenhagen. 9, 26, 27, 29, 45, 46, 48–50, 57, 58, 64, 65

Implicit Intent An implicit intent specifies an action to be executed and enables a component within an external application to handle the execution of that action. 46, 58, 64

Minimum Viable Product The Minimum Viable Product (MVP) is a simplified version of a product that includes only the essential features and functionality necessary to fulfill the fundamental requirements of the target audience. 14, 20, 45, 46

MoSCoW A popular technique for prioritizing and managing requirements. MoSCoW is an acronym representing four categories: Must have, should have, could have and will not have. 14, 20

SDK stands for Software Development Kit. An SDK is a set of tools for software development, in one package. An SDK often contains an API. 56, 59

Value Proposition A value proposition is a statement that describes the unique benefits and value that a product, service, or solution offers to its customers or users. 29, 31, 42, 45

Introduction

Travel guides and itinerary planners are valuable resources that help tourists get the most out of their trips. Itinerary planners allow tourists to create detailed schedules for their trips, including information such as activities, dates, times, and locations for these activities. On the other hand, travel guides, provide a wealth of information about a country or city including details about restaurants, cafes, hotels, transportation, sights, and historical facts. Combined, these resources become a powerful tool in helping tourists navigate new destinations and explore the top attractions and experiences the destination has to offer.

Copenhagen is a popular destination for tourists worldwide, with millions of visitors each year [1]. Its appeal lies not only in its popularity but also in the myriad of tourist-friendly activities and attractions it offers. Among Copenhagen's unique features are its reputation as one of the most bicycle-friendly cities globally [2], its status as a culinary capital, and Nørrebro's recognition as **the world's coolest** neighborhood in 2021 [3]. So how can we do this city justice and help tourists fully explore Copenhagen, and discover all that the city has to offer?

With Voyager, we aim to provide visitors with an all-in-one solution to explore Copenhagen and uncover all its hidden and not-so-hidden gems. Traditional travel planners can be unreliable, leaving travellers to find the missing pieces independently. We seek to bridge this gap by offering detailed itineraries tailored to individual preferences, budgets, and group sizes, and creating a personalized schedule. Voyager's integrated AI-tool is available to assist all types of travelers in planning the perfect trip, whether you're a family of four planning a summer vacation, a couple looking for a romantic weekend, or a group of friends on a tight budget. Our goal is to help the tourists of Copenhagen unlock the city's full potential and we believe Voyager is the solution.

1.1 Problem Statement

This thesis aims to develop an intelligent itinerary planner application aimed at tourists visiting Copenhagen and to explore which features and user interface our application

"Voyager" should implement to be considered valuable and user-friendly by the users. "Voyager" combines a travel guide and a travel itinerary planner and is designed to help users plan their trip to Copenhagen and navigate effectively between the city's Experiences. Additionally, our goal is to provide insights and recommendations for future development of the app that will enhance the user experience and realize the apps' full potential.

1.2 Method

In this thesis, we will describe the development process of Voyager, including the theories, research, user involvement methods, and subsequent analysis of the findings that informed our design decisions, the technical requirements of "Voyager" and the iterative design process of the user interface.

While developing Voyager, we emphasized user involvement and engaged users early. Given the project's time frame, we prioritized gathering qualitative data rather than quantitative. As a result, we conducted one-on-one user interviews for the first round of user involvement. We selected a broad group of people to capture a variety of perspectives on travel habits, travel guides, and mobile apps in general.

The user interviews played an essential role in shaping the design of the app's user interface. After completing the design, we conducted a usability test of the prototype to gather additional user feedback. The usability test saved us much time when implementing the app, as we had already gotten feedback on the changes we should make to enhance the user experience. The iterative process of user feedback drove the development of the app.

We followed a branch-based approach when developing the app, where we implemented one feature at a time and tested that it worked properly before merging it with the rest of the app [4]. This was to prevent merging several branches in the end and risk that the different features were incompatible. Although iterative user involvement requires substantial planning and time, it is an added quality assurance measure, reduces risks, and enables continuous monitoring of project progress.

Although conducting thorough user research saved us time in the app development phase, processing and analysing the findings and insights took longer than anticipated. This ultimately led to shortening the time period we had assigned to developing, and forced

us to compromise on certain app features. However, we took the time to thoroughly analyze our decisions before making any changes to the original plan, and we are proud of the final product we submitted.

User Involvement

In the project's discovery phase [5], we considered different exploratory research methods such as user interviews and surveys. To decide which method was most suitable for our project, we first had to figure out what we wanted to get out of it. Our principal wishes were

- We wanted to base our sketches on insights from the exploratory research;
- We wanted to get quality data and discover patterns and trends; and
- We wanted the possibility of asking follow up questions to answers we found particularly interesting

Based on this, we decided that user interviews would be the best way to gather qualitative data. Additionally, since we started creating the project from scratch, we figured that one-on-one interviews would allow us to learn a lot and reflect on the findings between interviews, instead of user surveys, where all the data is collected simultaneously. The time and discussions in between the interviews could be a valuable learning phase.

We also decided that after creating a prototype based on findings from the interviews, we would conduct a usability test to get feedback before we started developing. This chapter will discuss findings, methods and other relevant information regarding the user involvement in the project.

2.1 Interview Guide Method

We conducted semi-structured interviews based on an interview guide which assisted us during the interview-process (see Table 2.2). When creating the interview guide, we decided to start with some soft questions about the interview object's travel habits, followed by more specific questions about travel guides. We divided the questions thematically to create cohesion between them, and keep a common thread throughout the interview. The interview guide is based on research on interview guides and on how to conduct and prepare interviews [6][7]. The semi-structured format suited our purpose

well, allowing us to investigate new findings during the interviews, and modify the questions based on what worked well. It also helped us ensure that the participants were asked more or less the same questions, thereby making it easier to identify patterns in the responses from the interviewees. The main objective of the questions posed in the interview guide revolves around traveling and research.

2.2 Conducting the Interviews

We conducted ten interviews in total and tried to find interview objects from a broad target group to get as much feedback as possible. As our product's target group is people of all ages traveling to Copenhagen, it was essential to get feedback from people in different age groups and with different levels of technical skills.

The interviews took approximately 10-15 minutes each, and were semi-structured. We used the interview guide (see Table 2.2) as our starting point and asked follow-up questions when suitable. The interviews were recorded and transcribed between each interview, which allowed us to reflect on what we learned from each interview. For example, during one of the interviews, we got feedback that creating a user was the most tedious part of an app and that downloading an app was a big commitment. These were findings we found particularly interesting, and therefore further explored this during the following interviews to figure out how we could make it as simple as possible to create a user and also try to figure out what we could use as an incentive to get people to download the app.

We had not created any sketches before the interviews, so we also investigated if there were any specific features the interview objects like or did not like when using apps. We have included transcripts in the Appendix section 10.1. In the next paragraph, we will uncover the findings from the interviews.

Research Question	Interview Question
What are the target groups travel habits?	- How often do you travel? - Beach holiday or city break?
Does the target group research their travel destination before they leave and what tools do they use for this? Do they experience any challenges in planning their trip?	Do you research potential sights and experiences at your travel destination, in advance? - If no: why not? - What do you do instead? - If so: which tools do you use for your research? - Do you experience any challenges with this? - How much time do you typically spend on researching?
What is important to the target group when they have to select which sights and experiences to visit during their trip?	What is important factors when choosing which sights and experiences to visit? What information is useful in advance?
Definition af rejse guide	A book or mobile application for tourists that describes attractions in a particular area
Does the target group use digital travel guides and what do they get out of using a travel guide?	Have you ever used a physical travel guide? If yes: Did the guide make it easier for you to plan which sights and experiences to visit? - If yes: how did the guide make it easier? - If no: why not? What was missing? Have you ever used a digital travel guide? If yes: What was your impression of it? - User-friendly: what made it user-friendly? - Awkward: What could be improved? What do you think a travel guide should contain? - Any good examples?

Table 2.1: Interview guide

2.3 Analysis of Findings from User Interviews

The user interviews generated a lot of raw, qualitative data. To identify and analyze findings, we followed the three steps described by Mashuri et al. [7]: data preparation, categorizing and seeking patterns, and lastly summarising the results.

Data preparation plays a critical role in simplifying further analysis. We recorded all the interviews and transcribed them to facilitate this process. However, transcription can result in losing critical nonverbal cues such as tone of voice and other sounds. To mitigate this risk, we carefully listened to the audio clips several times, ensuring that the written text as accurately as possible conveyed the speaker's intended meaning.

Following data preparation, we categorized the data to identify overall themes and findings. We conducted a thematic analysis on the collected data [8]. We started by summarizing the findings from each interview and recording them on digital Post-it notes. Then, we eliminated duplicates and grouped similar topics together. Documentation of the analysis is available in Appendix 10.2. This approach provided a comprehensive understanding of the findings, enabling us to prioritize the ones for further analysis.

Finally, we utilized the MoSCoW prioritization method to categorize the findings into those deemed high priority and those not. See glossary or the next section for further explanation of MoSCoW. This was necessary because it was only feasible to implement some of the findings within the given time frame. MoSCoW prioritization effectively identifies the features to include in our prototype, the Minimum Viable Product, and future iterations. See Section 2.3.1 to read about how findings are categorized.

2.3.1 MoSCoW Prioritization of Findings

MoSCoW is a popular technique for prioritizing requirements. The categories used in MoSCoW prioritization are as follows: Must have, which includes all features we should include in the prototype; Should have, which includes all features we should include in the MVP; Could have, which includes features that we would like to include if additional time was available; and Will not have, which includes features that we will not include [9]. We have listed the categorized findings below.

Must have

- The user should be able to see the price, location, accessibility, child friendliness, adult friendliness, among others, regarding each experience.
- When the user presses an 'Experience', the app should display pictures and information about the 'Experience'.
- The user should be able to register for a user-profile with the following methods: Facebook, Google or email and password.
- The user should be able to navigate between attractions from a map of Copenhagen.
- The user should be able to view all experiences near them on a map of Copenhagen.
- The user should be able to save an itinerary generated by creating a user-profile and adding it to their profile.
- The user should be able to filter which experiences they can see on the map of Copenhagen, based on the following labels: *CHILD_FRIENDLY, ROMANTIC, POPULAR, UNIQUE, LOCAL, ACTIVE, CULTURE, NATURE, HISTORIC*.

Should have

- The user should be able to edit the itinerary, add their own experiences, and delete or move recommended experiences.
- The user should be able to access all services without a user profile.

Could have

- The user should be able to add their own experience, with location, perceived price range, pictures and text.
- The user should be able to create and save multiple itineraries to their user profile.
- The user should be able to access a overview of all their itineraries.
- When the user presses an experience, the app should display star ratings of the experience from other users, walking distance in km/miles, and time to walk to the experience from the present location.

- The user should be able to access a 'Weather' tab with information about the current weather conditions in Copenhagen.
- The user should be able to access general information about Copenhagen, such as districts, historical facts about the district and what the district is known for among locals.
- The user should be able to see reviews from other users about the different experiences, with text, pictures and star ratings of the experiences.
- The user should be able to post their reviews of the experiences in the app, with text, pictures and a star rating.
- The user should be able to share an itinerary by using a generated link.

Will not have

- The user should be able to access information, such as delays and timetables for public transportation.
- The user should be shown suggested routes to an experience with public transportation.

2.4 Usability Test

After creating the wireframes and a high-fidelity clickable prototype (described in Sections 3.1 and 3.2), the next step was to conduct a usability test. Our primary objective was to receive beneficial and qualitative feedback for the prototype to enhance its usability as much as possible. We interviewed ten people for the wireframes.

We conducted the usability test in the atrium of our university, and we arranged a stand with plenty of sweets and a large banner to draw in as many individuals as possible. We also announced the test on the university's Facebook page to increase our visibility. We had to make a considerable effort to recruit participants to take part. Ultimately, we managed to get twenty participants.

Krug [10] gave valuable insights when structuring the usability test. We decided to adopt a hybrid approach that combined traditional testing with some concepts from DIY testing. Traditional testing involves testing the design when it is close to completion

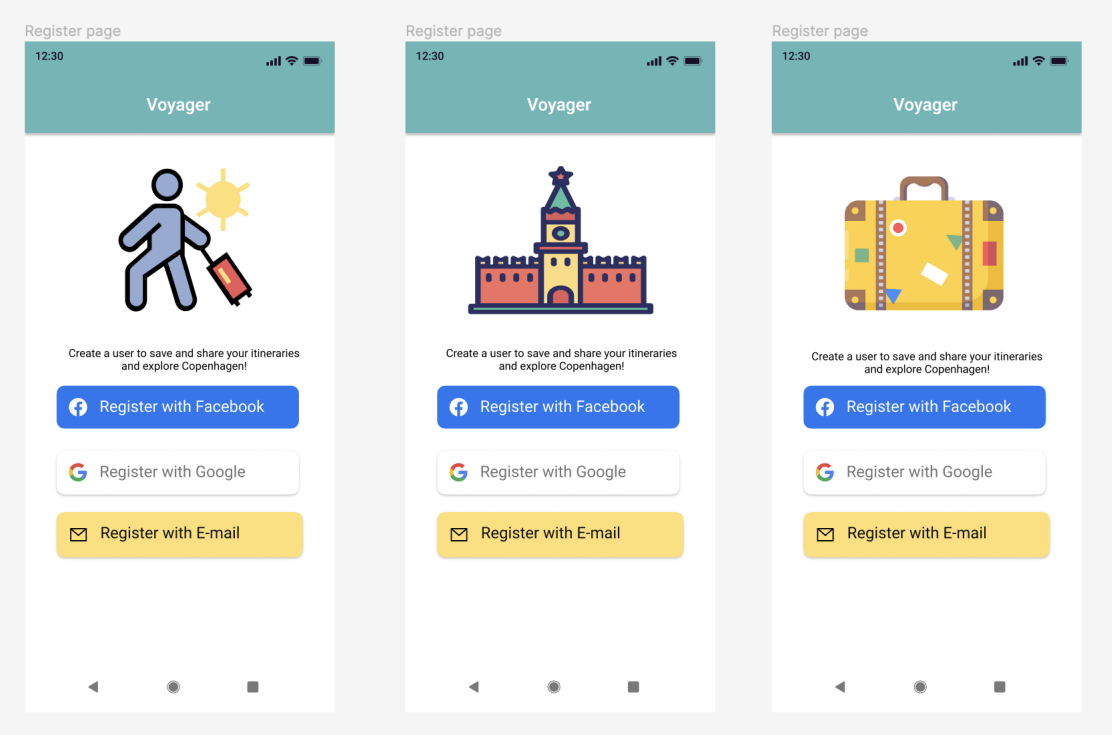


Figure 2.1: The logos we considered for Voyager

with at least eight participants, which can cost between 5000 and 10000 with carefully recruited participants and hundreds of problems to test. Since our app's target group is broad, and we did not have a large budget, testing at the university would suffice. We combined the traditional testing method with some DIY methods, such as loosely recruiting participants and identifying the most important features to test [10]. We created 11 scenarios and incorporated warm-up questions based on the usability test script adapted from Krug [11]. See Appendix 10.3 for the different test scenarios.

On average, we assigned each test object 2-4 tasks depending on their complexity. Examples of these tasks included "Add a new experience and view all attractions on a list" or "Open the burger menu, close it, open it again, and sign out". After completing the tasks, each participant filled out a brief survey that included which tasks they had performed and provided feedback. They also voted for which logo they preferred of the three candidates, which are presented in Figure 2.1. During the test, one team member took notes while the other guided the user and asked follow-up questions. We found that this approach worked best for us in regards to collecting feedback.

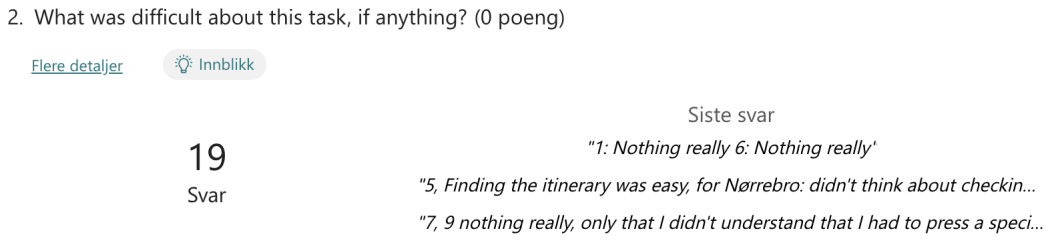


Figure 2.2: Screenshot from the survey

2.5 Analysis of Findings from Usability Test

The feedback we collected during the usability test and from the survey resulted in a large amount of text. However, we found that the analytic process we used after the user interviews was effective, so we decided to use the same approach this time as well. Initially, we compiled all the feedback into a single document as bullet points. We then sorted them according to the corresponding pages they pertained to and discussed which suggestions we would incorporate. Finally, we reviewed each prototype frame, updated the design based on the feedback, and proceeded to implementation. Figure 2.2 shows a screenshot of how Microsoft Forms presents the data.

User Interface

This section describes the process of sketching and designing Voyager's interface and other decisions revolving the user interface. In this section, the term "main page" is used repeatedly, and it refers to the initial page that appears when you sign in to the app, namely the "explore" page. This page allows users to easily access the "plan your trip" and "itineraries" pages.

3.1 Wireframes

We based the features and sketches on key findings from user interviews. We also examined similar applications to determine which features we wanted to include and avoid, as detailed in section 4.

We each took on an equal share of creating wireframes with the aim of expressing our individual ideas for the app's functionality and gaining a preliminary understanding of the components that should be included on each page and their respective placement. The sketches were created manually using the app "Freeform" to facilitate collaborative editing of the same document.

Figure 3.1 shows our initial idea for the *explore*, *plan your trip* and *itinerary* page, as well as the burger menu. The explore page features a map of Copenhagen, with markers representing different experiences. Pressing a marker takes you to a screen with information about the selected experience, and pressing the rating displays all the reviews and their authors. Plan you trip has several sliders to input information such as number of days, budget and group size. This information generates an itinerary displayed in the bottom left, consisting of timestamps, notes and information about the recommended experiences. It's possible to press each experience to get further information about it, reusing the component from the 'Explore' page. Lastly, in the bottom right of the sketch, you can see our initial idea for the burger menu, which was intended to contain all the buttons not included in the navigation bar or the main page. However, usability testing revealed that this was confusing, and we decided to include all the different pages in the burger menu. You can find all the sketches in Appendix 10.5.

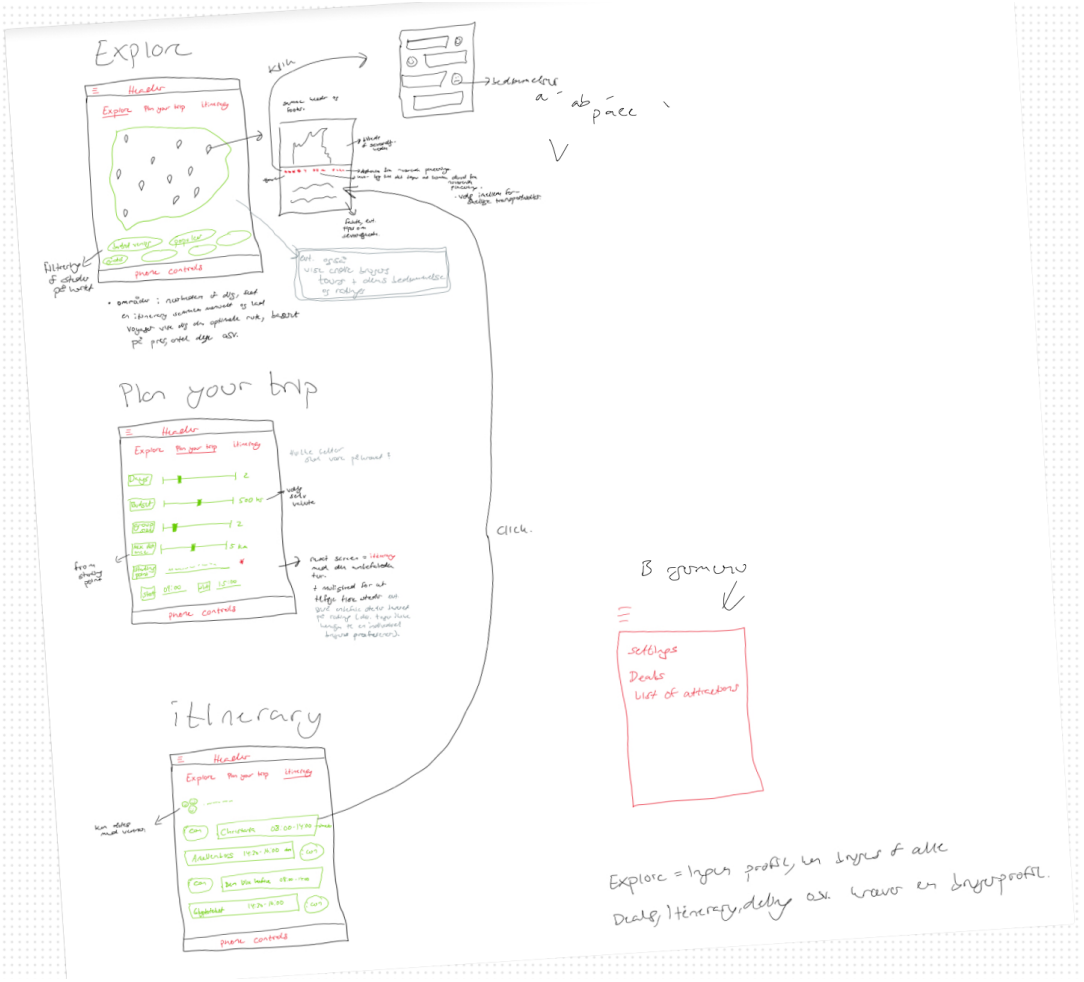


Figure 3.1: Wireframes for Explore, Plan your trip, Itineraries and the burger menu.

