

Group 15

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An aerial photograph of a city at sunset. The sky is a deep orange-red, and the city lights are visible. A large, modern building with a glass facade is prominent in the foreground, reflecting the sunset light. The building has a grid-like pattern of windows. The surrounding area is filled with trees and other buildings, creating a dense urban landscape.

Eindhoven, January 19, 2024

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1 | Introduction

In recent years, technology has become essential in every aspect of life, and one of the fields with emerging innovations is the travel sector. While existing features like online check-in, Google Maps, and TripAdvisor are prevalent, there is still limited utilization of technology to guide individuals throughout their entire journey seamlessly. Finding activities that fit with the desired trip still takes effort and time. Also, the trip itself is unthinkable without the technology of mobile phones. Think about navigating to activities and taking pictures. It comes with many advantages and makes the trip go smoother. However, using your phone the whole time also comes with notifications and distractions which can cause paying less attention to the environment and people around you.

According to the Booking.com 2023 Sustainable Travel Report, 76 percent of travelers express a desire to travel more sustainably (Cross, 2023). This substantial percentage signifies a growing awareness among consumers about the environmental impact associated with travel. However, nearly half (49 percent) of travelers believe more sustainable travel options are too expensive. These statistics not only highlight the importance of sustainable travel but also prompt innovative solutions and technological interventions to align with the evolving expectations of travelers.

This report explores the process taken by group 15 to conceive a product to improve sustainability, concerning smart tourist information and a navigation tool. The innovative approach involves meticulous research, collaborative ideation, and strategic design, aiming to contribute a sustainable solution for the evolving landscape of modern tourism. The report outlines the process of user involvement and exploratory prototypes to come to the final concept of Eco Explorer.

2 | Design Question

The design question guides the development process, capturing the main challenges faced by tourists. To come up with a design question, common challenges faced by tourists were considered. These challenges were found based on personal experiences. Issues such as unfamiliarity with the city, trip planning, navigation difficulties, and a lack of personalized tours were found. With these problems in mind, an initial design question emerged: *"How can a travel-related product blend navigation and information to create an engaging city exploration experience, fostering curiosity about historical facts and landmarks while promoting sustainable connections within the city?"*

Answering the design question involved extensive research facilitated by user interviews. The questions aimed to extract insights into participants' perspectives on various ideas and challenges that are commonly experienced while traveling. The goal was to gain an understanding of users' thoughts, preferences, and the challenges that significantly influence their overall travel experiences. For detailed information about the user interviews, readers are encouraged to refer to [subsection 3.2](#), while the specific interview questions can be found in [Appendix A](#) and [Appendix B](#).

To be able to answer the design question, constant feedback from the target group is required. This includes testing prototypes with potential users, gathering feedback, and refining the product based on the gained insights. The main objective is to develop a travel-related product that improves the travel experience of its users by offering a fun, eco-friendly, and personalized way to explore cities.

3 | User Involvement

3.1 | Co-creation

When developing designs for users, active involvement of the users in the design process is crucial. In addition to insights gathered from research studies, direct engagement with users provided valuable perspectives on the design scope. Co-creation enables users and innovators to collaboratively generate and refine the final product, ensuring it aligns closely with the users' needs. This not only positively impacts customer satisfaction and loyalty but also establishes a competitive advantage. User-influenced design choices often lead to unique features that set the product apart from others, addressing needs that may be overlooked by competitors. In this project, one of the initial steps involved conducting user interviews to initiate co-creation early in the process. This collaborative approach is essential from the beginning, as it allows users to provide firsthand experiences that validate our design choices.

3.2 | User Interviews

Before conducting the interview, the consent form was filled in by the participants affirming the confidentiality and exclusive utilization of the gathered data for research purposes. A total of 36 participants were interviewed ranging from the ages 18 to 51. While many questions were structured as yes or no queries for streamlined data analysis, each was supplemented by an open-ended “why” question to elicit detailed responses. For all interview questions, see [Appendix A](#). To maintain a natural and comfortable conversational flow, the interviews were voice-recorded. The focus of the question revolved around current navigation tools, obstacles in travel planning, and potential enhancements. Subsequently, the recorded data was translated into diagrams, and a comprehensive analysis of the interviews was conducted.

After conducting the first round of 36 user interviews, each interview was analyzed individually. These interviews are crucial for the product's success as they provide valuable insights into user preferences and expectations, increasing the likelihood of satisfaction. Results show that 97.1 percent of the interviewed individuals expressed interest in exploring new technology for travel enhancement, as can be seen in Figure 3.1. Furthermore, 55.6 percent indicated that technology wouldn't get in the way of their vacation enjoyment. Some insights gained from the analysis also highlighted a demand for increased personalization in travel apps, including local recommendations, additional filters, and automation aligned with individual preferences.

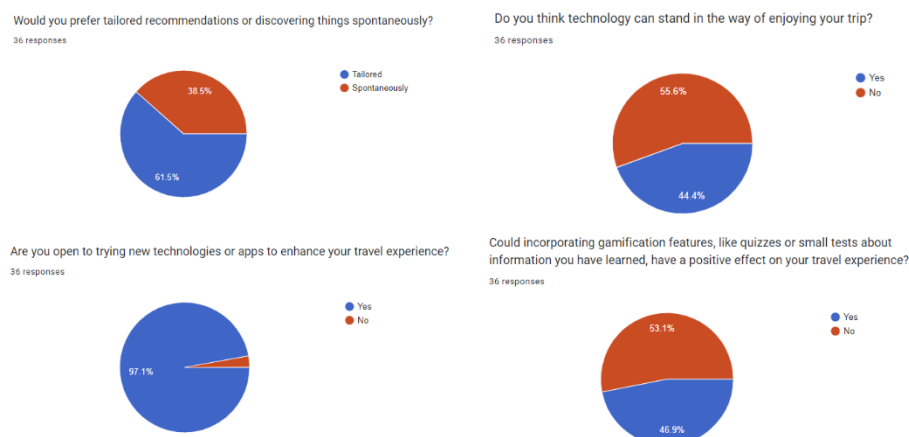


Figure 3.1: Pie charts user interviews

3.3 | User Tests

After coming up with a final concept five user tests were conducted. The goal of these tests was to find the desirability of the product. This was done in multiple ways, namely by asking questions, showing the app, and showing a 3D model of the prototype. The 3D model and app, see [Figure 3.2](#) and [Figure 3.3](#), were created to ensure the concept would be conveyed clearly. This helped both interviewers explain it and gave the participants a clear picture of what to expect. The questions went in-depth on various aspects of the product such as sustainability, the customizable pet, and information quizzes. All user test questions can be found in [Appendix B](#).

