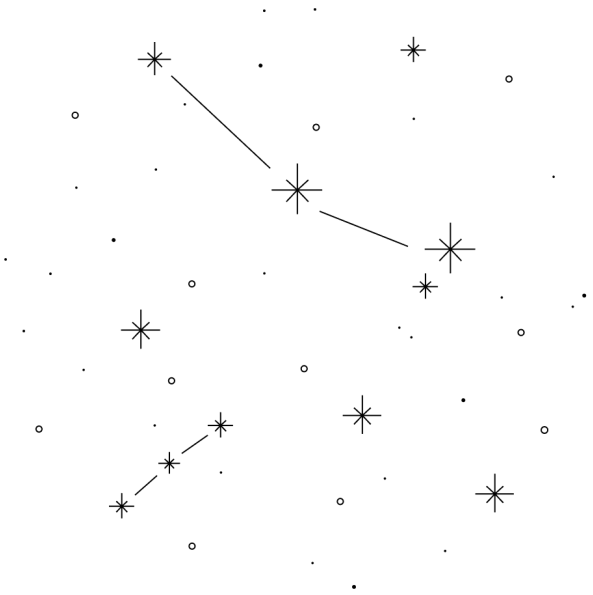

Driven by Emotions

Creating and Applying Guidelines to Encourage Emotional Connection Between Driver and Car in an Accessed Based Context

Master's thesis in Interaction Design and Technologies

JOEL JÖNSSON

ELIN NILSSON

Department of Computer Science and Engineering
CHALMERS UNIVERSITY OF TECHNOLOGY
UNIVERSITY OF GOTHENBURG
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Supervisor: Mikael Wiberg, Department of Computer Science and Engineering
Advisor: Anya Ernest, Polestar
Examiner: Staffan Björk, Department of Computer Science and Engineering

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Department of Computer Science and Engineering
Chalmers University of Technology and University of Gothenburg
SE-412 96 Gothenburg
Telephone +46 31 772 1000

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Abstract

People feel connected to all kinds of objects. The objects do not need monetary value but can, through attachment, feel valuable and be cared for differently. This might differ in access-based consumption since users only use the object for a limited time. This project explores how connectivity can be used to encourage an emotional connection between driver and car in an access-based context. The project will start by establishing guidelines to consider when designing an emotional connection between a driver and an access-based car. This will be done by examining existing literature and interviewing relevant user groups. How the brand and the user's relationship with the brand can strengthen the connection will also be investigated. In this paper, a design that applies these principles will be created following a design process. Finally, the design will be evaluated on how well it aligns with the presented guidelines and conforms to the car brand. The results are five guidelines to aid when designing for emotional connection, as well as a design that aligns with the created guidelines and captures the brand's identity.

Keywords: Emotional Connection, Automotive, User Experience, Interaction Design, Branded Interaction

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Elin Nilsson and Joel Jönsson, Gothenburg, June 2023

Contents

List of Figures

1

Introduction

People establish connections to everyday objects [1]. Even when these objects have deteriorated or are left unused, we do not wish to discard and replace them. When renting a car, it is assumed that the user does not form this type of relationship with it [2]. It is used once, and then a new car will take its place. Therefore, the user might care for it differently than it would if it were their own. If the user were to feel a connection to the car or perceive it as their own, it might improve their experience of borrowing a car.

With the rise of electric vehicles and an ever-growing connected world, there are new possibilities for the driver experience [3]. *Your car* might go from being the hardware to the software inside. This is similar to what other fields have gone through already. For example, your text editor is no longer bound to a singular device and can now be accessed from anywhere using the cloud, leaving the hardware as a shell. This can change what and how you view things as *yours*. Switching between cars can feel like two different singular experiences. The cars know nothing about what you did or what happened in the other. With connectivity, it might be possible to connect the two experiences and turn them into one.

1.1 Purpose

This project aims to explore how a connected experience could be used to encourage and shape an emotional connection between the user and a car. Furthermore, how this could be used in the context of access-based consumption. The insights about how one can strengthen the conditions for building and maintaining an emotional connection can help encourage sustainable behavior. The purpose of this project is to answer the following research question:

> *RQ: What guidelines should be considered when designing for an emotional connection between driver and access-based cars?*

Additionally, two sub-questions will be explored to facilitate and exemplify the main research question:

> *SQ1: How can these guidelines be applied in an interaction design project?*
>
> *SQ2: How can the user's relation to the brand strengthen the connection?*

1.2 Goals and Deliverables

One goal for this project is to explore the possibilities of combining the advantages of car fleets and the familiarity and feeling of having your own car. This will be done by investigating how a designer can encourage an emotional connection between a human and an object, specifically a vehicle in a fleet, by shifting the definition of what is perceived as *your car*.