Following our analysis of the user interviews, we utilized MoSCoW prioritization to group and prioritize the findings, as described in Section 2.3.1 where we further elaborate on the method. We decided that the features listed under “Must have” and “Should have” categories were essential for the Minimum Viable Product, and thus incorporated them into the prototype.

3.2 High Fidelity Prototype

We used Figma to create a high-fidelity prototype based on the wireframes discussed in the previous section. We started by finding a theme for the app, which we did by

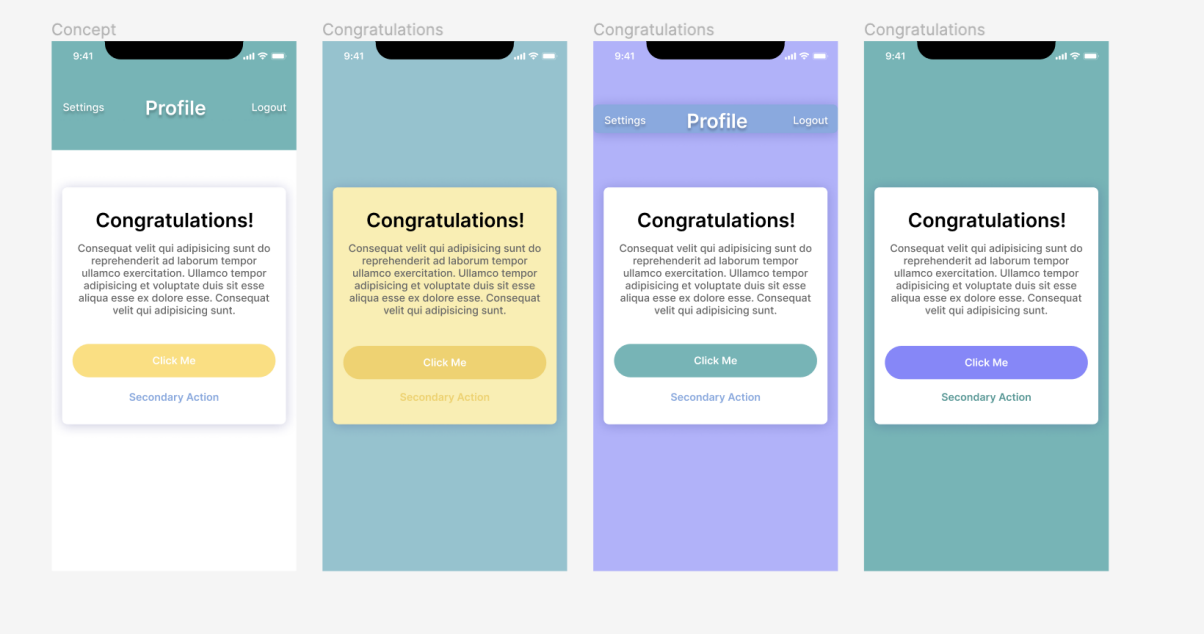


Figure 3.2: Our finalists when choosing the color theme

exploring colors and trying out combinations. Colorhunt and the Material Design Palette were great aids when playing around with different color combinations. We applied the different color palettes to template pages in Figma, and then experimented to find our favorite. It was not easy to decide because there were a lot of good alternatives, and we tried around 15 different combinations. We narrowed it down to the top four, and then decided on the rightmost one in Figure 3.2. We thought that the other designs were too colorful and that using white as a primary color would be more suitable.

The prototype was a valuable tool throughout the process, providing us with a comprehensive overview of what we were developing, and serving as a guide when implementing app features. Figma also offers the option to make a prototype clickable, so the user can try out an actual application. This was essential for us during the usability test as it allowed us to test the features properly before implementing it and see if buttons and use flows made sense. See Appendix 10.4 for more documentation of the prototype.

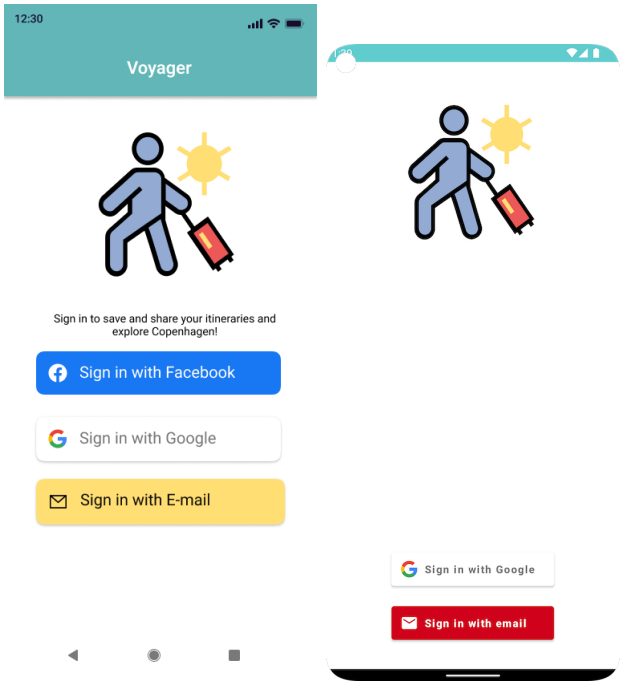


Figure 3.3: Log in screens for prototype and actual implementation respectively

3.3 Log In/Register

During the interviews, a recurring theme was that users found the process of logging in and registering for apps tedious, and they preferred simple solutions for this, in addition to the possibility of signing up using their existing accounts on third-party applications like Facebook and Google. These insights influenced our approach to designing the login screen in the prototype. Initially, users should be allowed to explore the app before being prompted to log in or register. However, we did not implement this in the actual product, as explained in Section 5.4. Figure 3.3 displays the prototype for the log in screen versus the actual implementation to the right. Firebase Authentication does not allow for much customization of the log in screen, so we were not able to adjust the positioning of the logo or the buttons, nor add the text you can see below the logo in the design. We also decided to not enable users to sign in with Facebook, which differs from the design, as we had to set up a developer account on Facebook to do this, and we then chose to prioritize our time otherwise.

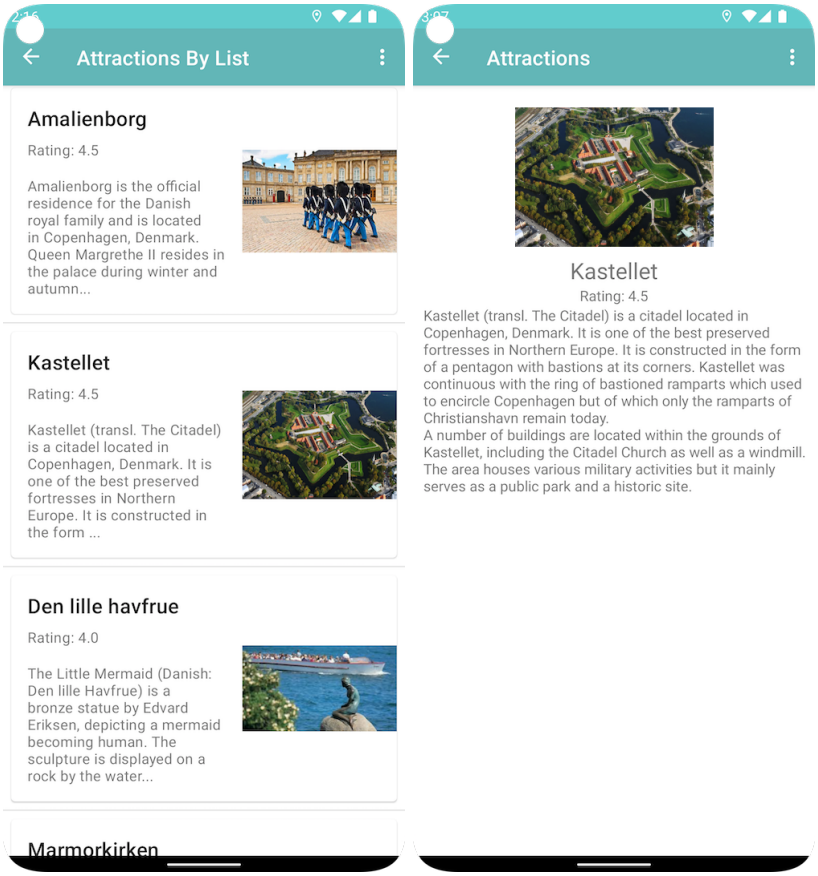


Figure 3.4: Left: Attractions by list, Right: Information about specific attraction

3.4 Attractions by List

To improve the user experience and facilitate finding specific attractions by name, we implemented a feature that allows the user to view attractions as a list in addition to markers on the map. For a clean and modern interface, we utilized Material Design for the cards, which display the attraction title, rating, description, and photo. Material Design is a design guide that emphasizes clean and modern interfaces [12]. In Figure 3.4 (leftmost), you can see the "Attractions By List" feature's implementation. Clicking on an element in the list leads to a detailed information page about the attraction, as shown in Figure 3.4 (rightmost).

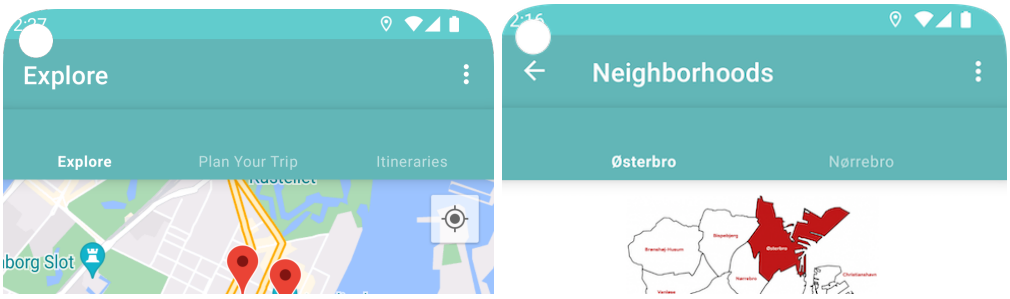


Figure 3.5: Navigation bar

3.5 Navigation

The navigation bar on the main page provides easy access to the most important features of the app, including *Explore*, *Plan Your Trip*, and *Itineraries*, see Figure 3.5. Other features are accessible via the action overflow menu, which can be accessed by clicking the three dots in the top right corner. This is consistent with Material Design guidelines, which recommends highlighting the most important actions while keeping other actions accessible but out of the way. Material Design is a design system developed by Google for creating mobile apps [13]. By placing the most important features in the navigation bar, we provide users with quick access to the most critical functionality of the app.

During usability testing, we found that users responded well to the navigation bar, and we decided to reuse it on the *Neighborhoods* page as well, see Figure 3.5 (rightmost). This is also consistent with Material Design guidelines, as they recommend using consistent navigation patterns throughout an app. This helps users to quickly learn how to use the app. By reusing the navigation bar, we ensure that users can easily navigate between different sections of the app and quickly access the features they need.

During the design process, we considered using a burger menu as the main navigation method, but ultimately decided against it. Using burger menus sparingly, and only when necessary is also a part of the Material Design guidelines. By avoiding the use of a burger menu, we provide users with a cleaner, less cluttered interface that is easier to use and less likely to confuse users. Additionally, several of the elements included in the prototype would not be included in the actual implementation, so if we had continued with a burger menu, it would take up a lot of space for only a few elements. Figure 3.6 displays our original design for the burger menu.

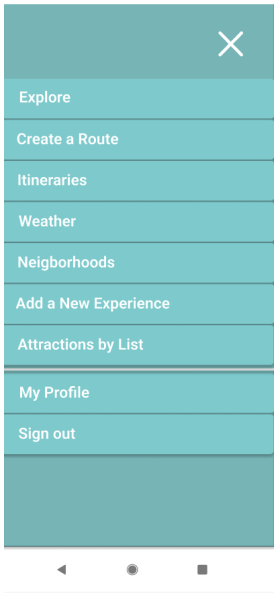


Figure 3.6: Burger menu

Finally, we chose to store less important features in the action overflow menu to keep the interface clean and uncluttered, see Figure 3.7. By using the action overflow menu to store less important features, we provide users with a cleaner, more streamlined interface that is easier to use and less likely to confuse users. This is also a good solution in terms of future development, as implementing new pages would not affect the design, but could easily be added to the menu.

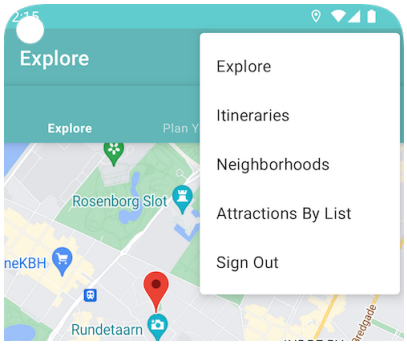


Figure 3.7: Action overflow menu

3.6 Explore

The homepage of Voyager is located under the "Explore" tab and serves as the user's initial impression of the application, aiding their decision to continue exploring Voyager. Therefore we want the homepage to encapsulate the purpose of Voyager which is assisting tourists in exploring the city of Copenhagen and helping them uncover everything the city has to offer. Thus we present the user with a large map on the homepage, showcasing various Experiences near their location. The Experiences are presented, with a series of red markers on the map allowing the user to immediately start exploring their surroundings as can be seen in Figure 3.8.

To provide the user with a personalised exploration experience based on their mood and interest, users can filter the experiences displayed on the map by pressing the labels conveniently placed beneath it offering users a complete overview of their options at a glance. By using buttons, we leverage the user's familiarity with this interface component, enabling them to intuitively understand how to interact with the filtering system. Moreover, the buttons provide immediate feedback by instantly removing or displaying markers on the map, allowing users to see the effect of their filtering choices in real-time. We believe that this interactive and responsive approach enhances the user experience and empowers users to effortlessly explore and discover experiences aligned with their preferences.

Moreover, to ensure easy visibility, the "Clear Filtering" option is prominently positioned directly below the map and highlighted in green, distinguishing it from other buttons. When a user selects one of the Experiences on the map, the button shown in Figure 3.8 appears, allowing the user to launch Google Maps and obtain directions to the chosen Experience.

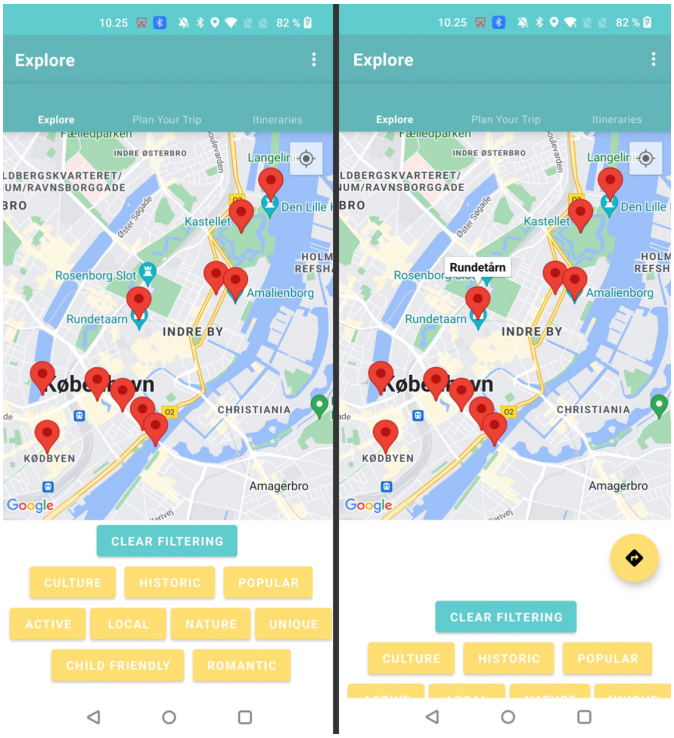


Figure 3.8: The homepage of *Voyager*, including the directions button that appears when a user presses an Experience on the map

3.7 Itineraries

During the design process, we quickly agreed that an important element of the user interface was to provide the user with an overview of the itineraries that they had created. Thus we decided to implement an "Itineraries" tab, in the navigation bar, so the functionality would be featured prominently on the page. Figure 3.9 demonstrates the layout of this tab, showcasing a list of itineraries. Each itinerary on the list is accompanied by a title and description, which the user added during the itinerary creation process.

We have chosen a list representation, with recently added items displayed at the top. This way of presenting data provides the user with a manageable overview of their itineraries, enabling them to quickly and easily locate relevant information, which we believe enhances the user experience. Furthermore, the simple display of the itinerary list, with only the name and a brief description, helps us achieve the clean and uncluttered look that we aimed for with the Voyager user interface.

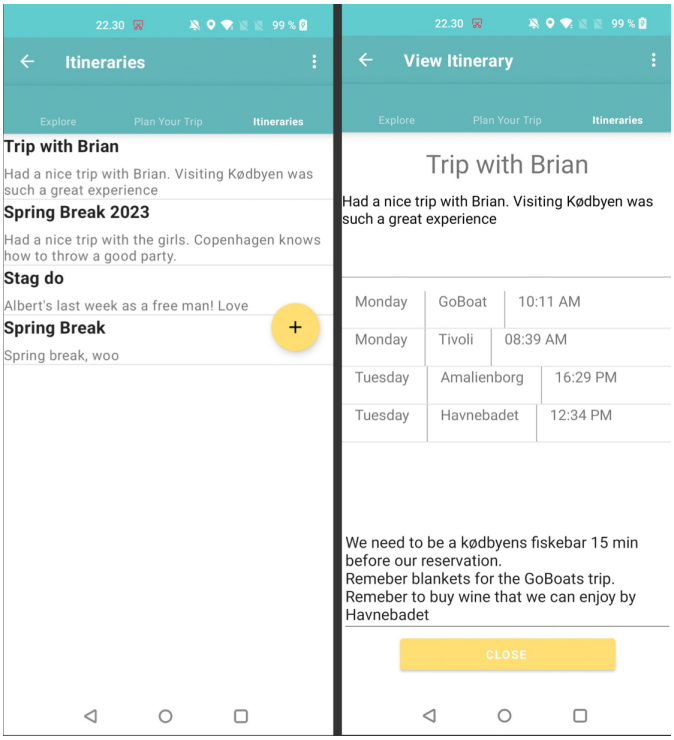


Figure 3.9: An overview of itineraries under the itineraries tab to the left. An opened itinerary to the right

During the usability test, we observed a recurring pattern among participants when asked to generate a new itinerary. A significant number of participants instinctively navigated to the "Itineraries" tab as their initial step. One participant specifically provided valuable feedback, expressing that there should be a possibility for creating a new itinerary within that tab. They suggested "*...it should maybe be a plus symbol in the itinerary page to create a new one there, make it more clear. "plan your trip" is ambiguous*".

Taking the feedback into consideration, we made the decision to enhance the user experience by introducing a prominent and easily identifiable floating button. Figure 3.9, showcases this button, which takes the user to the "Plan your trip" tab, where they can generate a new itinerary.

When users select an itinerary from the overview, they encounter a thoughtfully designed layout that incorporates essential elements to provide a good experience. This layout includes a title, description, schedule for the trip, an editable field for adding trip notes,

and a close button. Figure 3.9 provides a visual representation of this layout.

The comparative analysis detailed in Section 4 informs our design decisions on the elements of an itinerary. We saw that a way to provide a unique Value Proposition compared to similar applications was to add more information and customization possibilities to an itinerary. The addition of a notes field was inspired by similar functionality in *TripAdvisor*. We believe that the field would add a layer of personalization as it would allow the user to keep track of specific details or reminders that are relevant to them.

To further improve the user experience in comparison to similar applications, we included a title and description at the top of the page. This allows users to quickly identify the selected itinerary and and understand the nature of the trip, as well as giving them the ability to customize and personalize their itinerary to suit their preferences.