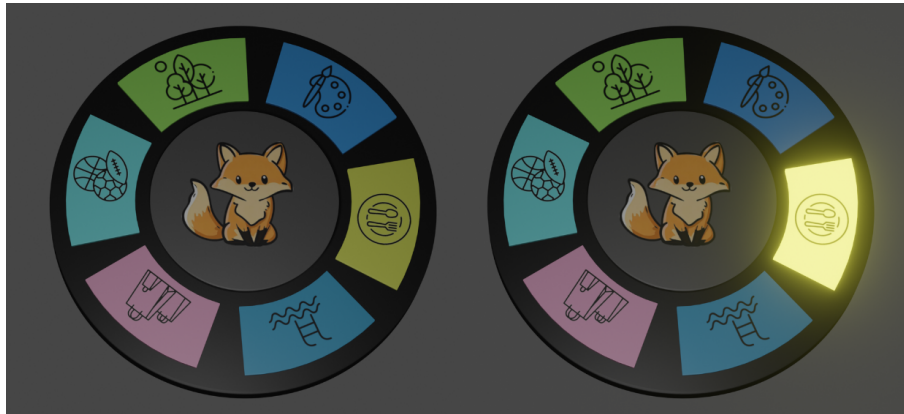


Figure 3.2: 3D model prototype



Figure 3.3: Overview of the App

After conducting the user tests, the data was analyzed. First, all answers were clustered, as can be seen in [Figure 3.4](#). Every participant has their own color in this diagram, which makes it easy to find patterns. Based on this, pie charts were created based on yes/no questions, as can be seen in [Figure 3.5](#). These figures show that the majority is not very positive, however, some participants answered: "No, but if you change ... it could be nice". Therefore a final list with key insights was made:

- It might be too childish for the target group
- Sustainable options should not be more expensive, time-consuming or inconvenient
- Combination with social media is a nice feature
- Only quizzes if you receive a reward.
- Making the quizzes a game that can be played with multiple persons for example while waiting in queues.
- The customizable pet is not liked by everyone. Try to find something to make it fun for everyone.

■ Positive about sustainable options, colorful app, customizable features



Figure 3.4: Clustered answers user tests

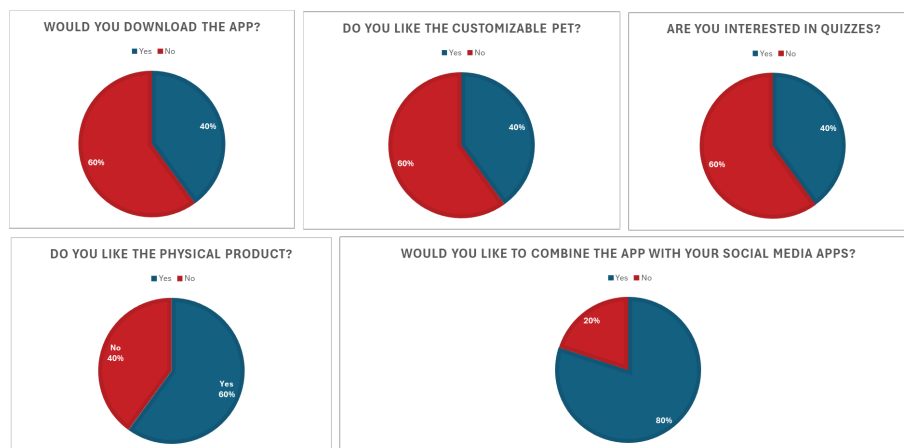


Figure 3.5: Pie charts user tests

4 | Benchmark Analysis

For a business to flourish, it must be prepared to compare itself to other competitors and the overall market. From specific market research, where comparisons are drawn between the organization and others, conclusions must be drawn on how to improve operations in the organization to increase performance. A benchmark analysis may be completed in a different number of different approaches. In the figure below, the ten most common benchmark analysis methods are shown. These methods are divided between internal benchmarking, where comparisons within an organization are described, and external benchmarking, where comparisons are made between the organization and external organisations.



Figure 4.1: 10 most common benchmark analysis methods

For the ideation and preliminary design phase of the designing process, only the product benchmarking is considered. The product benchmarking consists of analyzing a different product's performance and functionality to find out how the current design of the group is innovative and what it is still lacking. Different cases will be presented where not only different features of the product will be compared, but also other specifics such as pricing, performance, customer satisfaction and brand recognition.

When it comes to comparing product features, the specific features that both products have in common will be indicated with a + symbol, the features that the design of the group has, and the product doesn't will be indicated with a - symbol and all the features that the compared product has and what the current design of the group lacks will be given with a / symbol. After that, pricing, performance, customer satisfaction and brand recognition will be taken into account to determine the relevancy of certain features that the current design of the group is still missing. If the features are relevant and consumer ready, then they might be considered to be added to the MoSCoW and RPC list.

Case 1: Roadtrippers



Figure 4.2: Roadtrippers logo

Roadtrippers is an app that is meant for preparing hiking trips and other tourist trips by selecting certain landmarks on a map, which will then be put into an optimal route, which is the shortest and least expensive, to take when travelling. When comparing its features to those of the MoSCoW list, the following functional benchmark analysis is gained:

- + Sustainable options
- + User friendly
- + Landmark info
- + GPS integration
- + Customizable
- + Connect with friends
- + Multimedia
- Prediction algorithm
- multiple languages
- Mascot
- Connected to social media
- View friends location
- / Can save landmarks on a favorite list
- / Can toggle landmarks if there is enough time left

As for performance, the app has 1 million+ downloads on the playstore and is completely free, but you will then be limited to 5 stops on your trip. With a rating of 3.3 stars out of 5, the customer satisfaction is not completely fulfilled. After looking at some of the reviews, it became obvious that the execution of the app's ideas was sometimes lacking. This is in the form of bugs, taking you to places that were not selected or the fact that there is a yearly subscription that would get rid of the limitations of the free version, which is priced at 30 dollars. It may be concluded that the app has not hit the mainstream yet, due to these shortcomings. As for improvements to the app of the group, due to reflection of the benchmark analysis of roadtrippers, it must be prioritized that the app works flawlessly and that a different method of income, instead of a subscription service, is preferred. While making sure that the app works as it should, the app of the group should also lay focus on the things that roadtrippers do not have to ultimately achieve more brand recognition and hit the mainstream.