To answer the specified research questions, the project will be divided into three objectives. The first objective is to create guidelines to guide future designers and capture important principles when designing for an emotional connection between a driver and access-based cars. This will also answer the first question, RQ. The following objective is to create a design based on the guidelines. A prototype will then be made from the design. The last objective is to evaluate the prototype and assess how well it adheres to the guidelines. The goal of the last two objectives is to answer SQ1 and SQ2.

1.3 Stakeholders

This thesis is written as a part of the Interaction Design and Technology Master at Chalmers University of Technology. The supervisor for this project will be Mikael Wiberg, and the examinator will be Staffan Björk. The project is done in collaboration with Polestar, an automotive company based in Gothenburg. Polestar will assist the project by giving feedback, being part of workshops and interviews, and providing test rigs and cars for evaluation. This project investigates how designers can encourage an emotional connection between a user and a shared vehicle through design. Therefore, the main stakeholders of this project will be UX designers in the automobile industry, as they might find this helpful and can use the created guidelines to aid their design. Lastly, as the guidelines aim to help create an emotional connection between the driver and the accessed car, the drivers will also be affected by the guidelines and will be taken into consideration during the process of the project.

1.4 Delimitations

This project will mainly focus on the design of software inside the vehicle and how it can support an emotional connection between user and vehicle. Other aspects might be taken into consideration, but no guidelines will be created for them. A major delimitation of this project is the lack of time. It will not be possible to test the emotional connection over time. Therefore, it can not be known if the results of this study will be applicable over a larger time span. For the same reason, it will also be difficult to test the consequences of an emotional connection formed.

1.5 Ethics

One ethical consideration is privacy and what information will be acceptable to store about the driver. It is important to find a solution for how this can be done in a comfortable way. In the case of vehicles in fleets, one must be certain that there are no digital footprints left by the previous user.

Another ethical issue is the level of attachment between the user and the vehicle. The user should not grow too attached to the car so that it negatively impacts them. It is also essential to think of how the attachment is used. The user-vehicle relation should not be used maliciously. A strong attachment between the user and an object can lead to a higher risk of a company taking advantage of the user and adding additional fees over time. One example of this is BMW in South Korea [4], where they have added subscription fees for features already in the car, such as seat heater and Apple CarPlay, which can give the user a sense of feeling used.

In a fleet, users pay to gain access to the vehicle, and the level of attachment can influence how often this access is used. Therefore, the fleet owner has an economic interest in how often and long a user uses the car. If a user was to drive more than necessary, it could have more of a negative impact on the environment.

2

Background

This chapter aims to introduce relevant background information for this project. In this chapter, the history of cars will be described to emphasize its important role in society, relevant projects will be presented, and Polestar as a company will be introduced.

2.1 History of Cars

Driving and having access to a car have long been connected to the feeling of freedom. In the book *In the Company of Cars : Driving As a Social and Cultural Practice*, Sarah Redshaw [5], describes driving as an action taken for granted and seen as an everyday practice.

Cars have, beyond the transportation and practical benefits of them, a strong correlation with status and independence [5]. The car can have different meanings for different people, and the relationship can depend on social and cultural factors. It is important to understand these factors to understand what forms the relationship between people and their cars.

The emergence of cars has changed how we live, giving people a new opportunity to explore and a strong feeling of freedom [5]. It lets people travel and simplifies socializing as well.

Initially, the cars were only for the wealthy and were seen as toys [5]. The streets of cities were used for socializing and markets and had no connection to cars. This changed when the car became more affordable, and the middle class could also purchase them. As the car became more common and popular, the roads got more focus. As the goal with cars, at this time, was to go fast, people preferred straight roads with wide curves. It lets the driver keep a high speed and still feel they have control and prevent crashes.

To be able to 'go anywhere', there needs to be roads and landscapes allowing for it [5]. Motor vehicles have made new areas physically accessible but at the cost of nature. Nature was seen as the problem, and the roads as a solution as it would make it possible for vehicles to pass and therefore generate the possibility to explore new areas.