Lastly we chose to add a schedule and a close button. The schedule will allow users to easily access important details, such as day, time and name of each Experience on their trip, while the close button provides the user with a convenient way to close the itinerary view when they are finished with reviewing or editing the information.

3.8 Plan Your Trip

Generating an itinerary is another essential feature of Voyager, therefore we choose to implement a dedicated tab called "Plan Your Trip" in the top menu, providing the user with easy access to this feature.

When the user clicks the "Plan Your Trip" tab, they are directed to an external web application, as shown in Figure 3.10 (left). The feature is implemented as a tab, ensuring that users can access it without leaving the application. The user is greeted with a brief description of the purpose of the "Plan Your Trip" page, which is to generate an itinerary. During usability testing, some participant expressed confusion about the purpose of this page, and suggested: "*..A description of what plan your trip does*". To address this, we included a description of the feature. The description not only clarifies the purpose but also explains the type of input the user should enter. To further assist users, we included examples of input to guide them.

Maintaining a seamless user interface was of high importance to us, even when transitioning to the external web application. We wanted users to perceive all elements of Voyager as cohesive, including this feature. To achieve this, we ensured that the web

application closely followed Voyager's theme of green and yellow with predominantly white text.

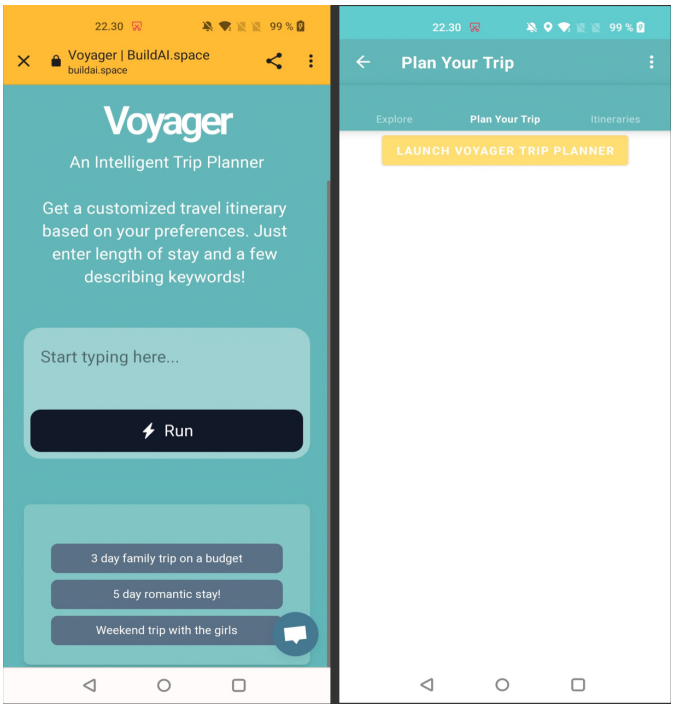


Figure 3.10: The *Plan Your Trip* page, including the web application on the left.

As the web application only launches automatically once, the first time the user opens the "Plan Your Trip" tab after launching Voyager, we chose to add a prominent yellow button at the top of the page. This button serves as a convenient way for the user to launch the web application effortlessly.

App Comparisons

To inform our preliminary decisions on which features Voyager should implement, we decided to conduct a comparative analysis of three mobile applications, TripAdvisor, Copenhagen Travel Guide (CTG) and Oplev illustrated in Figure 4.1. Like Voyager, these applications help users explore the city of Copenhagen.

The analysis helped us identify which user interface components were similar across these application, thereby allowing us to leverage familiarity to implement an intuitive user interface. Moreover we were able to identify which features and user interface components worked well and which features and components could be improved or should be avoided altogether, allowing us to avoid making the same mistakes as existing solutions. Through the analysis, we gained insights into the strengths and weaknesses of existing solutions. This understanding enabled us to develop a unique Value Proposition for Voyager, setting it apart from the competition and enticing users to choose Voyager as their preferred application for exploring the city of Copenhagen.

4.1 Method

First, we explore TripAdvisor, CTG, and Oplev, and describe their features. Then we conduct the analysis based on the approach described by Xanthopoulos and Xinogalos [14]. They conducted a comparative analysis by first presenting a set of criteria and then comparing the different types of Cross-platform development approaches based on these criteria.

4.2 Oplev

Figure 4.1 depicts Oplev, a mobile application available on Android and iOS platforms, designed to help users discover nearby experiences in the Copenhagen area. The application categorizes these experiences into Culture, Music, Active, Nature, and more. Upon launching the application, users encounter a list of experiences from various categories close to their current location, illustrated in Figure 4.1. Users have the option to apply

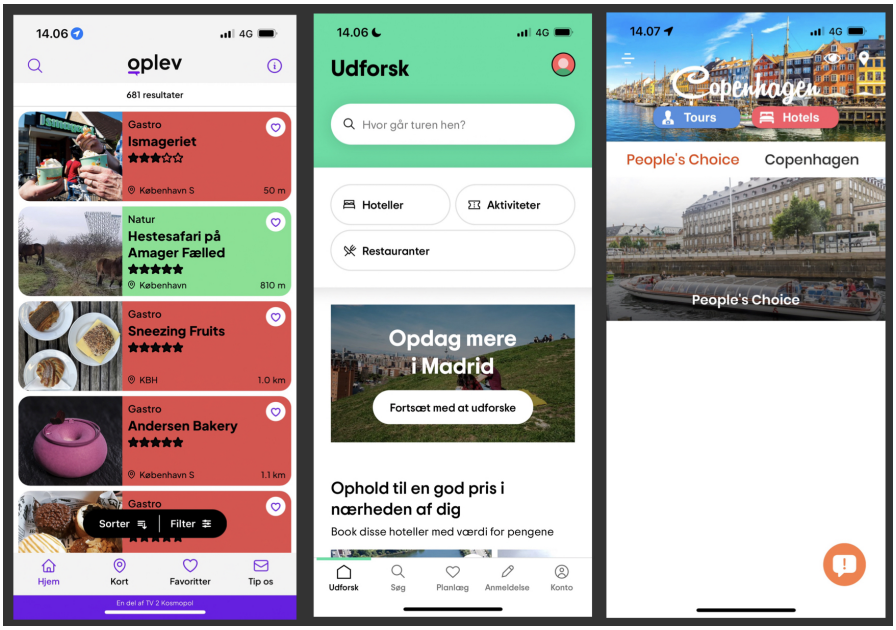


Figure 4.1: The home screens of the *Oplev*, *TripAdvisor* and *CTG* mobile applications respectively

filters to the list by selecting one or more categories. Additionally, users can visualize the same experiences on a map and likewise filter the experiences shown on the map. When a user selects an experience, they are provided with comprehensive information, showcased in Figure 4.2. This includes reviews, visuals such as pictures or videos, textual descriptions of the experience, address and website details, distance from the user's current location, estimated travel times by car and bicycle, a link to the website "Rejseplanen" for travel information, and suggestions for similar experiences within the same category.

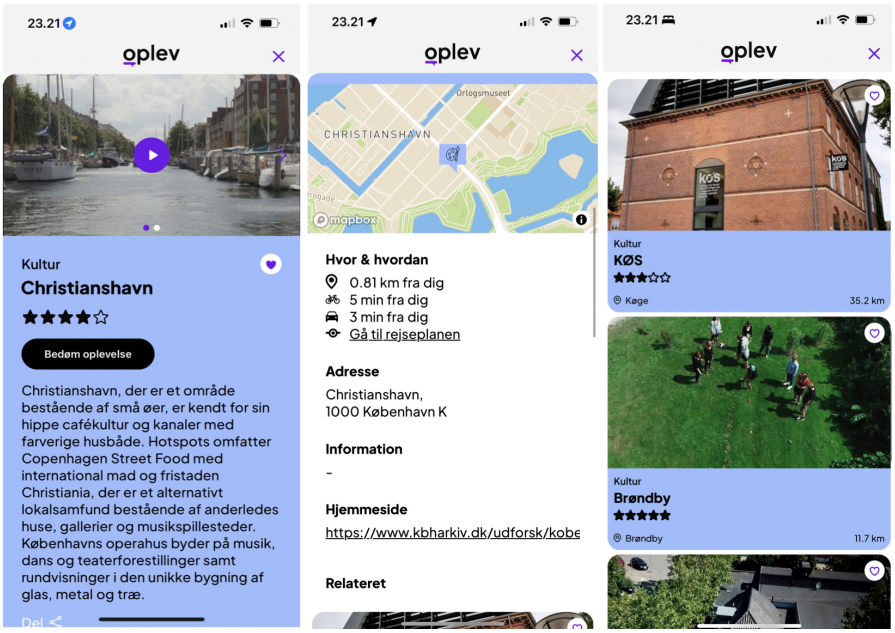


Figure 4.2: Information about an experience in Oplev called Christianshavn

Furthermore, users have the ability to bookmark experiences as favorites, which can be easily accessed under the "Favorites" tab. Lastly, the application offers a "Tip us" feature, enabling users to submit recommendations for experiences they would like to see added to the application.

4.3 Tripadvisor

TripAdvisor is a mobile application available on iOS and Android platforms. TripAdvisor is not restricted to the Copenhagen area. Users can also also search for things to do in Paris, New York, Amsterdam, and more.
Upon launching the application, users encounter the "Explore" tab, which suggests nearby restaurants, hotels, and activities based on their current location.
The "Search" tab, depicted in Figure 4.3, allows users to search for a location, view their recent searches, or select "I nærheden" (nearby). When the user presses "I nærheden" activities, hotels and restaurants near them are shown on a map. Users can filter these options using various categories, including "concerts and shows", "language", "budget-friendly", "free entrance," and more. Additionally, users can book hotels, make restaurant reservations, and purchase activity tickets.

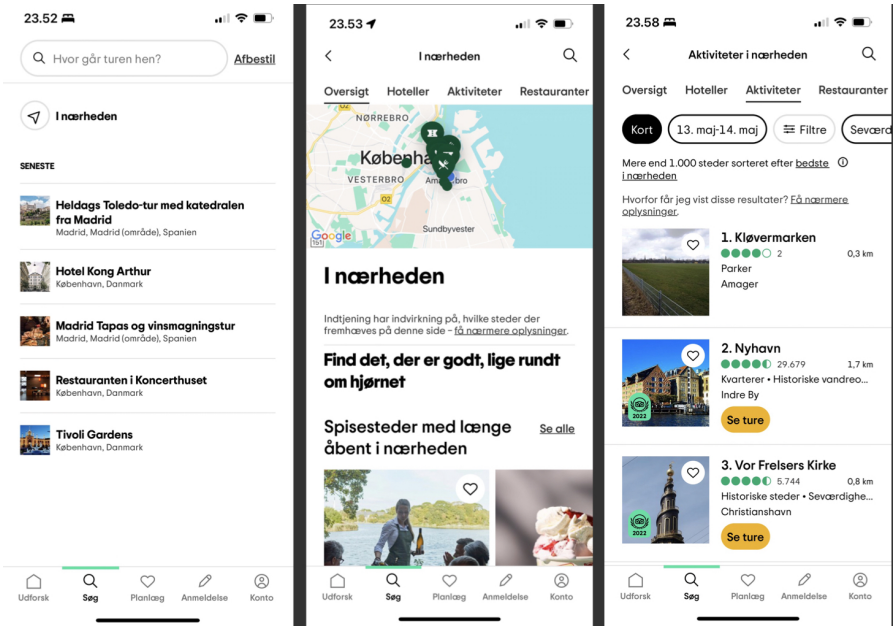


Figure 4.3: Search tab (left) along with "I nærheden" (middle) and the Activites tab (right)

When users select an activity, hotel, or restaurant, they receive comprehensive information, as showcased in Figure 4.4. This information includes pictures, reviews, opening and closing hours, the address, textual instructions on how to reach the destination, a link to the "Rejseplanen" website for travel information, and a link to Google Maps.

The application also features a "Plan" functionality, enabling users to create trips and add activities by favoriting them in the explore view. In addition users can add comments to the activities they have included in their trip.
Lastly, similar to Oplev, users can contribute by adding new places to TripAdvisor.

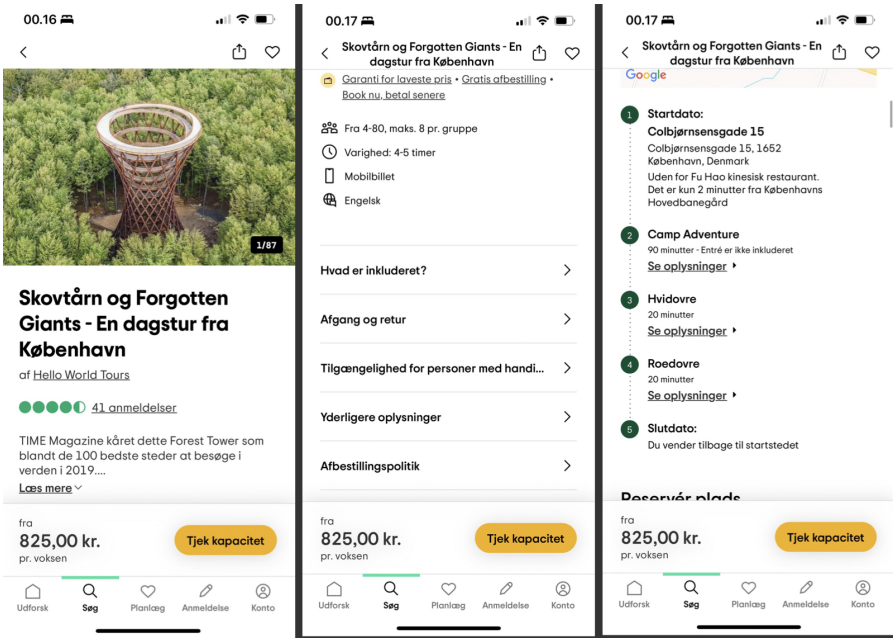


Figure 4.4: Information about an activity in TripAdvisor called “Skovtårn og Forgotten Giants - En dagstur fra København”

4.4 Copenhagen Travel Guide (CTG)

CTG is like Oplev and TripAdvisor, also a mobile application available on iOS and Android platforms. CTG helps users find hotels, tours, and other activities in Copenhagen, that they can book. It is important to note that CTG offers a premium and free version, where premium users can access itineraries, street maps, augmented reality, members-only tours, and activities. However in this comparison, we will only focus on the features available to users of the free version.

The application provides historical information about the city of Copenhagen, information about the city’s districts, culture, and popular experiences, as well as tidbits about the experiences. Figure 4.5 illustrates the information provided for an activity in CTG called ”Langelinie.”

Many application features, such as hotels, tours, and popular experiences, lead users outside the application and into their native browser application.
Moreover, the application shows activities close to the user on a map, depicted in Figure 4.6. When a user selects an activity, they are redirected to their phone’s native map

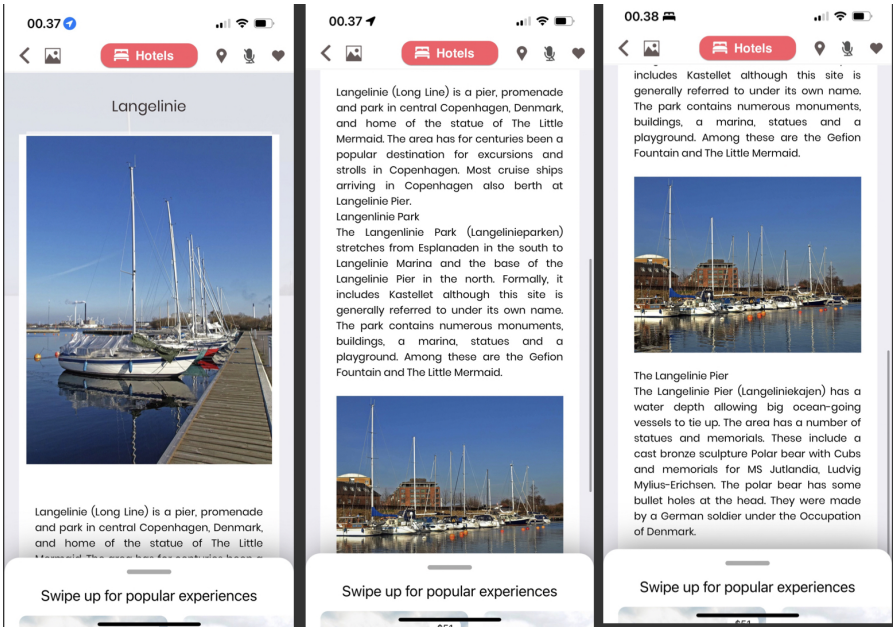


Figure 4.5: Information about an activity in CTG called "Langelinie"

application, either Google Maps or Apple Maps, to view directions to the chosen activity.

4.5 Comparative Analysis of Copenhagen Travel Guide, TripAdvisor and Oplev

The criteria that we will use for the comparative analysis of TripAdvisor, Copenhagen Travel Guide, and Oplev are the following:

- *Navigating the user interface (UI).* Evaluates whether the user interface is easy, moderate or difficult to navigate, in terms of easily being able to uncover the full scope of features available to the user.
- *Description of experiences.* Evaluates whether the application presents none, limited or extensive amounts of information about experiences to the user along with which type of information is presented.
- *Filtering and labeling experiences.* Evaluates whether the application lets the user filter experiences and which types of labels ore used for filtering experiences.

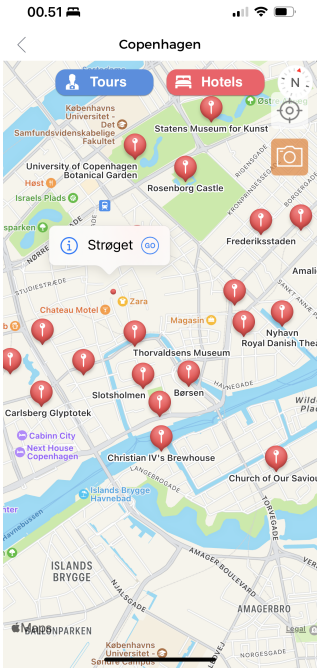


Figure 4.6: A map with activities in CTG

- *Instructions on getting to experiences.* Evaluates whether the application offers none, limited or extensive information about how to get to an experience and how they do it.

- *Itineraries.* Evaluates whether the application lets the user build an itinerary with experiences and what type of information the itinerary displays to the user.

In regards to the assessment of criteria it is essential to note that we will only focus on features that are integrated into the application. If the application e.g. links to an external website, the functionality provided by the website, will not be regarded as a feature of the application. The results of the comparison are summarized in Table 4.1.

4.5.1 Navigating the UI

Among the three applications, Oplev has the easiest user interface to navigate. Upon opening the app, we can quickly find all the available features. These features are conveniently placed in the bottom navigation, which is the menu at the bottom of the screen with the "Hjem" (home), "Kort" (map), "Favoritter" (favorites) and "Tip os"

Table 4.1: Summarization of the comparison of *CTG*, *TripAdvisor* and *Oplev*

	Oplev	**TripAdvisor**	**CTG**
Navigating the UI	Easy	Easy	Difficult
Description of experiences	Extensive	Extensive	Limited
Filtering and labeling experiences	Yes, extensive	Yes, extensive	Yes, limited
Instructions on getting to experiences	None	Limited	None
Itineraries	No	Yes	No

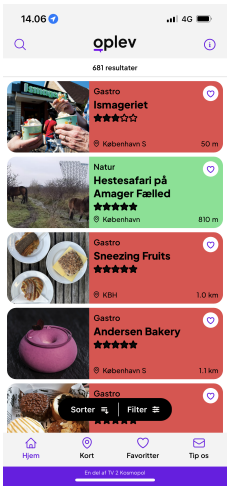


Figure 4.7: The homepage of Oplev

(give us a tip) tabs, the header which is the top section of the screen with the search icon and the content container, which is middle section where the application displays content, in this case a list of activities and filtering button. These are showcased in Figure 4.7.

Similarly, TripAdvisor also provides a user-friendly navigation experience. Upon opening the application, we are immediately presented with most of the available features in the bottom navigation, content container, and header, just like in Oplev. These are showcased in Figure 4.8. However, the filtering option is only revealed after we click on the search icon and select ”I nærheden” (nearby).

On the other hand, CTG has a user interface that is relatively challenging to navigate. Many features are hidden within a navigation drawer/slide out menu, depicted in Figure 4.9.