Case 2: TripAdvisor



Figure 4.3: TripAdvisor logo

TripAdvisor is another app that helps you plan out your trips. TripAdvisor runs a system based on reviews on a certain landmark and tailors those with a high enough score to others more frequently. TripAdvisor also creates premade trips for the most popular cities. TripAdvisor has over 100 million downloads and a score of 4.4 out of 5. This is because TripAdvisor excels at what it is supposed to do and because it is advertised to the public, instead of advertising a niche. From another functional benchmark analysis, the following is gained:

- + Sustainable options
- + User friendly
- + Landmark info
- + Multimedia
- + multiple languages
- + Connect with friends
- Customizable
- GPS integration
- Mascot
- Connected to social media
- View friends location
- / Make reservations on the app itself
- / Algorithm based on reviews
- / Journey stories and articles made by users

From these two analyses, more ideas are gained and tips on how to successfully market that idea. From TripAdvisor, it is learned that a product must work flawlessly to compete in the market and that this aspect must be prioritized. After that, it is very important to market the app around the features that the two products in the product benchmark analysis did not have. In both cases, the products have things missing which are present on the current MoSCoW list. To build up brand recognition, it is almost a requirement to be recognized for something unique. With features, such as a virtual time machine and more connectivity with social media, this goal may be achieved.

5 | Reflection and Resulting MoSCoW Specifications

Table 5.1 shows the final list of Must-haves, Should-haves, Could-haves and Won't-haves. In order to improve the original list, interviews were conducted to determine the preferences of the target group, containing individuals from ages eighteen to thirty-eight. The MoSCoW list was then refined based on their answers.

The interviews revealed that the target group was not as interested in the feature '*Connect with friends*' as initially assumed. Also the '*Information quizzes*' received a tepid response, as many participants felt it would remind them of school or work. On the other hand, participants underscored the importance of supporting '*Multiple Languages*'. Lastly, a majority of the participants criticized the use of Augmented Reality (AR), citing concerns that it would distract them from their surroundings.

Table 5.1: Improved MoSCoW list

Must Have	Should Have	Could Have	Won't have
Sustainable Options	Customizable	Mascot	Global Availability
User Friendly	Prediction Algorithm	Connect to Social Media	AR Integration
Landmark Information	Multiple Languages	Information Quizzes	
GPS Integration		Connect with Friends	
Multimedia			

Additionally, an RPC (Requirements, Preferences and Constraints) list was created based on the improved MoSCoW list. This list was created to emphasize the concepts that must be integrated (requirements), the desired concepts (preferences), and any factors that could potentially make it difficult to successfully create the app (constraints).

Requirements	Preferences	Constraints
<i>User-Friendly:</i> The app should be easy to use.	<i>Landmark Information:</i> Provide information about landmarks in various cities.	<i>Privacy Concerns:</i> Ensure that the app follows privacy laws and keeps user information safe.
<i>GPS Integration:</i> Include GPS to help users navigate new destinations.	<i>Personal Recommendations:</i> Provide recommendations based on the personal preferences of the user.	<i>Technical Expertise:</i> Lack of knowledge on app development.
<i>Multimedia support:</i> Enable users to view and share photos and videos.	<i>Sustainable:</i> Encourage sustainable behaviour.	<i>Network connectivity:</i> The app requires internet access for full functionality.

Table 5.2: RPC list

6 | Experiential Prototypes (iterations and reflections)

6.1 | Green Explorer

The Green Explorer app revolves around the idea of creating a community for all things sustainable. Unlike traditional travel apps, it concentrates solely on showcasing and promoting sustainable elements within cities, guiding users toward eco-friendly choices in their daily activities. This app showcases only the sustainable aspects of a city, to guarantee each action that the user makes is sustainable. It was designed because in the current travel and navigation market there is a lack of a single platform that highlights all things sustainable in one place.

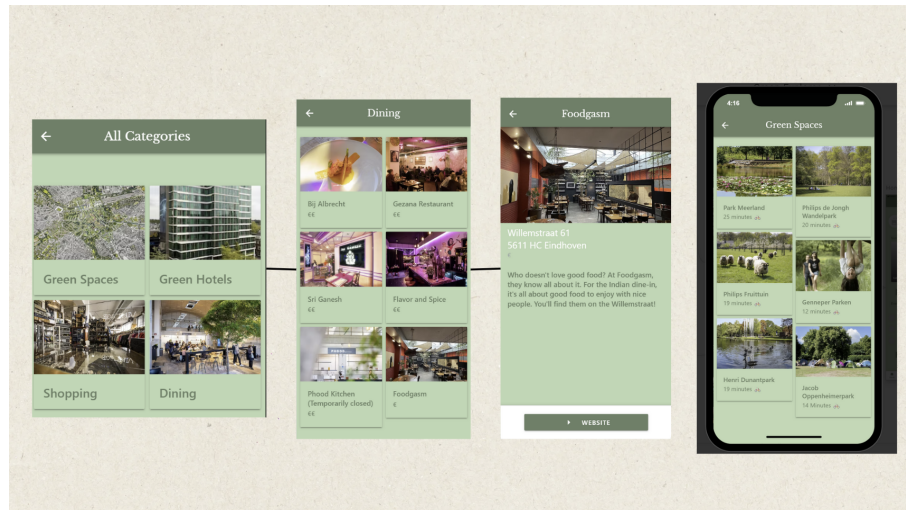


Figure 6.1: Green Explorer: App

Users begin by selecting a category of interest, such as dining, transportation, or shopping. The app then provides a curated list of sustainable options within that category, ensuring that every choice aligns with environmentally conscious practices. On these infographics, a sustainability rating will be shown, as well as how much it will roughly cost and how to get there. It will also recommend travel by foot or by bike as they are not only more sustainable but more often than not faster within the city of Eindhoven.

In the future, some additions to the app will be added. Quizzes will offer educational insights, and map integration will provide real-time navigation to sustainable locations. Exploration of augmented reality is also underway to enhance the user experience.

6.2 | Smart Compass

The Smart Compass is based on the following insights gathered from the interviews:

- “I don’t want to look at my phone all the time while being on vacation.”
- “I would like to have 1 platform that contains all the information to go on a trip”
- “It is hard to find a logical route through activities.”
- “I don’t know what activities to do while being on a trip”

The Smart Compass consists of an app (Figure 6.2) and a compass (Figure 6.3). First of all, users have to add their preferences to the app. Besides, they need to give some basic information such as how long they are going on a trip and to what location they are going. Based on these preferences, the app creates a personalized planning. Besides, tips regarding budget, safety, and transport are given in the app. As an extra feature, users can play daily quizzes. The compass guides the user to the different activities by making efficient routes via Artificial Intelligence. The compass is a screen that contains Augmented Reality, which makes it easier to follow the navigation. Also, it can show extra information on how for

example monuments were built.