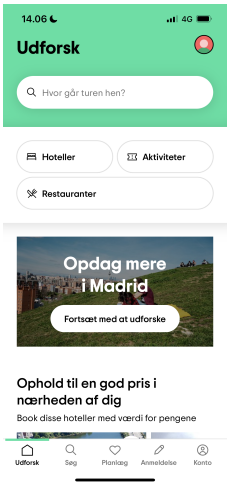


Figure 4.8: The homepage of TripAdvisor

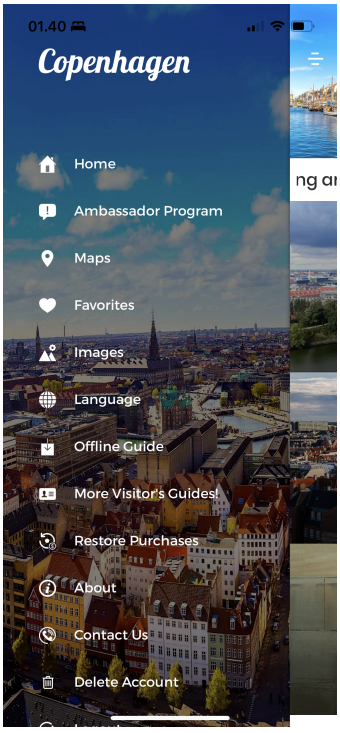


Figure 4.9: Navigation drawer/slide out menu in CTG

Furthermore, it took some time to discover that the band under the header, depicted in Figure 4.10 can be scrolled and offers some form of experience filtering. Furthermore, certain experiences available under different filters are concealed within a popup menu,

which is easy to overlook since it is positioned quite far down on the page as can be seen on Figure 4.10.

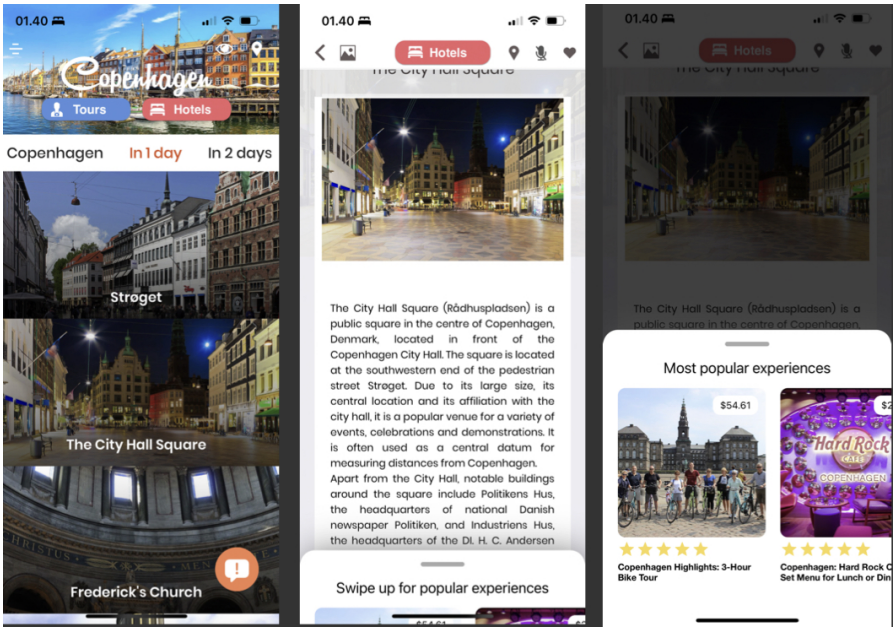


Figure 4.10: Scrollable band (left), popup menu positioned at the bottom of the page (middle and right)

4.5.2 Description of Experiences

Both Oplev and TripAdvisor provide extensive amounts of information about an experience. These platforms include essential details such as the address, reviews star rating, website, opening and closing hours, pictures, videos, a description of the experience, distance from the users current location, and estimated travel time based on different transportation options. They offer additional resources to help users navigate to an experience.

In contrast CTG offers limited information compared to the other platforms. They provide tidbits of information e.g. “The major music venues in Copenhagen are Parken stadium on Østerbro for the biggest stars. Downtown Copenhagen Jazzhouse obviously hosts jazz concerts.”

4.5.3 Filtering and Labeling Experiences

All applications allow users to filter experiences based on specific categories or labels. However, Oplev and TripAdvisor provide a wide range of labels, that users can utilize to refine the experiences that the application shows to them. These labels include various aspects such as price range, duration in hours or days, nature, history, culture, hotels, activities, and group size, among others. Moreover, users can combine these labels to expand/narrow down the types of experiences that they are shown.
In contrast CTG offers a minimal filtering experience. Users can selct pages such as "People's choice", "In 2 days", "Shopping", "Nightlife" and more. However users can only view one page at a time, and the experience available under that page can be found in the popup menu, the lies at the bottom of the screen as depicted in Figure 4.10.

4.5.4 Instructions on Getting to Experiences

All applications provide limited or no instructions on how to navigate to an experience. CTG and Oplev do not offer any instruction but instead uses the native map application on the user's phone or provide a link to an external website, respectively.
TripAdvisor also includes a link to an external website similar to Oplev and uses Google Maps similar to CTG. Furthermore, TripAdvisor provides the user with minimal text instructions on how to navigate to an experience. For example, to get to Hotel Kong Arthur, the instructions are "*Københavns lufthavn 9.33km, Sturup Airport 53 km, Nørreport minutters gang: 6, Forum minutters gang: 11*".

4.5.5 Itineraries

Both Oplev and CTG do not let users create itineraries based on the experiences displayed in the application. In contrast, TripAdvisor offers this feature allowing users to create trips and add experiences to them. Additionally, users have the option to add notes in the itinerary and easily share them with their fellow travellers.

4.6 Conclusion

We observed that the applications that were the easiest to navigate made key features immediately visible in both the top section and the menu located at the bottom of the

screen upon opening the app. Drawing inspiration from Oplev and CTG, we decided to incorporate a similar menu structure in Voyager, ensuring that important functionalities like trip planning and activity exploration are easily accessible in this component. Reflecting on CTG's shortcomings, we aimed to avoid hiding essential features, such as maps and favorites, in a slide-out menu. Instead, we included less critical features in a similar UI component. Additionally, we recognized the significance of using UI components that would be familiar to the user. For instance, we implemented filtering options using buttons, thereby avoiding the introduction of unfamiliar elements like the sliding band found in CTG, which could potentially diminish the intuitiveness of the UI.

To align with the user-friendly approach of Oplev and TripAdvisor, Voyager aims to provide users with a comprehensive range of information about each experience. This approach encourages users to stay within the app and conduct their research, eliminating the need to rely on external resources such as other websites. By offering various details such as pictures, descriptive text, reviews, star ratings, address, distance in kilometers from the user's current location, and estimated travel time in minutes, Voyager aims to enhance the overall user experience. The thematic analysis of the user interviews outlined in Section 10.2, further validates the importance of including these specific details in Voyager. The insights gathered from the interviews indicate that interviewees expressed a desire to have access to similar types of information when exploring an experience.

As most applications provide users with the ability to filter experiences, Voyager recognizes the importance of providing this feature. By offering users this option, we enhance their ability to discover and explore activities that align with their personal interest and preference, creating a more personalised experience. Inspired by Oplev we will also offer labels such as culture, nature, historic, and active.

Based on the exploration and comparative analysis of TripAdvisor, CTG, and Oplev, we can offer our user a unique Value Proposition by focusing on enhancing the itinerary and navigation features of *Voyager*. Optimally we would like to help the user navigate between all experiences in their itinerary so they can have a carefree exploration experience of Copenhagen.

In addition, we aim to expand the functionality of the itinerary feature in Voyager. This includes incorporating a schedule that outlines the selected experiences, as well as offering the ability for users to add pictures and a descriptive overview in the form of a title and description of their trip. Similar to TripAdvisor, we also intend to provide users

with the option to add notes and share their itinerary with fellow travelers, facilitating collaboration and enhancing the travel planning experience.

Design & Implementation Decisions

In this section, we delve into certain aspects of the design and implementation process that required careful consideration or presented challenges, along with our reflections and reasoning behind them.

5.1 Developing in Kotlin

Flutter, *React Native* and *Kotlin* are popular alternatives for Android app development. Each of these alternatives has its pros and cons, depending on the intended usage.

Flutter is known for its performance and ease of use. It provides hot reload, which is a useful feature for developers as it helps to reduce the development time by providing a quick feedback loop. Moreover, Flutter apps tend to have a smaller app size compared to other alternatives, which is a benefit for users with limited storage space on their devices. Flutter is a relatively new framework, and hasn't gained the largest community yet, which can result in shortage of documentation and aid online. Additionally, it does not have the same variety of plugins as Kotlin or React Native [15].

React Native is based on JavaScript, and known for its Cross-platform development capabilities, which means that developers can build apps that work on both Android and iOS with the same codebase. It also has a large and active community, which means that there is a lot of support and resources available for developers. Still, React Native is not the best choice for applications with complex and heavy computation and no match for the native solution [15].

Kotlin is a Cross-platform programming language developed by JetBrains, and is fully interoperable with Java. Kotlin is touted as a more efficient and concise alternative. Google recommends Kotlin for Android development, and more than 95% of the top 1000 Android apps contain Kotlin code, Android Development actually has a Kotlin-first approach, meaning that they design new features and tools with Kotlin in mind [16]. Additionally, Kotlin is a statically typed language, meaning that it catches errors at compile-time rather than at runtime, resulting in fewer errors in the code. On the other

hand, Kotlin has high maintenance cost, and while having a relatively large community, it's still a pretty young language, and is not as matured as Java for example [17].

Considering the project's time frame and weighing the ups and downs, we decided that coding in a native language would be the best choice because of its natural advantage when implementing features with more substantial operations. Kotlin, being a native language for Android development, appeared to be the best choice regarding future development and feature expansion. Additionally, Kotlin is interoperable with Java, the traditional language for Android development, which means that it can seamlessly integrate with existing Java code [15].

5.2 Directions

Providing users with step-by-step instructions on how to navigate to an Experience and notifying them with information such as "You need to leave in ten minutes to get to the little Mermaid at 05:00 pm.", allowing for carefree exploration of Copenhagen and eliminating the need for users to constantly monitor the time or keep track of their itinerary, was the way we wanted to enhance the navigational experience in line with the Value Proposition identified in section 4.

Our initial approach to providing our users with this features was to implement a simple algorithm that would calculate the most effective route between the Experiences in the users itinerary based on criteria such as when the user was supposed to arrive at the destination, the users current location, the weather and other criteria.
We would use Google Maps API to visualize the calculated route on the map and provide instructions to the user, when they pressed the "Begin Route" button in their itinerary. Showcased in Figure 5.1 is a depiction of the original design of how we wanted an itinerary in the Minimum Viable Product to look, including the "Begin Route" button.

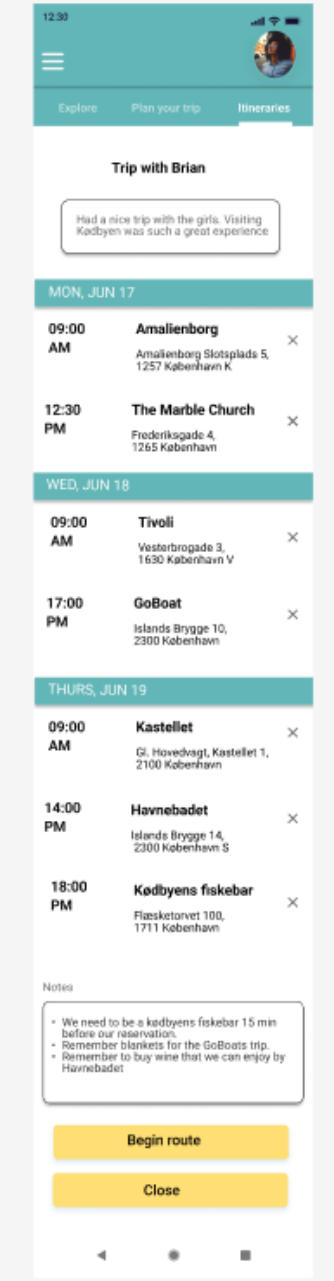


Figure 5.1: The original design of an itinerary in the Minimum Viable Product

However, due to time constraints, we opted to launch Google Maps via an Implicit Intent, to provide the user with directions to an Experience and as a result, we removed the ”Begin route” button from the itinerary.

While this is a suitable temporary solution, as it provides user with full access to Google Maps features while navigating, it does not align with our vision for Voyager as an all-in-one solution in the long run.

5.3 Neighborhoods

We compromised on the implementation of the Neighborhood feature. We planned to have a scrollable menu bar with information about all the different districts of Copenhagen. Figure 5.2 (left) shows the map of all the districts in addition to the intended design. However, when it came to implementation, using a ViewPager with a single fragment for each page, dynamically updating the image and text based on the page, proved to be challenging with 12 different districts.
Alternatively, we could use the ViewPager and implement a fragment for each of the districts, but we felt this would take too much time and space in the project.
We also considered a navigation bar, which we had already implemented for the main page, but this only supports a maximum of 5 items. Due to time constraints, we decided to go for a simpler solution that utilizes the same navigation bar and only displays two districts, as seen in Figure 5.2 (right). This approach allowed us to save time by not creating a fragment and writing descriptions for each district, and instead focus on other higher-priority features.
Looking back, we could have made a good compromise by using tabs, as they would not have required an individual fragment for each page.

5.4 Exploring the App Before Creating a User

An important finding we discovered during the user interviews was the common dissatisfaction with registering when downloading a new app without being able to explore it first to decide if it's worth creating a user account.
Initially, we wanted to let the user test some of the features without signing up or signing in, so they could decide first. We included this in our prototype. However, after implementing Firebase Authentication and setting up the security rules for the database, we decided that the user had to sign in before using the app. The Firebase Authentication design works in this way. Additional logic and development would be required to access parts of the app without authentication, which could potentially compromise security.

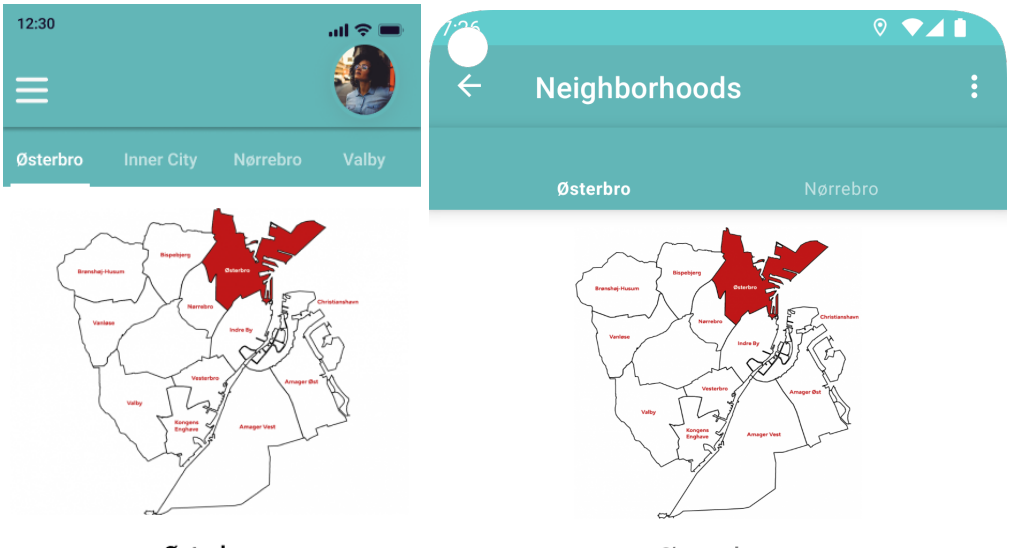


Figure 5.2: Left: Prototype of Neighborhood menu, Right: Actual implementation

Therefore, we decided to prioritize security and require authentication before using the app.

To make the sign-up Experience easier, we provided options to sign in with an existing Google account and with an email and password.

5.5 Filtering Experiences

The comparative analysis detailed in Section 4 led us to recognize the importance of implementing a filtering feature that would enable users to filter Experiences.
To implement this functionality we incorporated an Enum Class named "Labels". The Labels class consists of the following constants *CHILD_FRIENDLY, ROMANTIC, POPULAR, UNIQUE, LOCAL, ACTIVE, CULTURE, NATURE, HISTORIC*, gathered from the thematic analysis of user interviews detailed in Section 10.2 and the app comparison. We then added a "labels" attribute to the *Experience* data class. The "labels" attribute is a list of one or more labels.
We opted for an Enum Class as it provides the following advantages compared to other data types e.g. a String:

- **Easy Extensibility:** Using an Enum Class enables use to easily expand or modify the labels if needed. We have the flexibility to add new constants or even extend

their functionality. For example, we could associate labels with specific icons or colors, enabling us to create custom markers on the map. This visual distinction would assist users in easily differentiating between various Experiences showcased on the map.

- **Compile-Time Safety:** Implementing labels as an Enum Class ensured compile-time safety. The format and structure of the labels were pre-defined, minimizing the chances of errors due to incorrect formats or typos.

To enable users to filter Experiences on the map, we added a series of buttons corresponding to the labels in the Labels "Labels" Enum Class as shown in Figure 5.3. When a user pressed a button, the corresponding label was added to a list called "SelectedLabels". Subsequently, we implemented a method that cleared the map of all markers and compared the selected labels with the labels list in each *Experience* object. Whenever a match was found, the method added the marker associated with that Experience to the map.
Furthermore, when the user pressed the "Clear Filtering" button, the method would reinstate all the markers on the map and clear the "SelectedLabels" list. This would allow the user to view all experiences again and initiate a new personalized exploration experience.

5.6 Generating Itineraries with Artificial Intelligence

Our original plan was to get user input on the parameters listed below to facilitate the generation of itineraries.

- Start of trip in the format of dd-mm-yyyy.
- End of trip in the format of dd-mm-yyyy.
- Budget.
- Group size.
- Starting point, which specifies the address that the user will start their day from e.g., the address of a hostel.
- Max distance from starting point in kilometers.

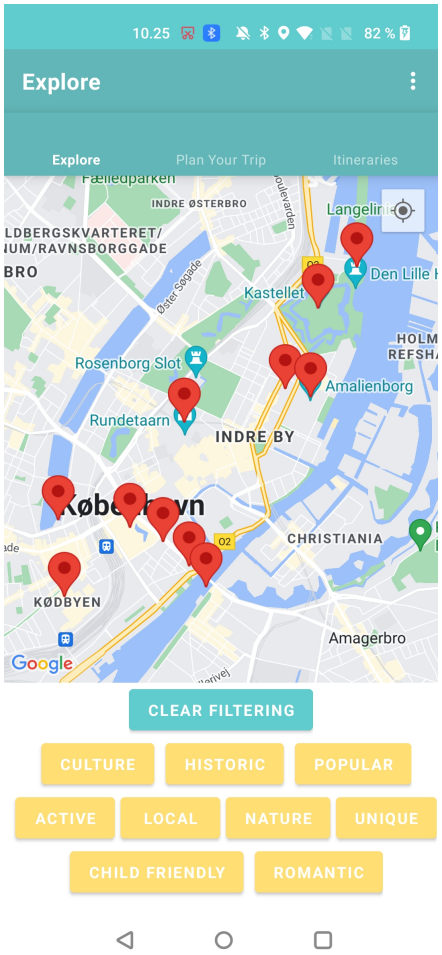


Figure 5.3: The *Explore* page with buttons to filter the Experiences, represented by the red markers on the map

- End and start time around the city daily in the format of mm:hh.
- One or more labels such as *unique*, *$$*, to characterize the experiences that the user would like to have added to their itinerary.

Based on the provided input, our initial approach was to develop a simple algorithm that considered factors such as labels, budget, trip length (in days) etc. to create a personalized itinerary for a user. However the recent emergence of Artificial Intelligence (AI) tools such as *ChatGPT*, *Microsoft Bing search chatbot*, and *Bard* interested us in integrating AI in our project to leverage the benefits of AI. To this end we were looking

for an AI tool that, like the tools mentioned above could interpret simple text-based user input and generate a detailed itinerary.

We found an AI-powered web application developed by Build AI, which specializes in providing customized AI-powered web applications for various projects and purposes. The Build AI web application is a text-based AI Application that generates text output based on the text input provided. By utilizing this technology, our users can generate itineraries effortlessly by typing a simple text query, such as "4-day, include free places only" or "2 day schedule, with kids".
The application generates a complete itinerary, as shown in Figure 5.4, including restaurants, attractions, timestamps, and addresses.

Day	Time	Activity	Address
Day 1	9:00 AM	Breakfast at Cafe Norden	Ostergade 61
	10:00 AM	Tivoli Gardens	Vesterbrogade 3
	12:30 PM	Lunch at Grød	Jaegersborggade 50
	2:00 PM	The Little Mermaid statue	Langelinie
	4:00 PM	Nyhavn	Nyhavn Canal
	6:00 PM	Dinner at Papiroen Street Food	Trangravsvej 14
Day 2	9:00 AM	Breakfast at Granola	Vaernedamsvej 5
	10:00 AM	Copenhagen Zoo	Roskildevej 32
	12:30 PM	Lunch at Paper Island	Trangravsvej 14
	2:00 PM	Visit the National Museum of Denmark	Ny Vestergade 10
	4:00 PM	Amalienborg Palace	Copenhagen 1257
	6:00 PM	Dinner at Cafe Victor	Ny Ostergade 8

Figure 5.4: The output generated by the BuildAI web application when typing in "2 day schedule, with kids"

We customized the web application by providing it with the app instructions listed in Figure 5.5. The app instructions specify that the web application should generate itineraries for the city of Copenhagen and present the output in tabular form, including information such as day, time, activities and addresses based on user input of the form "3 day schedule include romantic activities", "5 day schedule, include party activities".

Give a detailed travel itinerary for the city of Copenhagen. It should be presented in a table based on each day, and give approximate timestamps for when each activity starts, also include the address of the activity. It should include restaurants and cafees, attractions and fun stuff to do. The user gives a few keywords about what type of trip, and the itinerary should be based on that. The user will also input length of stay.

Figure 5.5: App instructions giving to the BuildAI web application

By integrating the AI-powered web application into our project, we expected to gain several benefits:

- **Enhances the user experience:** Users can make queries and receive output that aligns with their needs. We believe that the personalized experience will enhance user satisfaction.
- **Expanded data set:** We gain access to a more extensive data set of experiences and expand beyond just attractions. Now, we can offer our users a more comprehensive range of experiences, including cafes, restaurants and more attractions than the eleven that we currently store in our database.
- **Stand out from the competition:** Including the text-based AI web application sets *Voyager* apart from similar applications. We also believe that the ability to generate itineraries with comprehensive and diverse options will help *Voyager* to stand out.
- **Simplified implementation of itineraries:** Incorporating the itinerary generation feature becomes significantly more accessible, as we simply need to provide a text-based app instruction to the web application, whereby it will handle the task of generating personalized itineraries for us.

Technical Implementation

The following section covers the technical aspects regarding the implementation of the app.

6.1 Firebase

We decided early on to use Google Firebase for our back end. Firebase is a mobile and web application platform that provides developers with various services to build and host their apps. They offer features such as a real-time database, user authentication, cloud messaging, hosting, analytics, and more.

Voyager uses Firebase for authentication, storage and database hosting. We chose Firebase for many reasons:

- The fact that we could use it for several aspects of the application (authentication, storage and database) weighted heavily.
- The natural integration of Firebase Realtime and Authentication with Android apps.
- It is relatively simple to set up, and has good performance [18].

Firebase Authentication is a pre-built authentication tool that supports social media login and multi-factor authentication. The tool saved us a lot of time and effort by eliminating the need to build our own authentication system. Their services have good performance, and the vast selection of services can be a good opportunity for us to add more advanced features in the future [19]. Additionally, the different features Firebase offers are also easy to integrate with each other, which made the choice simple for us.

6.1.1 Database

Firebase Realtime is a NoSQL, cloud hosted database synced in realtime. Firebase Realtime offers offline persistence and integration with Firebase Authentication to secure the data further [19].

Firebase stores data as JSON objects. There are no tables or records, and the database works like a JSON tree, where data is saved as nodes and child nodes. A node represents a key-value pair where the key is a unique identifier, and the value is the actual data, in JSON format. Child nodes are nodes that are nested within another node called a parent node, which forms a hierarchy. This structure makes it easy to retrieve data [19]. Our database contains three nodes **experiences**, **itineraries** and **users**. Figure 6.1 illustrates the relationships between the nodes.

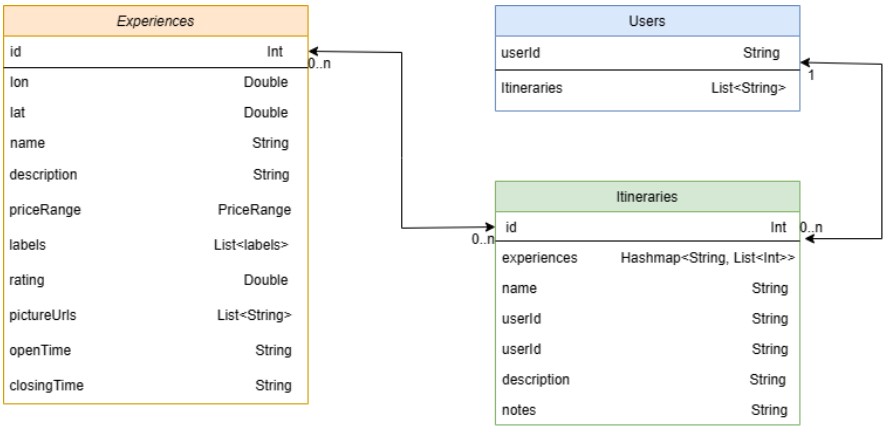


Figure 6.1: Database diagram describing the relationships between the three nodes, *experiences*, *itineraries* and *users*

Figure 6.1 shows the **Experiences** implement the following attributes:

- id : Int
- lon : Double
- lat : Double
- name : String
- description : String
- priceRange : PriceRange (enum)
- labels : List <Labels>(also an enum)
- rating : Double
- pictureUrls : List <String>(the strings are file locations in Firebase Storage)

- openTime : String
- closingTime : String

Most fields are self-explanatory, but a few may need to be clarified: priceRange is an Enum Class divided into free, one, two, and three. The numbers refer to the dollar signs to indicate the price. Labels are a list of labels from an Enum Class called label, which are keywords describing the different experiences (for example: historic or family-friendly). Lastly, picture urls are a list of strings that point to the file location in Firebase Storage, where we have uploaded all the pictures.

Itineraries implement:

- id : Int
- experiences: HashMap<String, List<Int>>
- name : String
- userId : String
- description : String
- notes : String

Again, most of the fields are self explanatory, but the experiences field refers to a HashMap consisting of a String and a list of ints. The strings represents different weekdays, and the list of ints is the id of the experiences per day. To illustrate with an example, **Monday, [7, 10]**, will show up in the itinerary as Goboat and Tivoli on Monday, and then some new experiences the next day Lastly, userId is a string referring to each user's specific IDs to ensure their itineraries are only visible to the user who generated them.

Lastly, **users** implement:

- userId: String
- itineraries: List<String>

Opposite to the other node, the ID here is a string. That is because Firebase's IDs are strings. When a user authenticates, the system adds their information to the database. Itineraries are a list of strings referring to the specific IDs of each itinerary.

6.1.2 Authentication

Ensuring secure and reliable user authentication is critical to any modern app. We used Firebase Authentication. Firebase Authentication provides easy-to-use SDKs, is easily integrated with our database, as mentioned earlier, and supports registration through Facebook, Google, e-mail and more [20].

6.1.3 Security

The security of our app is significantly enhanced by Firebase. All data stored through authentication and the database is encrypted and managed in compliance with GDPR regulations [21].

Firebase Authentication allows us to authenticate users properly. They also provide various security features such as passwordless sign-in, multi-factor authentication, account linking, and more, that can help to prevent unauthorized access to user accounts and sensitive data [20].

Moreover, the database adds an additional layer of security to our data. The unique user IDs are recorded in the database to allow recognition of user-specific data, which ensures that only authorized users have access to their data. Firebase Realtime also offers security measures such as authentication rules, which lets you decide who can read and write the data in your database. This feature can help prevent unauthorized access to your data and ensure that the data being stored in the database is valid and meets your specified rules. However, it is worth noting that the security of the data depends on the implementation and configuration of the security rules [19].

6.2 Folder Structure

An Android application consists of different components such as activities, fragments, and adapters. We kept a strict folder structure and naming convention to ensure an organized code base and consistency throughout the app [22]. Figure 6.2 shows the folder structure in the app.

Here is a short explanation of the folders:

- **Activities** contains all the app activities.

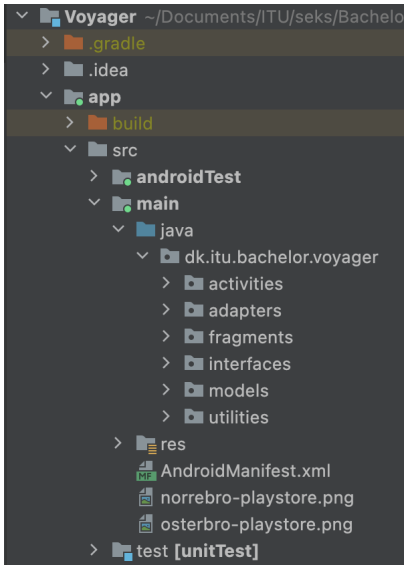


Figure 6.2: Folder structure

- **Adapters** contains custom adapters, which act as a bridge between the adapter and the data we want to display.
- **Fragments** contains all fragments.
- **Interfaces** contains all interfaces, such as custom onClickListeners for different components.
- **Models** contains the data models, which correspond to the nodes in our database.
- **Utilities** contains supporting code.

6.3 Google Maps

We utilized Google Maps API to implement a map in Voyager that visualized the locations of Experiences using markers. Several factors guided our decision to use the Google Maps API. Considering that Voyager was developed for the Android Platform where Google Maps is the default map application on most devices, we were able to leverage the API to provide users with a familiar interface, design and functionality that aligned with their prior experience and expectations of a digital map. Other key advantages of using the Google Maps API included:

- **Easy integration into project:** Google Maps API offers extensive documentation and customization possibilities, making the API easy to integrate into Voyager.
- **Future maintenance:** Implementing Google Maps API will ensure that Voyager's map stays up-to-date and accurate as Google Maps consistently gets updated with new data [23].

Additionally, we used an Implicit Intent to launch Google Maps and leveraged its functionality to provide users with step-by-step instructions on how to navigate to an Experiences with their preferred mode of transportation.

Discussion

This sections discusses potential paths for Voyager and opportunities for further integration with artificial intelligence.

7.1 Future Development

This section outlines the potential future developments for Voyager, ranging from small to large-scale features. Some of these features may require significant resources and a large budget. We have yet to consider this when suggesting it, and we are presenting them based on potential value.

7.1.1 Firebase Machine Learning

Firebase Machine Learning (hereby referred to as Firebase ML) is a mobile SDK (software development kit) aimed at making it easier for developers to implement machine learning functionalities in their applications [24]. As we already use several of Firebase's services, such as authentication and storage, a natural next step would be to apply machine learning tools from their wide range of APIs (see glossary for definition). Some APIs that could be suitable for Voyager are QR code scanners, on-device translation, and landmark recognition.

By scanning QR codes located near various experiences in Copenhagen, users could retrieve information about the attraction or food service, within the app. We could expand on this additionally, to include audio guides, for example.

Firebase ML also offers on-device translation, which can dynamically translate between more than 50 languages. Users can either recognize the language or manually select the two languages they want to translate. As Voyager is an app intended for tourist, this would be a convenient feature, especially for those who are not fluent in English or Danish. The on-device translation API mostly handles simple translations, but it is possible to upgrade to Google's Cloud Translation API; however, this is more expensive and requires more computing power. Additionally, the API uses English as an intermediate

language when translating between non-English languages, which can affect translation quality [25]. However, it is still a promising feature that would enhance the functionality of our app.

Finally, the landmark recognition API is also worth mentioning. It allows the user to pass an image, and it will return the recognized landmark along with its coordinates and region [26]. Voyager is already a location based service, so the coordinates would not offer any new information. However, the landmark recognition itself is a clever approach to enhance interactivity within the app and may be appealing to users who prefer more visual features.

7.1.2 Collaboration with Experiences

An insight from the user interview which has potential for future development is collaborating with businesses to offer users discounts on experiences. This could be a valuable incentive for individuals who are hesitant to commit to downloading an app. Some interviewees expressed their concerns about the commitment involved in downloading a new app. Providing discounts on museums, cafes, and other attractions could address this concern and encourage users to download the app. In return, businesses could benefit from increased traffic and visibility. Implementing this would require a lot of planning, negotiation, and potentially a dedicated employee.

7.1.3 Other Possible Features

Several features in the prototype did not make it to the actual implementation. This includes more extensive reviews, a weather feature, and the ability for users to suggest new experiences to include in the app. The intended design for these pages is in Appendix 10.4.

Per now, users can view the rating for each experience. Initially, the plan was to implement star ratings where the users could see the reviewer's name and their comments. This could be expanded further by allowing users to add photos, befriending other users, and creating a more community-based environment, similar to TripAdvisor, where users can earn badges for reviewing attractions and interacting. Additionally, the team had planned to include a weather feature that would show the forecast for the rest of the day and the next eight days. This would have further enhanced the app's all-in-one solution.

Lastly, we intended the "Add a new experience" page for users to suggest experiences not already included in the app's database. Our thought behind this was to discover hidden gems that may not be familiar to everyone, and increase the feeling of being in a community. However, to implement this, we would need to establish a system for reviewing and approving the submitted experiences, as we expect many bogus suggestions to be submitted with considerable growth in the user base.

All of these features are natural next steps in improving the app. Publishing it to Google Play store is also an important next step, but would require some polishing of the existing features first. As of today, the Firebase features we use are free, but with a significant increase in the user base, this would also lead to increased costs. If the team decided to continue working on the app, implementing these features would be a priority.

7.2 Further Integration with Artificial Intelligence

The following section details how the user experience and some features of Voyager, could be enhanced by leveraging Artificial intelligence (AI).

7.2.1 Integrating the Build AI web Application with *Voyager*

To enhance the user experience, we aim to further integrate the web application described in section 5.6 with Voyager as we currently do not persist anything generated by the web application. Thus if a user does not find a way to save the output generated by the web application e.g. by copying and pasting the results into an external notes application, the output will be lost when they navigate to another window in *Voyager* or press the back button. In this regard refining the integration aims to provide users with a more cohesive experience, minimizing the perception of using an external web application.
We accomplish this by persisting the itineraries generated by the web application in *Firebase Realtime Database*, thereby allowing the user to save and view an itinerary in their personal itineraries overview.
Furthermore, this integration will allow users to personalize their itinerary to a greater extent. Users can add a title, description, pictures, and notes to their itinerary, making the travel planning process more enjoyable.

7.2.2 Google Live View

Google Live View (GLV) is a relatively new and innovative feature of the Google Maps API. GLV provides a captivating augmented reality (AR) navigation experience by letting users view directions in the real world through the camera feed on their devices during a trip's walking portion, as shown in figure 7.1 [27].

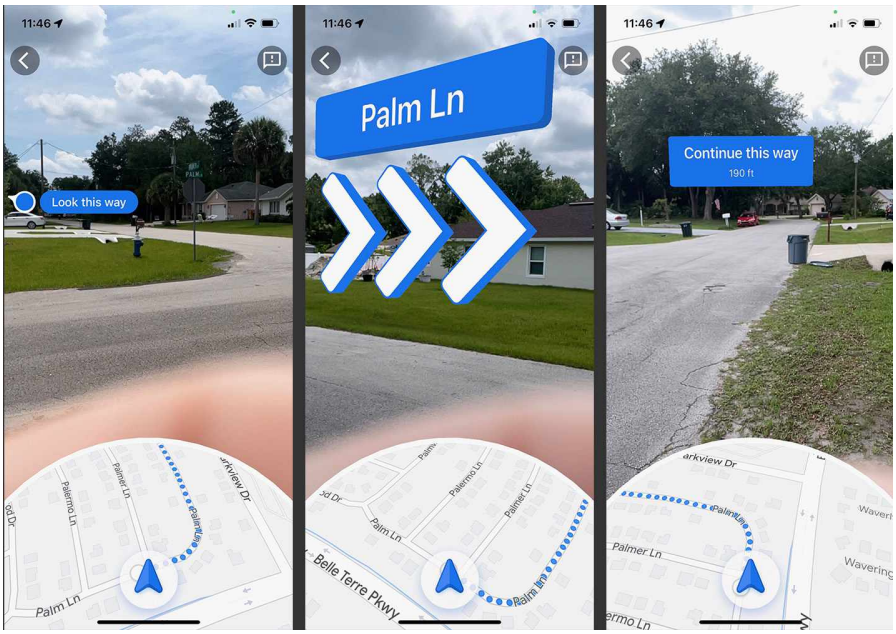


Figure 7.1: *Google Live View* providing directions trough the users camera.

Furthermore, GLV enables users to see which iconic landmarks are close to them and will inform the user of their distance to these landmarks and provide them with directions on how to reach them as, shown in figure 7.2 [27].

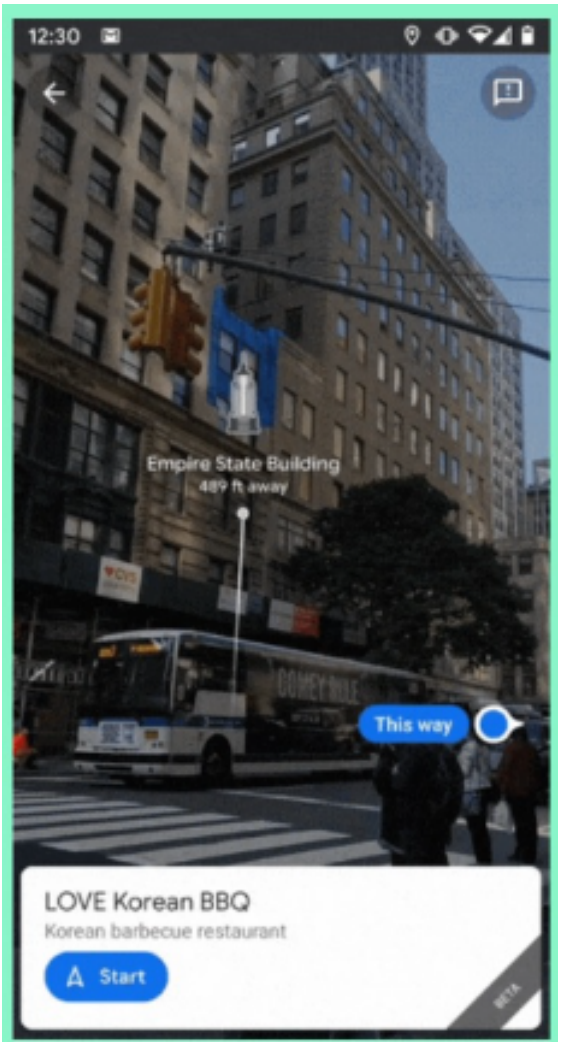


Figure 7.2: *Google Live View* informing the user that they are 489 feet (149.0472 meters) away from the Empire State Building.

Hence, integrating GLV into Voyager will enhance the user experience in several ways. Firstly, we can offer the user a more intuitive and immersive navigation experience. The user could effortlessly follow the arrows displayed on their screen, avoiding the need to constantly look down at a map, thereby enabling them to be more aware of their surroundings. Moreover, the arrows will help the user identify the correct ways to turn, minimizing the likelihood of getting lost or taking wrong turns. Thus leading to a less frustrating navigation experience, enabling the user to confidently find their way around a new area.

Secondly, the landmark feature within GLV will be convenient for users exploring new and unfamiliar areas independently. The feature will help users identify landmarks that may interest them and provide them with directions on how to get there. This will enable users to discover and engage with their surroundings offering a more immersive exploration experience. Furthermore, users will be less dependent on tour guides or other types of guided/structured tours, allowing them the freedom to tailor their sightseeing/exploration experience to their preferences and interests.
Lastly, offering a more immersive and pain-free exploration experience with GLV will allow us to distinguish Voyager from similar applications and incentivize users to grab Voyager instead of the competition.

7.3 Directions

As discussed in Section 5.2 our current approach to providing users with directions to an Experience is to launch *Google Maps* with an Implicit Intent, when the user presses the directions button. However, this solution is limited as it only offers directions to a single Experience. Consequently, users would need to access their phones whenever they wish to go to a new Experience on their itinerary and manage their departure time for each subsequent destination.

To significantly enhance the current navigation experience and provide a more user-friendly solution, we would implement a method that calculates the most effective route between two or more Experiences and visualizes the route on a map using the Google Maps API. This method would consider various parameters, including when the user is supposed to arrive at a destination, the weather, and the user's current location. Moreover, we would notify the user when they need to leave for the next destination. By doing so, users can fully explore the city of Copenhagen without having to keep an eye on the time or constantly be on top of where they need to be next and find the directions to that location.

Calculating the most effective route between the Experiences in a user's itinerary, considering parameters such as arrival time, current location, and weather conditions to start, falls under the realm of solving the shortest path problem.
The shortest path problem is finding the path between two points e.g. locations on a map, with the least cost. In our case cost could be the users current location, travel

time and weather information.
Consequently, identifying an algorithm that can effectively tackle this problem will bring us a step closer to providing the user with a much better navigation experience.