All in all, by using the Smart Compass, users will have one platform that contains all information, do not have to worry about finding the right activities and a logical route between them, and do not have to check their phones while navigating which reduces distraction.

Although the concept would fit the design question, there could arise problems regarding feasibility. The biggest issue would be the integration of Augmented Reality.

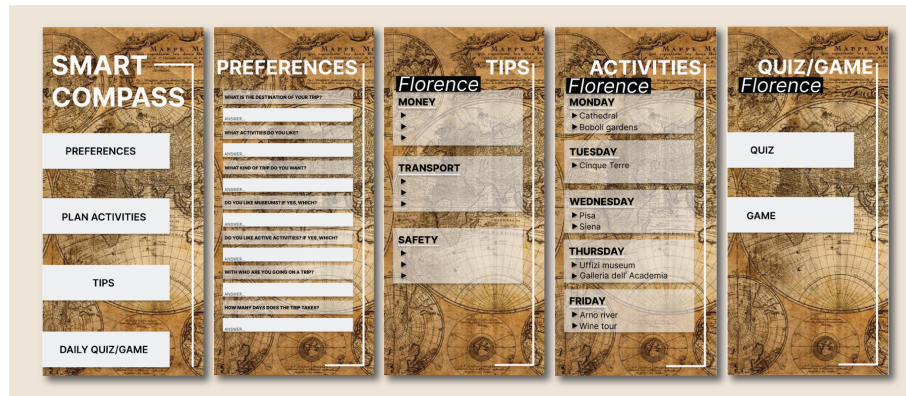


Figure 6.2: Smart Compass: App

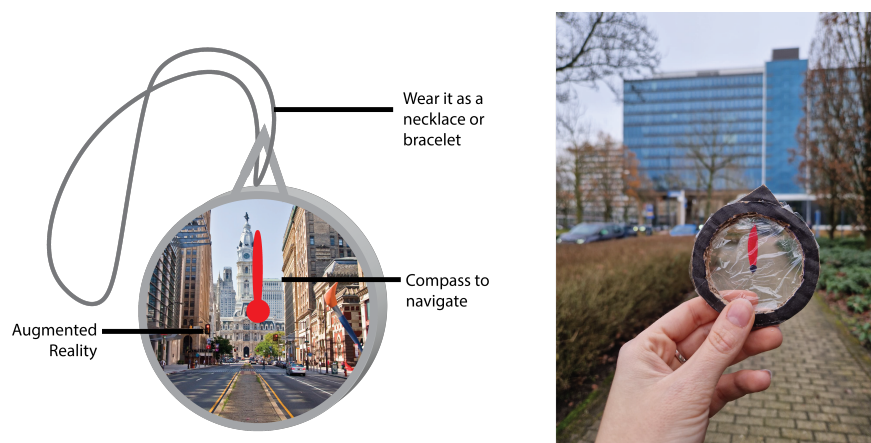


Figure 6.3: Smart Compass: Compass

6.3 | Card Game

During the thinking process of the first preliminary design, some ideas that were thought of were more similar to each other and some that took the concept of smart tourist information in a whole different direction. The goal of the card game concept was to think of other ways to gamify exploring a new area and to make tourists explore more obscure locations.

The card game concept came down to a simple card game where two players could battle against each other with their own created decks, consisting of 40 cards each. A player can assemble their own deck by exploring monuments, restaurants and other establishments and locations with the app on hand. The player would then be able to claim a specific card that was designated for that specific location. Sometimes that would be free, and sometimes you would have to pay for the experience first. For example, you would get a free card while connecting to the app while visiting the tower of Pisa, but you would have to pay in a restaurant or a museum to get the specific card there.

The card would feature an illustration of something that had to do with the location that you were visiting on the front of the card and a lesser known fun fact on the back. This is where the smart tourist information was worked into the concept. The user would visit recognizable locations while on a trip or on vacation, but the user would also be incentivized to explore more obscure locations to also get a new specific card. The player would be able to create a deck and play the game once a minimum of 40 cards were received. An image of the card design can be seen in [Figure 6.4](#).

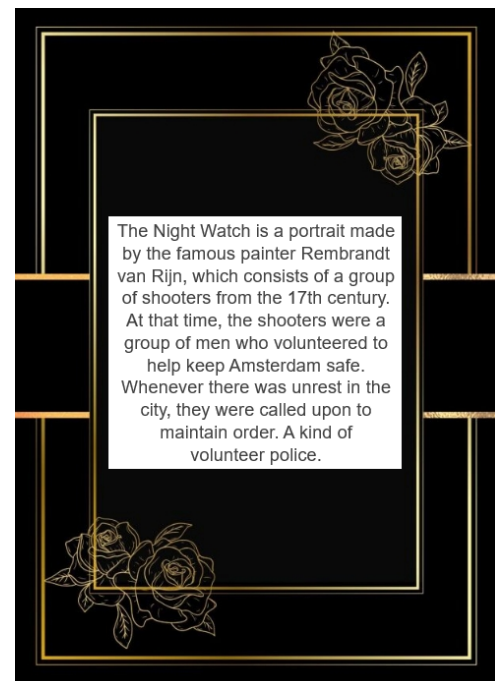
The card game will feature 4 types of cards: player cards, unit cards, spell cards and equipment cards. Every player would first put one player card on their own side of the field. This card acts independently of the deck and is therefore not included in the 40 cards of the deck. On the field itself, every player would be able to do the following: place a unit card down on the field, place a spell card to create chaos in the match or place an equipment card on a unit card, which would give the unit an additional effect. The unit cards on each player's side will be able to attack each other and once there are no unit cards left to defend on one player's side of the field, then the unit cards would directly attack the players card. The player card would have a set amount of hit points, which would depend on the specific player card (the player cards would also have an effect on the battle. The stronger the effect, the less hit points). Once the player card is defeated, the player whose player card is knocked out loses.

This card game concept would be different from other card games, because a connection is already formed between the player and the card, because the player has explored the area, which was required to receive the card. The card then becomes its own special reward for itself and is therefore more recognizable to the player. The card does not only function as just a card, but is also a fun memory. It is also intended, of course, to just collect the cards and not play the game at all. The game would be sustainable in the form of upgradable cards. A player would be eligible to upgrade a card of choice when a sustainable way of traveling to a location is achieved. AR would also be integrated into the game by including an option for AR battles.

Although the game had potential, it was ultimately scrapped due to the complexity of the game itself and disinterest. Some questions also did not have easy answers, such as the question of how the app alone would verify sustainable travel. Lastly, the game did also not meet a lot of aspects of the MoSCoW list. Fun was prioritized in this idea, instead of more smart or sustainable awareness.



(a) Card front design



(b) Card back design

Figure 6.4: Card design

6.4 | Smart Tourist Guide

This idea stems from insights that were gathered through user interviews, where participants frequently expressed a challenge of not knowing what to do while traveling. Additionally, when asked about desired improvements to a travel-related product, participants commonly mentioned a preference for *"More personalization and filters"*. These insights have led to the concept of the *Smart Tourist Guide* app, designed to enhance users' travel experiences.

The app contains three key features: firstly, it offers plenty of information about landmarks; secondly, it includes a map using integrated GPS; and thirdly, it includes a personalized route planner. As users explore a city, the app uses GPS to identify when they are in proximity to a landmark, providing detailed information about it. If the user wants use the personalized route planner, the app will initiate a brief questionnaire to better understand the user's preferences. The questionnaire may include questions such as *"What type of museums do you enjoy visiting?"* Users can then select their preferences, enabling the app to create a customized travel plan. The main goal is to minimize screen time and enhance the travel experience, allowing users to focus on their surroundings while receiving valuable information when needed. By using notifications, the *Smart Tourist Guide* ensures that users can make the most of their trip without constantly looking on their devices.

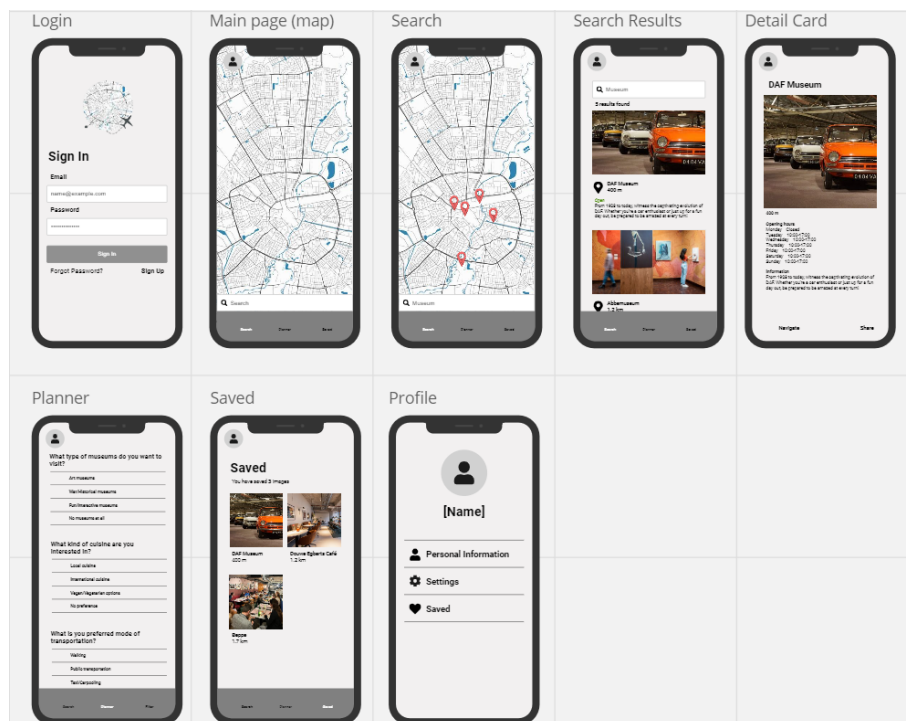


Figure 6.5: Smart Tourist Guide

6.5 | Spontaneous Planner

This concept is created while keeping in mind the insights of the interview of choosing an activity based on your mood, having all the information in one space, a playful aspect, and removing the distraction of using the phone for everything. All these aspects are implemented while promoting sustainable behavior in a playful and interactive manner.

The users will be confronted with sustainable options for activities, places, and travel choices which will let them have a moment to realize how their choice influences sustainability. If an unsustainable option is chosen, facts will be shown about why it is unsustainable but they can still decide to continue with their choice. The purpose of this product is not to force sustainable options on them but it is about awareness.

The product consists of two components: a physical circular device and an app. The device mainly is used for selecting a topic, answering questions, and navigating. The app is to get more insight into activities



(a) Design of circular device.



(b) Low-fi prototype with flickering.

Figure 6.6: The design for the spontaneous planner.

such as expenses, and opening hours.

The product works as follows:

1. The user clicks on a topic of interest.
2. A trivia question around that topic will be asked and needs to be answered on the device.
3. The device is connected to an app that can be opened with the notification that is received when the question has been answered.
4. A list of possible (sustainable) options will be provided and the user can choose an option based on the mood. More information is also available on the app.
5. The user will need to decide on how to go to the destination. Traveling by foot is more sustainable and sustainable points can be earned by doing this.
6. The app will connect back to the device which will navigate the user to the final destination with the topic buttons that will be flickering in the direction the user will have to go to.
7. Points can be earned based on the choices in the trivia questions, sustainable options, and travel choices.
8. The points can be spent on feeding the pet or getting discounts at stores or cafes.

To make the product more appealing features such as connecting with friends, checking the weather, and safety alerts can be added. When social media is involved, ranking lists of the point system can be visible which opens opportunities for implementing a competition aspect that may influence them to be more sustainable.

7 | Preliminary Design Solution

In response to the design question, which addresses common challenges faced by tourists, a preliminary design solution was created. The design contains both a physical product and a companion app and is a combination of two experiential prototypes: the *Green Explorer* (refer to subsection 6.1) and the *Spontaneous Planner* (refer to subsection 6.5). This decision was based on the groups preferences and the trade-off matrix shown in Figure (Figure 7.1) On the vertical axis are the specifications from the MoSCoW list and on the horizontal axis the exploratory prototypes. Looking at the matrix, the spontaneous planner comes out best. There has been chosen to combine this product with the Green Explorer to make it more sustainable.