Common choices for solving the shortest path problem are Dijkstra's algorithm and the A* algorithm. A key difference between the two is that Dijkstra's algorithm exhaustively searches all possible paths, whereas the A* algorithm selectively explores paths based on heuristics, which could be the weather or travel time. This selective path exploration makes A* more efficient than Dijkstra's algorithm, especially when dealing with larger areas [28].
Thus the choice between Dijkstra's algorithm and the A* algorithm depends on factors such as the number of Experiences the user can choose from and their geographic spread, as well as computational power. However, since the area is limited to Copenhagen and therefore not extensive, we can disregard the geographic spread criterion. Instead, the number of experiences provided to the user becomes a crucial factor. If the number of experiences exceeds a few thousand, we prefer using A* over Dijkstra's algorithm. However, if the number of experiences is below that threshold, Dijkstra's algorithm can be employed.

For our current situation with only eleven Experiences Dijkstra would be the clear choice. However, as discussed in Section 7.2.1 if we manage to persist the itineraries, the amount of experiences that we would be able to offer to users will increase significantly and thus A* will be the safest choice for the long-term development and maintenance of Voyager.

Conclusion

In conclusion, this project aimed to investigate the feasibility of an intelligent travel planner for Copenhagen, and through user feedback and insights from a comparative analysis, we have created a satisfying user experience that offers a strong value proposition. The study involved conducting user interviews to uncover pain points, preferences, and expectations of the target group, which helped in making the first sketches of Voyager. The usability tests further helped in making changes to the user interface to make it more user-friendly.

Moreover, our comparative analysis helped in identifying areas where Voyager could differentiate itself from the competition by offering unique and innovative features, such as state of the art AI. As a next step, Voyager plans to persist the generated itineraries to provide a more cohesive and personalized user experience. Furthermore, integrating Google Live View into Voyager will enable users to navigate effortlessly and explore new areas, while notifying them about iconic places.

The project faced many challenges and made compromises, which led to valuable learning experiences and equipped us with skills and knowledge useful to tackle future challenges. While there are many interesting possibilities for future development of Voyager, we are certain that time will uncover even more.

Bibliography

[1] Visit Denmark, "Nøgletal om dansk turisme." https://www.visitdenmark.dk/corporate/videncenter/noegletal-om-dansk-turisme. Accessed: 10.05.2023.

[2] Visit Copenhagen, "What makes copenhagen world's most bicycle-friendly capital?." https://www.visitcopenhagen.com/copenhagen/activities/what-makes-copenhagen-worlds-most-bicycle-friendly-capital. Accessed: 10.05.2023.

[3] Time Out PR, "Time Out reveals the World's Coolest Neighbourhoods right now." https://www.timeout.com/about/latest-news/time-out-reveals-the-worlds-coolest-neighbourhoods-right-now-100621. Accessed: 10.05.2023.

[4] G. Cloud Architecture, "Trunk-based development." https://cloud.google.com/architecture/devops/devops-tech-trunk-based-development, 2021. Accessed: 11.05.2023.

[5] M. Rosala, "The Discovery Phase in UX Projects." https://www.nngroup.com/articles/discovery-phase/, 2020. Accessed: 09.03.2023.

[6] L. Tanggaard and S. Brinkmann, *Interviewet: Samtalen som forskningsmetode*, pp. 29–52. Denmark: Hans Reitzels Forlag, 1st ed., 2010.

[7] S. Mashuri, M. Sarib, F. Alhabsyi, H. Syam, and R. Ruslin, "Semi-structured interview: A methodological reflection on the development of a qualitative research instrument in educational studies," *Journal of Research & Method in Education Volume 12, Issue 1*, 2022. Accessed: 05.05.2023.

[8] M. Rosala, "How to Analyze Qualitative Data from UX Research: Thematic Analysis." https://www.nngroup.com/articles/thematic-analysis/, 2022. Accessed: 09.04.2023.

[9] G. Marthasari, W. Suharso, and F. Ardiansyah, "Personal extreme programming with moscow prioritization for developing library information system," *Proceeding*

of the Electrical Engineering Computer Science and Informatics, vol. 5, 2018. Accessed: 05.05.2023.

[10] S. Krug, *Don't Make Me Think*, pp. 103–141. US: Pearson Education, 3rd ed., 2014.

[11] S. Krug, "Usability Test Script – Mobile Apps - adapted from rocket surgery made easy." `https://sensible.com/downloads/test-script-mobile-11-20.pdf`, 2013. Accessed: 18.04.2023.

[12] Google, "Look and Feel - Material Design," 2021. Accessed 09.05.2023.

[13] Google, "Material design." `https://m2.material.io/design`, 2021. Accessed: 10.05.2023.

[14] S. Xanthopoulos and S. Xinogalos, "A comparative analysis of cross-platform development approaches for mobile applications." `https://dl.acm.org/doi/abs/10.1145/2490257.2490292`, 2013. Accessed: 25.04.2023.

[15] Index, "Flutter vs react native vs kotlin: Which will drive app development in 2023?." `https://www.index.dev/post/flutter-vs-react-native-vs-kotlin-which-will-drive-app-development-in-2023`, 2021. Accessed: 07.05.2023.

[16] Google, "Kotlin — Android Developers." `https://developer.android.com/kotlin/first#what`, accessed 12.05.2023.

[17] Android Developers, "Build better apps with kotlin." `https://developer.android.com/kotlin/build-better-apps`, Accessed: 07.05.2023.

[18] M. Ohyver, J. V. Moniaga, I. Sungkawa, B. E. Subagyo, and I. A. Chandra, "The comparison firebase realtime database and mysql database performance using wilcoxon signed-rank test," *Procedia Computer Science*, vol. 157, 2019. Accessed: 02.05.2023.

[19] "Google Firebase Realtime." `https://firebase.google.com/docs/database`. Accessed: 02.05.2023.

[20] "Google Firebase Authentication." `https://firebase.google.com/docs/auth`. Accessed: 04.05.2023.

[21] Google, "Firebase privacy policy." https://firebase.google.com/support/privacy. Accessed: 11.05.2023.

[22] "Organizing your Source Files." https://guides.codepath.com/android/Organizing-your-Source-Files. Accessed: 04.05.2023.

[23] Google, "9 things to know about google's maps data: Beyond the map." https://cloud.google.com/blog/products/maps-platform/9-things-know-about-googles-maps-data-beyond-map, accessed 13.05.2023.

[24] Google, "Firebase Machine Learning." https://firebase.google.com/docs/ml, 2021. Accessed: 11.05.2023.

[25] Google, "ML Kit Translation — Google Developers." https://developers.google.com/ml-kit/language/translation, Accessed: 11.05.2023.

[26] Firebase, "Recognize landmarks." https://firebase.google.com/docs/ml/recognize-landmarks, 2021. Accessed: 11.05.2023.

[27] Google, "Use live view on google maps." https://support.google.com/maps/answer/9332056?hl=en&co=GENIE.Platform%3DAndroid. Accessed: 11.05.2023.

[28] D. Rachmawati and L. Gustin, "Analysis of dijkstra's algorithm and a* algorithm in shortest path problem." https://iopscience.iop.org/article/10.1088/1742-6596/1566/1/012061/pdf, 2020. Accessed: 13.05.2023.

Appendix

10.1 User Interviews

10.1.1 Interview 1

- 23 years old
- Technical expertise: good
- Travels a lot
- Plans a little bit on beforehand

Interview:
Started by giving some background information of the application and why we are doing this interview.

Interviewer: How often do you travel?

Interviewee: Maybe 4-5 times a year, and I also travel home (to my hometown).

Interviewer: Do you usually go on city trips or beach holidays?

Interviewee: Big city holiday, I'm not too fond of beach holidays

Interviewer: Do you usually research possible sights and experiences in advance?

Interviewee: Yes, a little, I go to Google and look up what you can see.

Interviewer: What do you usually look for information about in advance?

Interviewee: How do I get to the city from the airport (if I fly, or by train). I check if there is an app for public transport and of course what is near the hotel in terms of places to eat and supermarkets and such.

Interviewer: Which tools or platforms do you use then?

Interviewee: I use Google Maps a lot, it's very convenient and you can see reviews on restaurants and the like. You can also see how busy it is in several places. I think that's nice. Otherwise it's mostly just Google.

Interviewer: Do you have an estimate of how much time you spend on this in advance?

Interviewee: Half an hour maybe?

Interviewer: When you choose what you want to do from experience etc., what factors play a role for you?

Interviewee: That it's something you can't see at home, something unique to that place. That it's not standard and boring, museums can be a bit boring.

Interviewer: What kind of information is important to get in advance when choosing an attraction?

Interviewee: Whether it costs money, reviews, and where it is located.

Interviewer: Explains the definition of travel guide...

Interviewer: Have you used a travel guide before?

Interviewee: Yes

Interviewer: How do you think it is to use a travel guide rather than other research methods?

Interviewee: I actually mostly use Google, but travel guides are often very clear for tourists as the target group. It can be easier to find good sights than to dig through everything that can be found on Google.

Interviewer: Do you have any thoughts on what a good travel guide should contain?

Interviewee: Nice to look at, clear, contains the biggest attractions, but also hidden gems. Things I hadn't found myself. Restaurants, shops, museums, parks, and local tips on bargains etc.

Interviewer: Something I have received feedback on in other interviews is that user registration can be boring, how can this be solved in the best possible way?

Interviewee: That there aren't too many clicks, I think it's stressful to confirm the email. If possible, do not confirm the email.

10.1.2 Interview 2

- 31 years old
- Technical expertise: good

- Likes to travel
- Plans a little bit on beforehand

Interview:
Started by giving some background information of the application and why we are doing this interview.

Interviewer: How often do you travel?

Interviewee: Abroad?

Interviewer: It could also be other cities in Denmark, for example, or abroad, yes.

Interviewee: I probably travel 5 times a year, maybe more.

Interviewer: Do you usually go on city or beach holidays?

Interviewee: Big city

Interviewer: Do you usually research experiences/sights at the travel destination in advance?

Interviewee: Yes, especially if I haven't been there before.

Interviewer: How do you do the research?

Interviewee: Google and Tripadvisor, friends, networks, if I know someone who has been somewhere.

Interviewer: Do you experience any challenges in connection with this? Any downsides?

Interviewee: I think sites like TripAdvisor are very generic, and very much based on typical tourist attractions that older clientele want to do. You don't get inside information about what you want to do, it's more like the most important sights and the best museums. It's harder to find local, cultural things that I'm interested in, so then I have to use people I know or contacts I have from the place I'm going to.

Interviewer: How much time do you spend on the research?

Interviewee: I don't spend much time, because of what I just mentioned.

Interviewer: What is important to you when looking for sights and experiences?

Interviewee: It has to be something memorable, something that fits the context of the trip, who I'm traveling with. Something worthwhile, and enjoyable.

Interviewer: What information is important to get in advance, once you have found an activity?

Interviewee: Content, price, location, that kind of thing. Reviews, which group it is suitable for.

Interviewer: Is there anything that you think gives a bad user experience?

Interviewee: It must be clear, easy to use, intuitive.

Interviewer: How would you describe a good registration solution for new users?

Interviewee: The easiest thing is to register with your email and password, you also don't have to fill in the link.

Definition of travel guide...

Interviewer: Have you ever used a travel guide?

Interviewee: Physically?

Interviewer: Online or physically.

Interviewee: Yes, I have used a physical brochure, not online. Does it count?

Interviewer: Yes. Is there something you feel is missing in digital travel guides?

Interviewee: Everything is better to use digitally with maps, planning etc. I don't use guides that much, because I want to plan my own route. The internet is easy to use for planning.

Interviewer: Do you have any thoughts on what a good travel guide should contain?

Interviewee: Reviews are important, including maps. That is the most important thing.

10.1.3 Interview 3

- 55 years old
- Technical expertise: okay
- Travels a lot
- Plans a little bit on beforehand

Interview:
Starting with some background information about the app..

Interviewer: How often do you travel?

Interviewee: I travel quite a lot, maybe 5 times a year.

Interviewer: Do you usually go on city trips or beach holidays?

Interviewee: Beach holiday once a year, the rest in the city. Summer holidays are often beach holidays, and city breaks are weekend trips

Interviewer: Do you usually research possible sights and experiences in advance?

Interviewee: Absolutely, I usually check out things to do, where to stay and recommended places to eat and stuff like that.

Interviewer: How much time do you typically spend on research?

Interviewee: 30-60 minutes.

Interviewer: Do you experience any challenges when researching places?

Interviewee: For slightly new cities, I think it can be a challenge to find where to live, because sometimes it turns out that things are much worse than you thought. For the most part, in a city you want to have a short distance to most of the things you have to do, and sometimes it turns out that the hotel is located in a place where nothing happens.

Interviewer: Which tools or platforms do you use then?

Interviewee: Travel blogs, I use google to find some good travel blogs, and I visit tripadvisor.

Interviewer: What do you like about the two?

Interviewee: With travel blogs you often get personal opinions and experiences, if you have a similar style you can imagine if you like what they like. And you are often recommended hidden gems. While tripadvisor is better for, if you are going to Malta for example, you can find the three most important things to do there.

Interviewer: When you choose what you want to do from experience etc., what factors play a role for you?

Interviewee: I like places that have a lot of history, if it's going to be a city break it should be a city that has a lot of exciting history and that has some things and sights to discover. Food, museums, parks, things to do.

Interviewer: Explains the definition of travel guide...

Interviewer: Have you used a travel guide before?

Interviewee: Yes, in the past you always bought travel books, I always did. "Asia on a shoestring", "The trip goes to..", books about the city you were going to, and had a small travel book with you on the trip, so I could imagine using an app that corresponds to the old travel books.

Interviewer: Do you have any thoughts on what a good travel guide should contain?

Interviewee: For example, I can remember a travel guide about Thailand, it contained information about the various parts of Thailand, because often you want to travel around a bit, and then you can see where there are jungle and safari opportunities, and where there are nice swimming opportunities or cheap accommodation and good food in the individual areas. Include things that are important/useful to know about the various areas.

Interviewer: Something I have received feedback on in other interviews is that user registration can be boring, how can this be solved in the best possible way?

Interviewee: I prefer when you can log in with things you already have. Google or vipps for example.

Interviewer: Anything last you want to add?

Interviewee: Yes, for my part, I think it's important to include tips for places to eat and transport, and where it's a good idea to stay. For example, in Copenhagen, where do you want to live if you want to cycle a lot or experience culture. Such tips.

10.1.4 Interview 4

- 33 years old
- Technical expertise: medium
- Likes to travel
- Plans travels thoroughly

Interview:
Started by giving some background information of the application and why we are doing this interview.

Interviewer: When you go on a trip, do you usually do research on beforehand?

Interviewee: In what sense, for what to do there, how to get there, where to stay or all of it?

Interviewer: Yes, what to do there, what to eat, your plans there.

Interviewee: Yes, all of it.

Interviewer: Why?

Interviewee: Especially big city vacations can be shorter, like Copenhagen, you don't have too much time, so therefore I think it's important.

Interviewer: Do you have any pains or gains when researching? I.e some downsides or upsides by researching

Interviewee: I think planning where to eat is less relevant, but what to do is more relevant. It's easy to go on Tripadvisor and check, some disadvantages can be difficult to find unique local attractions.

...

Interviewer: How can we make the research phase more comfortable?

Interviewee: If your going on a city break, I think thats pretty easy to research, but if you are going on a longer trip, a honeymoon for example, and you are very flexible and maybe have 3 weeks. You have the time and location aspects, you know you want to start somewhere and you know you want to end somewhere, you got a certain amount of time, and everything is kind of changeable. A painpoint here is estimating how much you will have time for in the number of days you have available, and changing it as you go.

Interviewer: When you do research, which websites, apps, books, other do you use to plan?

Interviewee: Straight google, no preferred websites, definitely not books. I just google, usually tripadvisor comes up, but you can be taken anywhere. I have no loyalty or preferred.

Interviewer: What are some important factors when you choose attractions?

Interviewee: Uniqueness coupled with something a bit intrinsic to the place. For example there is no point in going to the Zoo in Copenhagen, you can do that anywhere. I think it would be more funny to do something Copenhagen-y in that case. Price is relevant,

but when you have already paid for hotel and flights, not unless it is insanely expensive. Other peoples reviews. And of course time is relevant, its important to know how much time you spend on an attraction, you want to do more stuff. So basically for an app, I think you should filter on uniqueness of the place and time consumption. So if you specify you are only there for three days, you shouldn't see stuff that takes more time than that.

Interviewer: Good point. Can you think of any bad user experiences you have had while using a website or an app? Or some features that you really dislike.

Interviewee: The worst thing is if you need to register straight away, because no one wants to bother registering. Search engines can often filter through prices, but they haven't got it correct, so by the time you go to pay, the price has actually changed, or even worse is not available, so you have just wasted all your time entering your details.

Interviewer: Good points, on another note, is there anything you think gives a good user experience?

Interviewee: Hmm thats difficult, thats vague. Actually, I wouldn't use an app for traveling.

Interviewer: How come not?

Interviewee: The thing about an app, it's quite a commitment. The thing I like about apps is when its simpler than a web browser, cause I got a specific niche purpose for using it, but I wouldn't use an app for general searching. I'm not gonna use an app for... even skyscanner, I would just use the browser. I wouldn't use an app for that, the only ones I have are Uber, bankaccount..

Interviewer: Do you have the tripadvisor app?

Interviewee: No way. I don't know why, i'm just trying to think, why would anyone want the tripadvisor app? Cause you can google something, and it comes up.

Interviewer: I can only speak for myself, but I have downloaded it on the go, and wanted to search for restaurants and reviews. Google offers the same, but I think it's easier navigating if you are really looking through a lot of restaurants, and filtering and so. But I agree that as Google is improving, the point get's lesser. But the point of our app is finding out how we can make an app that people actually want to use? We want to combine a route finder ala Google Maps, you can see what kind of attractions are near you, maybe even restaurants, and filter based on how many days you are staying, number of people etc.

Interviewee: I think if you were to make an app for this, there should be a reward for the user. If you can get points, discounts or rewards in some way, something like that, then I might bother.

Interviewer: that's a good point.

Interviewee: If there were vouchers on it and offer, something that gives you a financial gain, that's a good incentive for downloading an app like that.

Interviewer: Ah yes, not a bad idea. That was actually my last question, do you have anything you would like to add?

Interviewee: Hmm, yes just about what you can offer in the app. I think you should think about how you can offer something they can't just get from Google, a reward of something. Free tube travel, discounts, stamp cards, 5 for the price of 3? Also, where can you withdraw money? Also, showing some hidden gems and information, something very local, some local angle that gives you more than the regular google search.

10.1.5 Interview 5

- 25 years old
- Technical expertise: medium
- Rarely travels, little planning

Interview:
Starting with some background information about the app..

Interviewer: How often do you travel?

Interviewee: Relatively often because I visit my family in Jutland, should I include that?

Interviewer: No, you don't need to plan that, so more like holiday trips.

Interviewee: Now it has been a long time due to corona, but maybe once a year otherwise? Maybe there will be more with my derby team eventually.

Interviewer: Do you usually go on city trips or beach holidays?

Interviewee: It's been a long time now, but big city trips.

Interviewer: Okay, you can try to remember when you have been an active traveler. Do you tend to research possible sights and experiences in advance?

Interviewee: No, not really, I've mostly been on trips with family, where someone else has done it. But sometimes I've tried to see what I really want to check out, and when it's open and stuff like that.

Interviewer: have you experienced any challenges when you have done research?

Interviewee: I think sometimes when you, well, if I'm going to this city, you also have to find out what's where, so it can be a bit difficult to find out where things are in relation to each other, and which district which is what, if you don't already know.

Interviewer: If you were to travel now, what would be the most important thing to take into account?

Interviewee: if I'm traveling with someone, how much it costs, when it's open, where it is in relation to my area, how to get there. If I was very good at planning I would probably think about how much you walk around a place, if you are in a museum for a long time, for example, your legs can really hurt at the end, so not then I would know that I should do some easy activities afterwards.

Interviewer: Explains the definition of travel guide...

Interviewer: Have you used a travel guide before?

Interviewee: A little bit, only those small, free brochures you get some places. But I have never used or bought a travel book.

Interviewer: How do you think it is to use a physical travel guide instead of a digital one, something missing, something better?

Interviewee: Sometimes it's nice to have a physical object.

Interviewer: What would it take for you to download a travel guide for a specific area?

Interviewee: Good question, I'm a bit against downloading apps for everything. I probably wouldn't do it unless, for example, I was traveling with a friend who recommended it and for some reason it made sense that we both had it. It should be very good, and offer something I can't find elsewhere.

Interviewer: What about user registration, how can this be solved as best as possible?

Interviewee: I don't like it when you download something and can't see anything in the app until I've given my email address. If you don't like the app, they still have your email and may send you lots of emails.

Interviewer: But if you are still going to create a user, how can you do it in the best possible way?

Interviewee: I want the opportunity to use the app first and see if I like it. Then you know it's worth creating a user. And that there is a reason why you should create a user, I want to know why.