	Green Explorer	Smart Compass	Card Game	Smart Tourist Guide	Spontaneous Planner	
Must have						1 - does not meet requirement
Sustainable options	5	4	3	2	4	2
User friendly	5	4	3	5	5	3 - some concerns
Landmark information	3	4	3	5	5	4
GPS integration	5	5	1	5	5	5 - meets requirements
Multimedia	3	2	3	2	3	
Should have						
Customizable	3	3	5	4	5	
Prediction algorithm	3	4	1	3	1	
Multiple languages	4	4	5	5	5	
Could have						
Mascot	1	1	3	1	4	
Connect to social media	3	2	3	3	3	
Information quizzes	3	4	1	1	5	
Connect with friends	3	2	5	3	5	
Won't have						
Global availability	1	1	5	1	1	
AR integration	1	5	4	1	1	
Total	43	45	45	41	52	

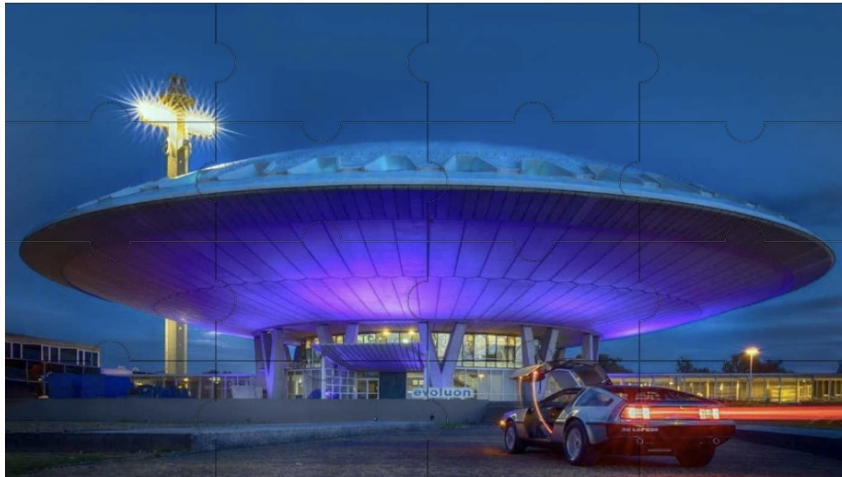
Figure 7.1: Trade-off matrix

While the design is mainly inspired by the *Spontaneous Planner*, it was deemed essential to integrate aspects of the *Green Explorer* to emphasize and prioritize the promotion of sustainable behavior, given its importance within our objectives. The main goal is to improve users' travel experiences by offering personalization and engagement during city exploration while emphasizing and prioritizing the promotion of sustainable behavior.

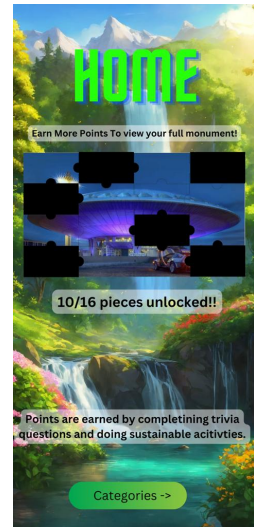


Figure 7.2: Companion app

After looking over this feedback from the second round of user interviews, it was decided to change the concept design to better fit the customer. The main feedback received regarded the pet system as being too childish. Hence the decision was made to replace the pet leveling system with a focus on collecting famous monuments from respective cities, see Figure 7.3. This modification not only resonates more effectively with the target audience but also strengthens the connection to the city exploration theme. Upon correctly answering trivia questions, users can collect points, which can then be spent on unlocking puzzle pieces representing various famous monuments in the cities.



(a) Puzzle of monument



(b) Homescreen with puzzle

Figure 7.3: Puzzle of monument

The solution revolves around a circular device that acts as a navigational tool and a game for trivia questions. Users can select a topic on the device, answer a related trivia question, and earn points. These points can be used within the app to get puzzle pieces to solve a puzzle from a monument or to get discounts. The app enhances the travel experience by providing personalized recommendations for activities, with a particular emphasis on promoting sustainable choices.

**Figure 7.4:** Physical Product

The product works as follows:

1. The user chooses a topic on the circular device.
2. A question about that topic appears on the circular device with which trivia points can be earned by getting it right.
3. After the question is answered, a notification will appear on the phone and the app can be opened by clicking on the notification.
4. The user can decide if they exclusively want the sustainable options. Other filters, such as price range, group size, and distance can always be applied to make the selection process more efficient.
5. Next a list of activities based on the user's preferences will be provided.

6. Each activity has more detailed information, and shows a sustainable or unsustainable fact about that certain option.
7. After having selected an activity, the travel option can be chosen. The sustainable option will be first asked, and if that is chosen, the app will connect back to the device that navigates the user to their destination.
8. The device will guide the user to the destination using the flickering topic buttons.
9. When the destination is reached sustainably, sustainable points will be earned.



(a) Choosing a category.



(b) The trivia question on the device.

Figure 7.5: Step 1 and 2



(a) Correct answer on the trivia question.



(b) Detailed navigation instructions.

Figure 7.6: Step 2 and 8



Figure 7.7: Step 8

7.1 | Key Features

The design offers various features designed to enhance the users' travel experience. By answering the trivia question on the physical device, users accumulate points for correct answers, contributing to solving a puzzle. The app also enables users to connect with friends, by monitoring each other's achievements

and finished puzzles. Further integration with social media platforms allows users to share their travel experiences and showcase their sustainable choices. The physical product also serves as a navigation tool, encouraging users to walk to selected destinations.

8 | Value Proposition Canvas

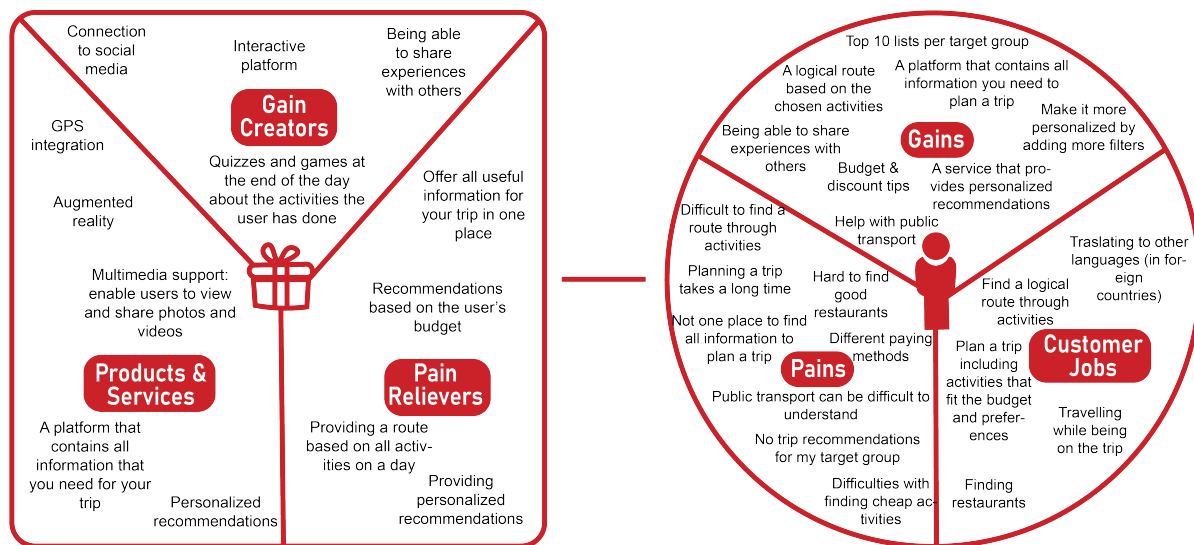


Figure 8.1: Value Proposition Canvas

Based on the user interviews a value proposition canvas (Figure 8.1) has been made. The interviews provided useful information about the customer's jobs, pains, and gains before and during a trip. During the interviews, most questions were about the user experience while planning a trip and being on the trip. From the analysis of the interviews was deduced that most people are currently dissatisfied with the process of planning a trip. The value proposition canvas gives clear insights into how the product adds value to this process and whether users would be satisfied.

As can be seen in the value proposition in Figure 8.1 most pains from the Customer Segment were treated by adding the product specifications. For example, customers can now find all the information for planning a trip on one platform instead of not knowing where to find which information. Besides, users do not have to spend hours to find a logical route through the places they want to visit since the product will do this for them. In Figure 8.1 the gains that the product brings along are shown as well. For example, the system could be connected to social media channels such as Instagram. This way, people can easily share a trip with others. Moreover, fun features such as games and quizzes could be added.

The Value Proposition Canvas shows that almost all pains could be solved by creating a personalized platform that helps with planning a trip. With the preliminary design, almost all pains are gone and additional gains are added.

9 | Risk Analysis, Desirability Strategy and Technical Feasibility

To ensure that potential pitfalls can be recognized and prevented, a risk analysis has been done with the method Failure Mode and Effects Analysis (FMEA). The FMEA is a tool to identify failure modes, and their causes and effects. Afterward, each potential risk will be rated on severity, occurrence, and depiction which will eventually be multiplied resulting in the Risk Priority Number (RPN). The higher the calculated Risk Priority Number (RPN), the higher the risk. In this phase of the project, the FMEA is conducted to highlight the risks associated with the development of Eco Explorer and discuss major possible concerns and risks about the preliminary design.

9.1 | Risk Analysis

FMEA															
Process/Product Name: EcoExplore						Prepared By: Group 15 - Smart Tourist Information and Navigation tool									
Responsible: Group 15						FMEA Date (Orig.): 11/1/2024 (Rev.): 19/1/2024									
Process Step/Input	Potential Failure Mode	Potential Failure Effects	SEVERITY (1-10)	Potential Causes	OCURRENCE (1-10)	Current Controls	DETECTION (1-10)	RPN	Action Recommended	Resp.	Actions Taken	SEVERITY (1-10)	OCURRENCE (1-10)	DETECTION (1-10)	RPN
What is the process step, change or feature under investigation?	In what ways could the step, change or feature go wrong?	What is the impact on the customer if this failure is not prevented or corrected?		What causes the step, change or feature to go wrong? (how could it occur?)		What controls exist that either prevent or detect the failure?			What are the recommended actions for reducing the occurrence of the cause or improving detection?	Who is responsible for making sure the actions are completed?	What actions were completed (and when) with respect to the RPN?				
Sustainable options	Not appreciated	The main purpose of encouraging sustainable behaviour will be unachieved	8	Personal opinion of importance	7	User testing and interviews	7	392	Add more serious facts that they can empathize with and understand the need for sustainability	Group 15	In progress				
Apple platform	Product unavailable for potential customers	Will not use the product, thus will not gain any value	7	Platform app	7	Developing and researching	7	343	Develop the app on another platform	Group 15	Future steps				
Device in hands	Uncomfortable in hands or to carry around	Device falls out of hands or cannot be put away quickly	7	Slippery coating; Bad dimensions	6	Hands on inspection and user testing	8	336	Little pouch or belt to wear it as a bag	Group 15	Future steps				
Compatibility crashes of app	The app does not work properly and smooth	Not a pleasant experience	9	Issues in the app development	6	User testing	6	324	User testing the app while developing to resolve issues	Group 15	Future steps				
Trivia questions	Disliking quizzes	User not interested in using product	8	Personal interest	5	User testing and interviews	7	280	Add more rewards with the points they earn	Group 15	In progress				
Expenses	Does not get bought	Will not use the product, thus will not gain any value	7	Free apps; expensive product	6	Marketing	6	252	Adding exclusive aspects	Group 15	In progress				
Order of use	Wrong order	Product not used correctly which will make the user experience bad	9	Unclear instructions	4	User testing	4	144	Clear instruction video	Group 15	Completed	9	2	2	36
Collecting puzzle pieces	Not enjoyable	Users not motivated to use the product	8	Personal interest	3	Interviews and iterations	6	144	Adding more (real life) rewards such as discounts	Group 15	In progress				
LCD screen errors	Crashing, black screen or wrong visuals	Device not usable	10	Mistake in programming, hardware issues	4	User testing while developing and inspection	3	120	Evaluate the device several times during the making and testing	Group 15	Future steps				
Device and app not working together	Are not connected and this cannot work properly	Device not usable	10	Mistake in programming, hardware issues	3	User testing while developing and inspection	3	90	Evaluate the device several times during the making and testing	Group 15	Future steps				
Transportation option	Sustainable options are ignored and not chosen	No sustainable improvement	8	Bad infrastructure for walking; Public transportation is easier	3	Conduct research about location	3	72	Make users realize why they should avoid public transportation, or add more rewards	Group 15	In progress				
GPS	Bad GPS	Navigation and sustainable option not possible	7	Poor network range at location	3	Testing at locations	3	63	Showing the full map in case there is a bad GPS	Group 15	Future steps				
Trivia topics	Inapplicable topics	Not motivated to use product	8	Personal interest	2	User testing and interviews	2	32	Personalized topics	Group 15	In progress				
Charging device	The option for charging is inconvenient	The device can be discharged while using it or forgotten to charge	7	The chosen charging system is not preferred by users.	2	User testing and interviews	2	28	Choosing the most preferred method of charging while also testing it	Group 15	Future steps				

Figure 9.1: Failure Mode and Effects Analysis on Eco Explorer

In Figure 9.1 the filled-in FMEA can be seen which shows all potential risks of Eco Explorer that were considered. The risks are about user experience and technical aspects but most risks at this stage are related to the users since this needs to be developed a bit further to increase the desirability. The white cells in the table are related to the users desirability and the grey cells concern the technical aspects.