10.1.6 Interview 6

- 26 years old
- Technical expertise: moderate
- Travels once a year
- Plans beforehand

Interview:
Introduction where the interviewer informs the interviewee about the topic of the interview and assures the interviewee that their answers are anonymous.

Interviewer: "So the first question is how often do you travel?"

Interviewee: "I travel about once a year."

Interviewer: "Would you describe it as a city or beach holiday?"

Interviewee: "A city or beach holiday? It's a bit of a mix, I would say."

Interviewer: "Yes."

Interviewee: "I would probably say it's a city holiday."

Interviewer: "Is it such that when you go, do you usually investigate possible experiences that you can visit on your trip in advance?"

Interviewee: "Yes, I usually do that every time before I travel, so I try to investigate on the internet, for example, which restaurants I can visit, cafes, or something else exciting to do in that city."

Interviewer: "And besides the internet, do you use other tools to investigate what you can do?"

Interviewee: "Yes, if there are people living there that I know, maybe I have family members who can recommend an area or a place, so I can get a little referral or guide."

Interviewer: "Is it the case that you experience some challenges in connection with your research?"

Interviewee: "With my research, and what could it be, for example?"

Interviewer: "Yes, it could maybe be that it was difficult to find information or that you felt a bit overwhelmed."

Interviewee: "Yes, well, I would like it if I could, for example search for the city's best restaurants, and then I would like to be able to see all the restaurants that exist, which I cannot do every time. I think, when you just google it, for example, if I have to find a restaurant in Istanbul, I don't think I can find all the best restaurants, that's how it is"

Interviewer: "How much time would you say you spend researching before you leave?"

Interviewee: "How much time do I use? Uhmm, that's a bit difficult, I would probably look and write something down when I have found a place I want to go and see, I would also do that when I'm there, how much time would I use? Should I say that in hours?"

Interviewer: "Yes, overall, what do you imagine it would be?"

Interviewee: "I spend about 3-4 hours, I would probably say, yes, it sounds very good because there are also some other days that I probably want to look, yes"

Interviewer: "And what is important to you when choosing which places to visit?"

Interviewee: "It is important that I can get there by public transport or by car if I have it there, where I am going, what else is important? That it is also affordable, I think, what I have to experience, see, or eat is at a price that my economy can handle, uhmm what else is important? I can't really think of anything else right now, but there may be other things, it was just the transport I was thinking of, and I would probably prefer to have something nearby for food and drink, uhmm besides that, I probably can't think of anything else." Interviewer: "Yes, that's fine."

Interviewer: "And what travel information would you say is most important for you to get?"

Interviewee: "Travel information?"

Interviewer: "Yes."

Interviewee: "Now I just remembered about the COVID restrictions."

Interviewer: "Okay."

Interviewee: "So, if there's anything related to COVID restrictions, I would like to know beforehand."

Interviewer: "Yes."

Interviewee: "If I need to get tested or wear a mask at this hotel or anything else."

Interviewer: "Yes."

Interviewee: "Anything related to flying and everything else, if there's anything I need to know beforehand, that's what I'm thinking about. What else could there be? I can't really think of anything else."

Interviewer: "Um, and then the last two questions. Um, before that, let me define what a travel guide is. A travel guide is a book or mobile application for tourists that describes what sights or experiences are available in a particular area."

Interviewer: "So, the first question is, have you ever used a travel guide?"

Interviewee: "Are you talking about an app?"

Interviewer: "On an app or in a book?"

Interviewee: "No, I haven't."

Interviewer: "And have you ever thought about using a travel guide?"

Interviewee: "No, I use maps if I need to find an address, but other than that, it's not something I've thought about."

Interviewer: "What do you think a travel guide should contain for you to use it?"

Interviewee: "Well, at least an overview of the cities in the country, the accommodations and hotels, the sights that one can experience, and the restaurants and cafes that one can visit. Oh, and I would like to be able to see transportation options, such as public transportation, if I were to go to a city where I had never been before, so I could get a good overview of what I could choose from."

Interviewer: "Transportation, meaning how to get there, for example, this bus goes there, or the actual route - you have to take this road?"

Interviewee: "I'm thinking both because it could also be that i am in a car, perhaps, um, both maps and how to get there by public transportation, and then a list of some hotels or accommodations."

Interviewer: "Yes."

Interviewee: "And then a little information, maybe, about the city or cities. That's what I'm thinking about."

Interviewer: "If you don't have anything else to add, that's it."

10.1.7 Interview 7

- 26 years old
- Technical expertise: extensive
- Travels multiple times a year
- Plans beforehand

Interview:
Introduction where the interviewer informs the interviewee about the topic of the interview and assures the interviewee that their answers are anonymous.

Interviewer: "How often do you travel?"

Interviewee: "Um, three to four times a year."

Interviewer: "Would you characterize your trips as city or beach vacations?"

Interviewee: "A good mix."

Interviewer: "Do you usually research possible sights and experiences you can visit at the destination before you leave?"

Interviewee: "Yes, always."

Interviewer: "And what do you use to research these sights and experiences?"

Interviewee: "Do I have some options or should I just shoot from the hip?"

Interviewer: "Well, yes, how do you find out that you can choose this restaurant, this hotel, or this museum before you leave?"

Interviewee: "Actually, I use Google a lot, and I also use Instagram."

Interviewer: "Do you encounter any challenges in your research?"

Interviewee: "Uh, no, not as such, I think. Or yes, sometimes I feel that it's just the same thing you find on all websites. I don't feel there's any variation, even if it's a blogger writing about it and she's trying to say that it's personal and stuff, it's not. She

probably just found it somewhere else. So, I just feel like they copy-paste each other a bit instead of coming up with something a little different, if that's what you're looking for. I don't want to go to those touristy places."

Interviewer: "Okay, when you say different things, do you mean, for example, a museum with hats versus a zoo if it were Copenhagen?"

Interviewee: "Yes, exactly. Something you know you just can't experience anywhere else, something that's a little hidden, something that's not basic. For example, if you search for Paris, it's the Eiffel Tower. More of the local, it would be cool if the locals could make some guides or something."

Interviewer: "Um, and how much time would you say you spend planning your trips?"

Interviewee: "How much time do I spend?"

Interviewer: "Yeah, an estimate."

Interviewee: "One to two weeks."

Interviewer: "And what's important to you when you choose which experiences and sights to visit?"

Interviewee: "That it's not touristy. That's very important because I don't want to go to places that are just filled with all sorts of tourists. It's important that when you go out, you see mostly locals and hear their language, you get a connection with the locals."

Interviewer: "Is there any travel information that is important to you?"

Interviewee: "The food is actually really important, and prices and um transportation options in the country itself. It's very important to find out if you need to rent a car and put more money into it or if you can take the metro and all those things, it's super important."

Interviewer: "Before we move on to the last few questions, I'll just define what we mean by a travel guide... and it's a book or a mobile application for tourists that describes sights in a specific area."

Interviewee: "Okay, like bloggers, right?"

Interviewer: "Yeah, actually."

Interviewer: "Have you ever used a travel guide?"

Interviewee: "Yes, I have."

Interviewer: "Did you find it easier to plan which experiences and sights to visit with the travel guide?"

Interviewee: "Yes, I certainly did."

Interviewer: "In what way?"

Interviewee: "It was more descriptive and informative than just Googling how the Eiffel Tower looks or how many visitors it gets. It was more like a review with personal experiences and opinions, which is more subjective and helpful."

Interviewer: "Was the travel guide digital or physical?"

Interviewee: "Definitely digital. I don't have the patience for physical travel guides. They give me a headache."

Interviewer: "What was your impression of the travel guide?"

Interviewee: "Well, for example, when you search for Asia, you already have certain preconceptions and thoughts about it, but you cannot confirm or deny anything until you have been there and experienced it yourself. By using these review apps or travel guides, as you call them, you can confirm or deny some of these things before you decide to go there. This way, you don't get disappointed when you arrive and realize that it is not as great as you expected it to be."

Interviewee: "It's really cool that you can confirm or deny some things, and of course, you should read many different guides, not just one, because otherwise, it's just the same thing, like reviews on Trustpilot, for example."

Interviewer: "One last question, what do you think a good travel guide should include?"

Interviewee: "Pictures. I think it's important to have pictures because who wants to read a three-page description of something? Videos are also good, where it is shown instead of being described. For example, vloggers are also travel guides. So, there should be some pictures or videos to attract me."

Interviewer: "Do you have anything else to add?"

Interviewee: "Oh, yeah, the weather is also an important factor in where we should go because we live in Denmark, and it's usually cold here, so we want to go to a warmer place. That's all for my additions."

10.1.8 Interview 8

- 23 years old
- Technical expertise: extensive
- Travels about once a year
- Plans beforehand

Interview:
Introduction where the interviewer informs the interviewee about the topic of the interview and assures the interviewee that their answers are anonymous.

Interviewer: "The first question is, how often do you travel?"

Interviewee: "Once a year, approximately."

Interviewer: "And would you describe this trip as a city or a beach holiday?"

Interviewee: "Primarily a city holiday. Recently, we went to a summer house, but I also went on a beach holiday in Cyprus last summer."

Interviewer: "Do you usually research possible sights and experiences to visit at your travel destination before you leave?"

Interviewee: "Yes."

Interviewer: "What do you use to do your research?"

Interviewee: "Google."

Interviewer: "Google?"

Interviewee: "Yes, the last time in Cyprus it was TUI, and they had a lot of things you could buy, experiences and guides on which sights to visit, so it was nice."

Interviewer: "So did TUI offer an app where you could add things and such?"

Interviewee: "Yes, they did."

Interviewer: "Did you use it?"

Interviewee: "A little bit. We used it because it calculated the transportation out to the sights and we could just check 'yes' and then we got transportation and tickets and such."

Interviewer: "So the way transportation was described, was it like you couldn't add more sights and then it would calculate the route between them?"

Interviewee: "No, it was mostly like, well, I know there was a full-day taxi tour, for example, available, where you could decide for yourself where to go. We bought tickets to the zoo, so we were picked up by a bus and then driven out to the zoo, and then driven home again."

Interviewer: "Did you encounter any challenges in connection with your research?"

Interviewee: "Yes, it was a bit difficult to figure out where and how and that kind of information."

Interviewer: "Was it because what you used was overwhelming or just a lack of information?"

Interviewee: "It was a lack of information, but also because it wasn't the best app ever, it was a bit difficult to navigate."

Interviewer: "So, because of too many options or just an overwhelming interface?"

Interviewee: "Overwhelming, it was very difficult to figure out where to go in the app."

Interviewer: "And how much time would you say you spent planning your trip?"

Interviewee: "I probably spent about an hour in total."

Interviewer: "What was important to you when you had to choose which sights and experiences to visit?"

Interviewee: "How easy it was, like how simple it was to get there and that kind of thing."

Interviewer: "And is there any particular travel information that you would say is important to you?"

Interviewee: "Transportation in terms of timing and location"

Interviewer: "Before the last two questions, I will define what we mean by a travel guide. It can be a book or digital application for tourists that describes attractions in a specific area. Have you ever used a travel guide?"

Interviewee: "Yes, the one that's everywhere, that little bird, the green one [referring to TripAdvisor], where you can review places. It reviews both restaurants and I think also some places, attractions."

Interviewer: "Is it something that you were recommended or stumbled upon?"

Interviewee: "Yes, it was Google actually. When searching for attractions, it was there, and then TUI, of course, also had their own list of things you could add."

Interviewer: "Did you like using the [TripAdvisor] app?"

Interviewee: "It's a bit special because it advertises a lot for certain things, so it's a bit difficult to see some of the smaller, lesser-known things."

Interviewer: "Is it something that you are concerned about, whether a place is heavily trafficked by tourists or not?"

Interviewee: "It was more like, it may be that you have just read about the three biggest attractions, but then it won't show much more than that."

Interviewer: "Have you ever used a physical travel guide?"

Interviewee: "Well, I haven't, but my mom was very fond of those 'Hvor går turen hen' books."

Interviewer: "And what do you think is the most important information that a travel guide should contain?"

Interviewee: "Hmm, well, of course, where the place is and any ideas for how to get there, especially if there is a bus line and it says you can do it this way. That was really it."

Interviewer: "Yes, do you have anything else to add?"

Interviewee: "No, I don't think so."

10.1.9 Interview 9

- 36 years old
- Technical expertise: extensive
- Travels a minimum of once a year
- Does not plan that much beforehand

Interview:
Introduction where the interviewer informs the interviewee about the topic of the interview and assures the interviewee that their answers are anonymous.

Interviewer: "How often do you travel?"

Interviewee: "Uh, about once a year, minimum, and usually it's during summer vacation."

Interviewer: "And would you describe this trip as a city or beach holiday?"

Interviewee: "It's a beach holiday."

Interviewer: "Do you usually research possible sights and experiences before you travel?"

Interviewee: "Uh, we've actually only done that once, when we went to Cyprus, uh, but otherwise we usually travel to Italy with the kids and it's mostly just on the beach and, uh, not doing too much."

Interviewer: "And that one time when you did research what you could do first, what tools did you use for your research?"

Interviewee: "Well, we relied a lot on, uh, people's experiences, uh, my mom's aunt has been a tour guide, so we kind of used other peoples experiences."

Interviewer: "So, experiences from people in your network?"

Interviewee: "Yes, we haven't really used the internet or technology to find out about it. I mean, it obviously has something to do with how much it costs and we have sort of investigated what it costs, but we haven't investigated sights and such."

Interviewer: "And how much time would you say you spent on your research?"

Interviewee: "Maybe a month, because there were several of us traveling, so we had to plan the vacation around the kids, work, and all the things we each have to fit together."

Interviewer: "And what was important to you when choosing sights, experiences, etc. in Cyprus?"

Interviewee: "Uh, well for us it's about, uh, it's very important because my mom has difficulty walking, so it shouldn't be places with too many hills, it should be sort of flat and with transportation options and, uh, where you could book through the hotel."

Interviewer: "And what travel information is important to you in general?"

Interviewee: "What do you mean by travel information?"

Interviewer: "It could be things like flights, hotels, restaurants."

Interviewee: "Yeah, uh, we're big fans of direct flights, especially when you have kids, it's quite important that travel time is as short as possible, so preferably direct flights and of course, it's quite important for us to travel in the morning, uh, as early as possible,

so we get something out of the day and, uh, when we're going back home, we travel as late as possible, because then we get a little more out of the day while we're there."

Interviewer: "So we have come to the final questions and before that, let me define what we mean by a travel guide."

Interviewee: "Yes."

Interviewer: "So a travel guide is a book or a digital application for tourists that describes attractions in a specific area. So the first question is, have you ever used a travel guide?"

Interviewee: "Umm not really, I mean we've had those 'Turen går til...' books, but I've never really used them because we usually always travel to the same place and umm yeah, but a few times I have looked, but usually not."

Interviewer: "Let's pretend it's a new place that you're going to visit, is it because this travel guide is missing something that you don't use them very often, or is it just that you know the place you're going to?"

Interviewee: "Well, we have researched what the hotel offers because they usually have a lot of activities that are part of the hotel's plan, so that's pretty much what we used. And everything was taken care of for us, so we just had to show up and they would transport us. But we were in luck in Cyprus because there was a tour guide who told us a lot of things about the places we went to see. Not because I think guides are missing something, but in that respect, I think we are a bit more hands-off, so we just experience things and try to get some experiences for the kids."

Interviewer: "So it kinda seems like there is a very strong focus on the kids, so if, for example, you were offered a travel guide that said that these things were child-friendly, is that something you could see yourself using?"

Interviewee: "Yes, I think so. When we researched Cyprus, it wasn't a specific travel guide, but we were on the hotel's website, and they had a lot of information about child-friendly activities and for adults. And, umm, I definitely think you could use a travel guide, but we are so digital, so it's more about how to get your hands on it."

Interviewer: "Okay, so the next question is whether you have ever used a digital travel guide?"

Interviewee: "Well, not really, except when we searched for the place we were going to, we haven't really found any digital travel guides."

Interviewer: "Okay, is there anything else you would like to add?"

Interviewee: "No, I think I got my answer out in a sober and good way, hehe."

10.1.10 Interview 10

- 24 years old
- Technical expertise: extensive
- Travels multiple times a year
- Plans beforehand

Interview:
Introduction where the interviewer informs the interviewee about the topic of the interview and assures the interviewee that their answers are anonymous.

Interviewer: The first question is, how often do you travel?

Interviewee: Well, last year I traveled, umm in January, February, April, June, July and then again in September and October.

Interviewer: And would you mainly characterize these trips as city trips or beach holidays?

Interviewee: Um, it's a bit different, some of them are city trips, some others are just to see something and there have been two trips where it was part of my studies.

Interviewer: Um, and before you go, do you usually research what you can visit at the destination?

Interviewee: Yes, I usually do.

Interviewer: Yes, and what do you use to do your research?

Interviewee: Um, well, I start by googling it, like what can you do in, I don't know, umm Portugal and then I usually also Google or search for some vlogs on YouTube and then I always find such websites where there are 3-day itineraries for this city or country.

Interviewer: Are those blogs or are they websites like TripAdvisor?

Interviewee: Um, no, those are blogs and personal websites and they usually just write what they've done and what they think is best.

Interviewer: And do you experience any challenges when you do your research?

Interviewee: Um, not really, but I think there's a lot of work, because you know besides looking at these three-day itineraries and such, umm it's also about looking at where everything is, so usually I would look at Google maps and then, because normally I would like there to be a map with such pins where I can see where everything is, because it's important for me to know where I'm going.

Interviewer: Okay, so that means that if you, for example, had an application where you said I'm going to Madrid in Spain and then it shows you, or you enter maybe the address of your hostel and then it says, okay in this area, there are these and these things that you can visit.

Interviewee: Yes, or not only in the area, but maybe umm here's a small map that shows where the most exciting things to visit are and then usually when I do it myself, I can see that most of the things are somewhere, right, so I usually try to find a place [to stay] close to that place and the other places, I usually just take the bus there.

Interviewer: So that means that you kind of look at what you can do and where there are the most exciting things, that's where you go?

Interviewee: Yes.

Interviewer: Okay, nice and how much time would you say you spend on this research, like a total estimate?

Interviewee: Um, maybe five hours, spread over several days.

Interviewer: And what is important for you when choosing which experiences to visit?

Interviewee: Um, I like to mix it up a bit, so for me there always has to be at least one museum, umm and then I also like to, umm visit different areas inside the city, if there is beautiful architecture, umm if it's a very historical city, then I usually like that there is information about what am I looking at in the different places and such.

Interviewer: Um, and are there any specific travel information that is very important to you when going to a country?

Interviewee: Prices, I would say, and if there is something that costs something, I would really like to know that, or if there are many things that don't cost anything at all, it would be super nice to know that.

Interviewer: "And now we come to the final questions, but before we move on to those, let me define what we mean by a travel guide. So a travel guide can be a physical or

digital guide for tourists that describes attractions in a specific area, so it could be a book or TripAdvisor, etc."

Interviewee: "Yes."

Interviewer: "Have you ever used a travel guide?"

Interviewee: "No, not according to the definition."

Interviewer: "If we wanted to get you to use a travel guide, what do you think it should contain in terms of information?"

Interviewee: "Well, if it's going to be something like TripAdvisor, I think it's very complicated to navigate through it. I don't think it's easy to use, as it's mostly about what other people have commented on it and you have to go through many comments, which I don't like. And if it's a physical travel guide like a book or something, then I just think there is too much information that I'm not going to read."

Interviewer: "When you say it was difficult to navigate through TripAdvisor, is it because you are bombarded with comments from other people or is it also about figuring out where to find specific things?"

Interviewee: "I would say both. Honestly, I can't figure out how to use TripAdvisor and I have traveled a lot, so yeah, I don't know."

Interviewer: "Can you give an example of what you have been looking for on TripAdvisor and what made it difficult to find it?"

Interviewee: "Well, usually, as I said, I just Google things and the first thing that comes up is TripAdvisor. Usually, there are so many activities and just too many comments. For me, it's those comments that I don't get anything out of. And then TripAdvisor looks like, to me, more like a website where you can buy experiences. So they have many tours, and sometimes you can do it for free, but it's just not what I'm looking for."

Interviewer: "So a good app for you might be an application where you have a map, it shows you these things you can experience on the map, and then you might click on something, and then it gives you some brief information about it?"

Interviewee: "Yes, and usually what these blogs do, for example, if it's a specific area like Nørreport that I want to see, then these blogs just say you can walk around different stores blah blah blah, and if you want a guided tour, then you can look at these. Whereas TripAdvisor just does it as a guided tour and that's it."

Interviewer: "Okay, that was it, do you have anything else you would like to add?"

Interviewee: "No, I don't think so."

Interviewer: "Then I say thank you very much."