The biggest risks are formed by the features of sustainable options, the trivia questions, the device's comfort while holding it in the hands, and the availability of the app for Android users. The common explanation for the sustainable options and trivia questions is that this feature is a purely personal preference that depends on each user. This is an insight that also surfaced in the interviews.

The other potential risk is users will not find the circular device comfortable to carry around along with their phone. If the device itself has a slippery coating it will be even more troublesome for the users, since this could lead to dropping the product.

The other major risk is losing a large part of customers due to the app being unavailable for Android users because of the platform that is currently being used.

9.2 | Strategy for Desirability

In the conducted interviews, it was mentioned that adding more rewards might stimulate people to use this product which will mitigate the risks about personal preferences. Another solution for the sustainable aspect can be utilizing the feature of stating more serious facts about how unsustainable a certain activity is. This realization could be about a certain event that they can empathize with since these often have a bigger impact on people and their choices. This claim should be analyzed further in this project.

To solve the discomfort in the hands, the device can be re-designed to a design that has straps attached to it making it usable as a bag. This will aid in not having to hold the device in their hands the entire time and the possibility of dropping the device on the floor will be mitigated.

Overall, co-creation will play a key role in mitigating all these potential risks, thus user testing and interviews will be needed to prove that these solutions will result in a higher desirability.

9.3 | Prevention of technical risks

The major risk of the technical of not including Android users can be resolved by doing more research about other platforms that work for both Apple and Android. When the platform is safe to use, it can be a better alternative to the current platform.

Moreover, the compatibility crashes of the app and the LCD screen errors need to be resolved during the programming of the hardware- and software. It has to be evaluated after every step to prevent any mistakes and errors. For a more effective end result, the users can provide insights by user testing the product while realizing the device and app.

10 | Next Steps

The next phase involves developing the physical product and app separately before integrating them.

10.1 | Physical Product

The first steps involve defining the technical specifications of the product, to create clarity on the product's functionalities and requirements. This ensures that the product will, ultimately, operate as intended.

While there is no physical prototype for the product yet, a preliminary drawing has been created with Blender. The next phase involves refining these drawings and proceeding with 3D printing the components. An important aspect is determining the electrical components to be incorporated, such as batteries, a microcontroller, LED, screen, etc. Something to take into account when choosing the batteries, is whether the product will be rechargeable or not and the power consumption of other components.

10.2 | App

An initial prototype of the app has already been created, though with limited functionality. In the next phase, the app layout will be significantly improved, by adding more features and details. A current problem is that the program, which is currently used to make the app, is only compatible with Apple devices. To ensure true global availability, a priority must be to make the app available for as many platforms as possible. A shift in app programming software will probably be made to remedy this current issue.

10.3 | Benchmark and feasibility

So far, a product benchmark analysis has been completed, but this is all but an aspect of a complete benchmark analysis. In the future, more benchmark analyses will be done, which will also be more on the financial side. More efficient strategies from different companies will be looked at and adapted into the production of Eco Explore. With the conclusions drawn from these analyses, it will also be discovered how feasible bringing the product to the public is. Some unanswered questions still linger, which must be answered. Such as how the physical product will be powered, what the battery life is, how expensive the product will be etc.

10.4 | Beyond Eindhoven

Currently, the app will only include locations in Eindhoven, but the scope might be increased to other cities based on how feasible this is.

11 | References

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Fig 4.2 = Roadtrippers (-), - , <https://play.google.com/store/apps/details?id=com.roadtrippershl=nl>

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Fig 7.3 = Evluon. (2024, January 19). *Plan your visit*. <https://evluon.com/en/expo/plan-your-visit>

11.1 | AI statement

AI has been used to create images for the app.

A | Appendix

User Interviews - Questions

1. How do you currently plan your trips?
 - What tools/apps do you use in the process?
 - What features do you find most useful in these apps?
2. Why is it important to get to know the city that you live in?
3. What challenges do you typically face when exploring a destination?
4. When exploring a city what is your preferred method for gathering information about what to do or see?
 - What aspects could be added to improve the overall experience?
5. Are you open to trying new technologies or apps to enhance your travel experience?
 - Do you think technology can stand in the way of enjoying your trip?
 - What are the positive aspects of using technology to improve the travel experience?
6. How important is personalizing your travel plans?
 - Would you prefer tailored recommendations or discovering things spontaneously? Why?
7. Do you know what augmented reality is?
 - In what ways do you think augmented reality (AR) could enhance your travel experience?
8. Could incorporating gamification features, like quizzes or small tests about the information you have learned, have a positive effect on your travel experience?
9. How do you handle language barriers when traveling? Would translating features be helpful in a travel app?
10. What role does sustainability play in your travel choices?
 - Are you conscious of your carbon footprint
 - Would a travel app that promotes sustainable traveling options be helpful?

B | Appendix

User Tests - Questions

Hello, my name is (...), and we are once again conducting a study for a USE Course at the Technical University of Eindhoven. Last time, we asked you to inform us about your own preparations and behavior when traveling. We have taken your valuable experiences and opinions into consideration and arrived at a final preliminary design called (...). EcoExplore is a product and app combined that will promote sustainable behavior during traveling and will help you find new and exciting locations to explore.

EcoExplore will incorporate sustainable transport, hotels, restaurants, events etc. EcoExplore will award points when sustainable ways of traveling are achieved and will create a leaderboard to show the most sustainable people. It will include trivia quizzes for those who are interested. EcoExplore will also act as a new social platform, where fun moments may be shared with everyone. Lastly, it will include a feature where you are able to raise your own virtual pet. Feed and dress up your pet with the points that you will earn during traveling.

A small prototype will now be shown of the app, and we would like to ask you some questions to optimize and improve the app in the future.

1. So far, what is your favorite aspect of the app? Follow: what is your least favorite aspect?
2. Are you interested in the available info quizzes?
3. What do you think of combining a travel app with a social media app? Follow: would you personally use it?
4. What do you think of the addition of a customizable pet to the product?
5. Could you envision a situation where the advising of sustainable options could become useless or annoying?
6. Would you personally download this app? Follow: if not, what additions or changes to the app can be made to possibly change your mind?
7. Do you have some more questions about the app?