10.2 Thematic Analysis

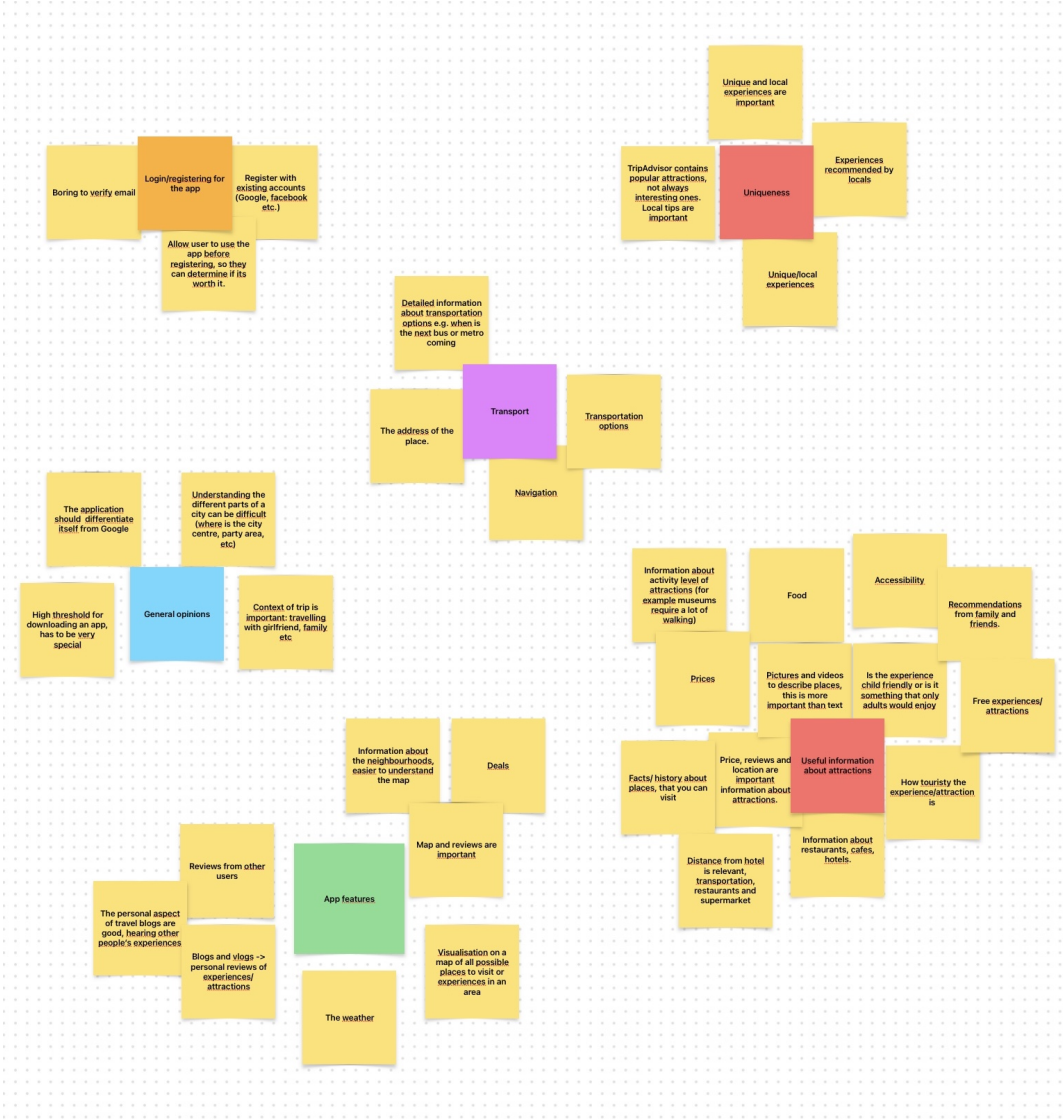
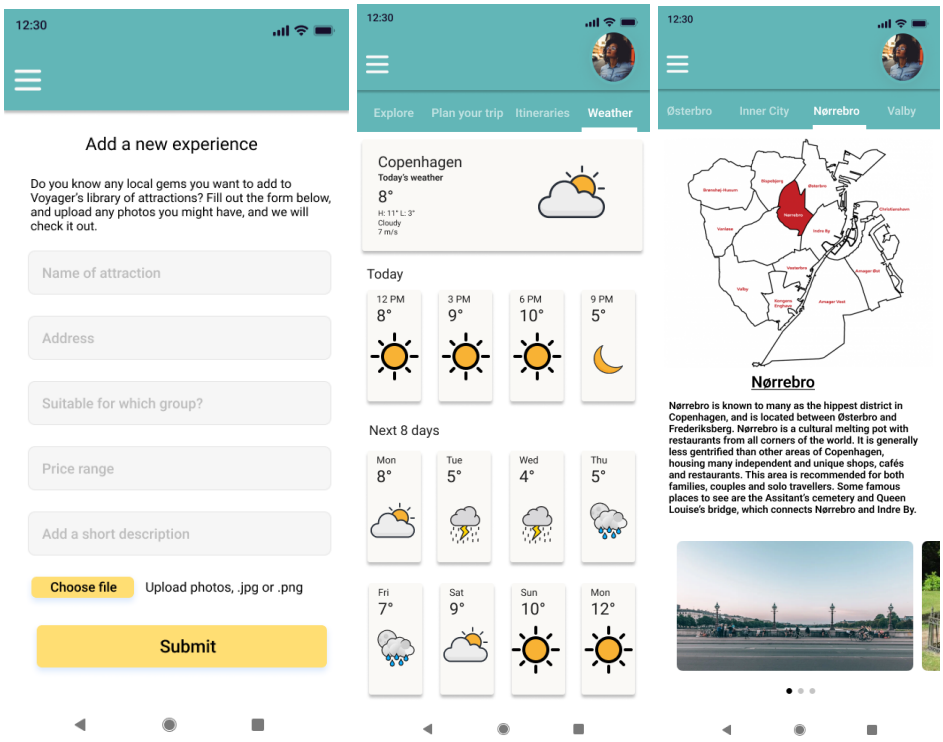


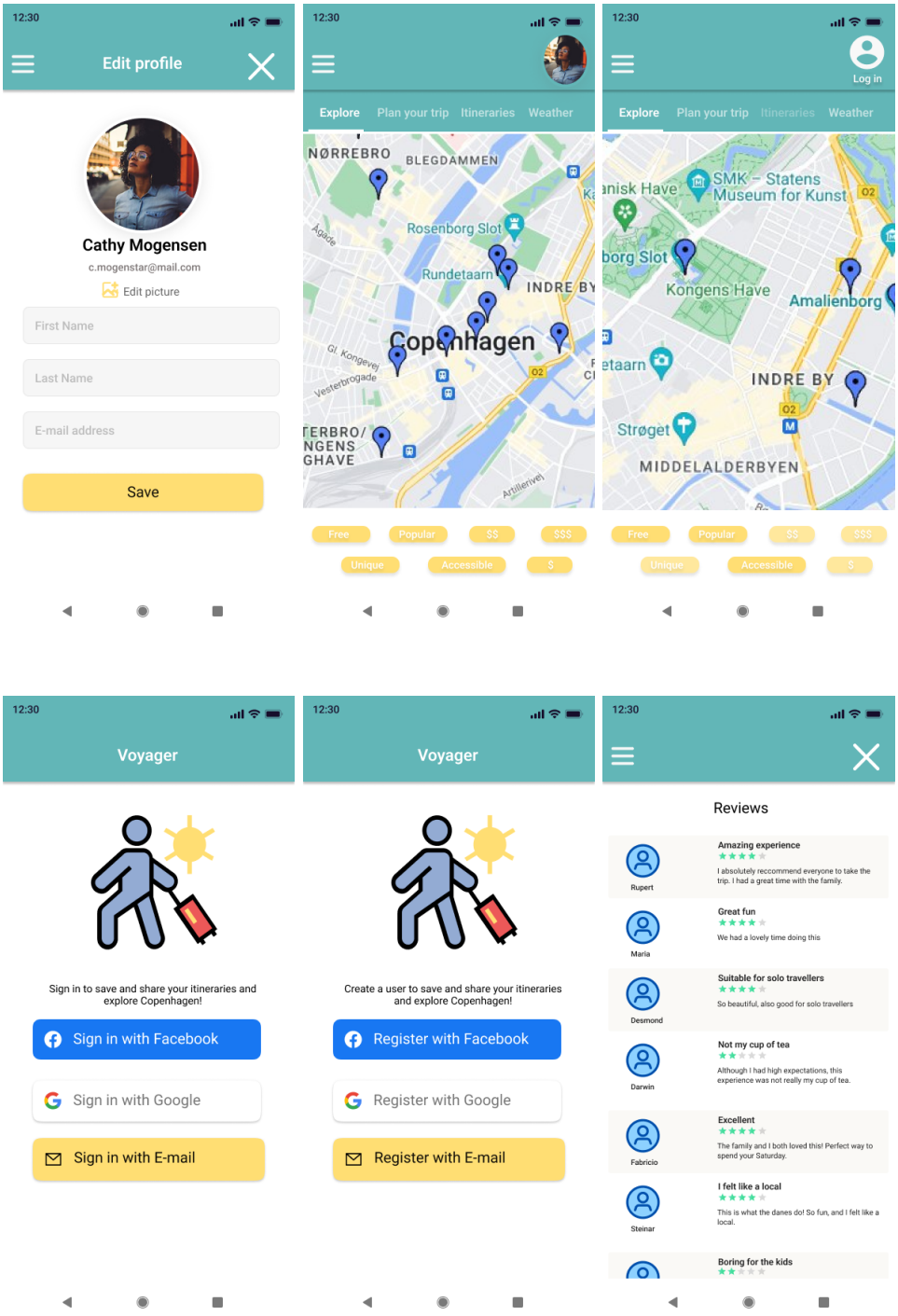
Figure 10.1: Result of the thematic analysis

10.3 Test Scenarios

1. Log in (the user chooses which login option themselves) and check the weather.
2. Explore all free experiences and then choose another label on the map (or a different label) and read about one of the experiences.
3. Generate an itinerary, and read about one of the experiences in the preview.
4. Generate an itinerary, then try generating a new one and saving it, then press continue exploring
5. Find itineraries, and open "Trip with Brian", then read about Nørrebro.
6. Edit your profile, change your profile picture
7. Click on a point on the the map and read some facts about the place. Read one of the reviews.
8. Add a new experience and view all attractions on a list
9. Open the burger menu and close it and then open it again and sign out
10. Log in, open attractions by list and read about an attraction
11. Log in, go to your itinerary add a new picture and share it with a friend

10.4 Figma Prototype





10.5 Sketches of the App

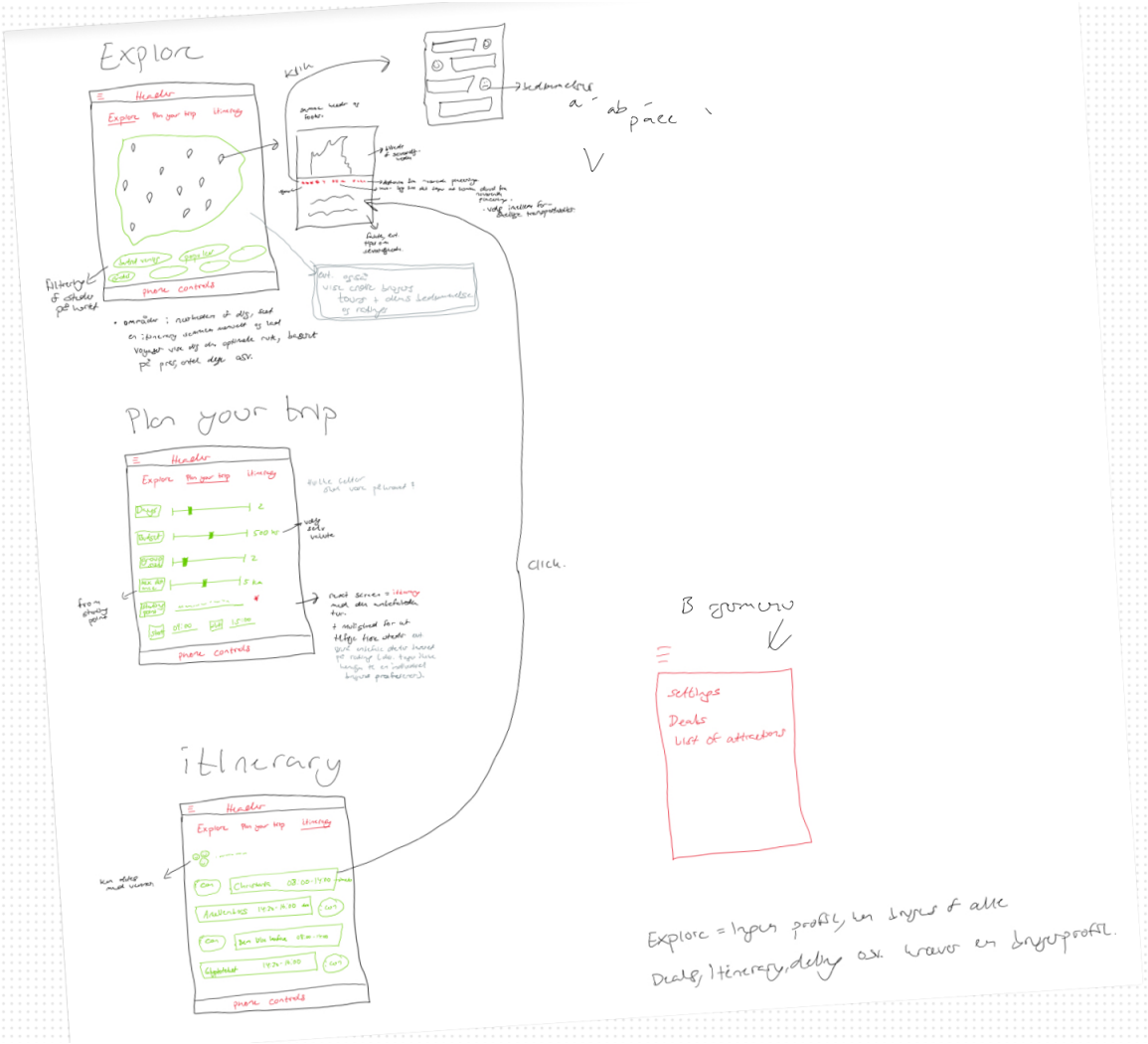


Figure 10.2: Sketch of *explore*, *plan your trip* and *itinerary*.

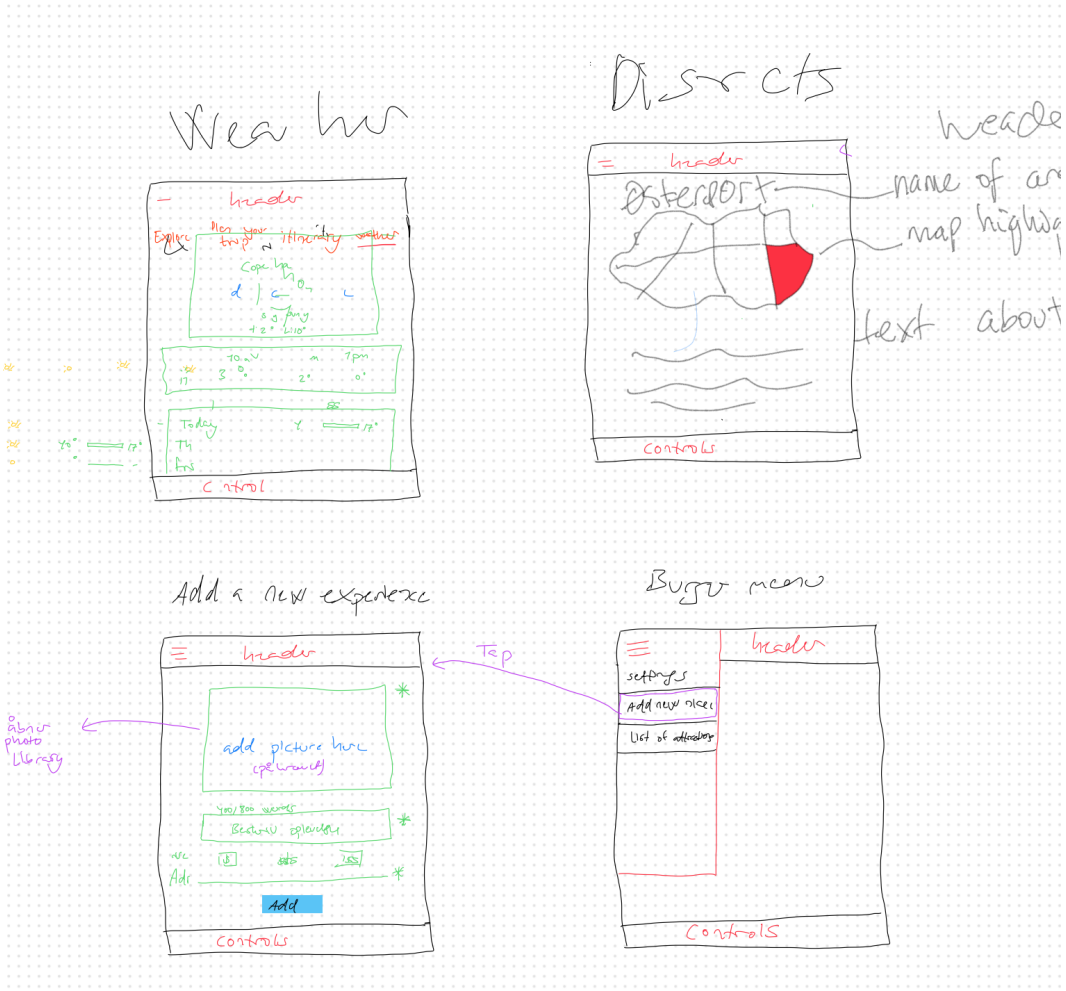


Figure 10.3: Sketch of *weather page*, *district page*, *add new experience* and *the burger menu*.

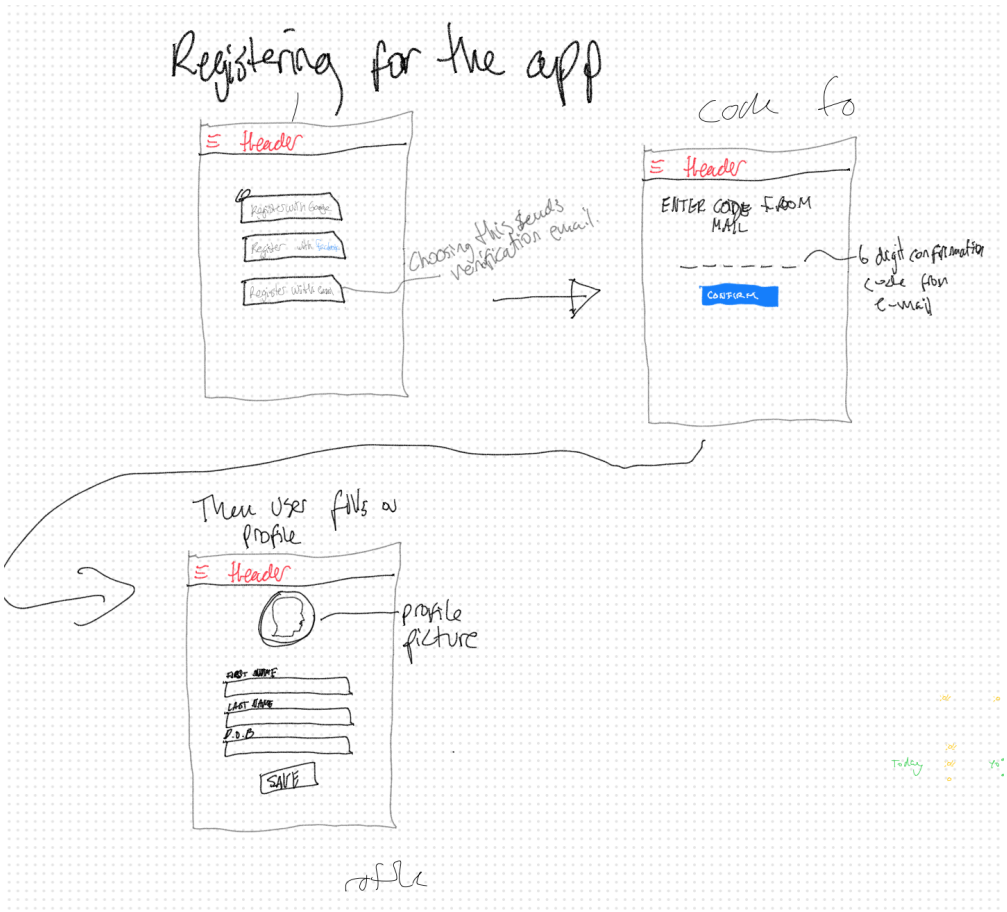


Figure 10.4: Sketch of *login* and *register* feature