Redshaw [5], has a quote in their book *In the Company of Cars : Driving As a*

Social and Cultural Practice that captures the importance the car has for people and society today:

> *People's attachments and forms of expression in their everyday lives include and are expressed through cars in societies where the car is not only the dominant mode of transport but also seen as a very personal vehicle of expression that can help fulfill every desire. We do not merely shape the car, the car shapes us.* [5, p. 105].

This can be seen today, where the car is a necessity for many people who depend on their cars daily. According to Lewis and Grande del Valle [6], car dependency is a growing problem internationally. Despite the increasing dependency, the car is still only used for a small amount of time and spends most time being unused. According to a report [7], cars in Great Britain were only in use 4% of the time in 2012.

It is not only the functionality of the car that matters. For a long time, brands have had an important role when it comes to how one thinks of cars [8]. People are drawn to a certain brand of cars as the brand might match their idea of themselves and what they want to be associated with. Even two almost identical cars will be perceived differently because of their brand.

2.2 Access-Based Consumption

Bardhi and Eckhardt [2], define access-based consumption as a transaction where the consumer is given access to an object for an amount of time, but no ownership is transferred to them. An example of this would be car sharing, where users can pay to drive a car for some time without owning it.

This limited time in access-based consumption may affect the users' relationship with the object, compared to traditional ownership, where the consumer has legal ownership of the object. The user interacts with the object during a smaller time frame, which could have an effect on how the users identify with it and its impact on the users' self [2].

2.2.1 Related Studies

Bardhi and Eckhardt [2], studied Zipcar, a car-sharing platform in the US, and its consumers. At the time, Zipcar had over 30 different car models available, and the car had to be picked up and left in the same permanent parking spot. They found that Zipcar's customers did not identify with the accessed car, nor did they feel like they owned the car through perceived ownership. Some consumers experienced contagion, the feeling of disgust when they became aware that other people had touched the object they were using. The consumers of this platform were mostly motivated from a pragmatic standpoint, not a hedonic one. They used it to get from point A to point B. The users of Zipcar did not want to engage in their community, and they felt embarrassment rather than pride as users of the service. The users did not care to interact with each other or respond to Zipcar's efforts to build a community.

Adèle Gruen [9], compared the findings of Bardhi and Eckhardt [2], regarding Zipcar with the car-sharing platform Autolib'. They found that Autolib's users contrasted Zipcar's in many ways. Autolib' drivers used the platform for hedonic reasons, even though the most significant reasons were utilitarian. More importantly, users formed relationships with the vehicles, experienced perceived ownership, and thought of them as *my car*. The authors examine how this feeling is reached through appropriation, it becomes part of one's extended self, and the users, therefore, get the feeling of ownership and care for it. This is done through three dimensions, control, knowing, and creating. The consumers of Autolib' expressed that they were in control of the car. This feeling seemed to be increased by the fact that the vehicle was electric and automatic. By only offering one car model, the users know the car and system well. It also strengthens the feeling of using the same car, even though they are not, and by knowing the car, users can create routines. Some settings, such as radio stations and GPS locations, were also saved between rides and allowed for personalization. It is suggested that personalization is key to bonding emotionally with a shared object. Additionally, the saved preferences would also give the impression of using the same car. Autolib' users changed the car to their preference, compared to Zipcar users that did not since they would not use the car for long and deemed it unnecessary. When using the car over a period of time, users learn how it works and create routines and habits.

Personalization is one of the key designs for emotional bonding with shared objects, but uniformity allows for knowledge and habits to be found. Therefore it is important to find a balance between them [9].

2.3 Polestar

Polestar is an electrical automotive brand based in Gothenburg. The brand has a strong identity, focusing on performance, sustainability, and innovation. Currently, Polestar has released two models on the market, Polestar 1 and Polestar 2.

Today, a customer's Polestar profile is connected to the customer's key and stored locally in the car. The profile is then activated when the key is near its car. As a result, the user does not need to re-enter their preferences each time they use the car. Instead, the user settings are applied as soon as the key is connected to the car.

However, this type of system does not work for fleet users. As the user unlocks the car using their phones, their profiles can not be stored similarly. Fleet users are also introduced to multiple cars, and not one single car as a regular user, which limits the possibilities to keep their preferences. Fleet users need to re-enter their preferences and settings each time since the storing of information in between experiences is limited.

2.3.1 Identity

The name Polestar is the literal translation of the Swedish name for the North Star, "Polstjärnan" [10]. The origin of the name lies in racing and is connected to the

pole position, but it was later repurposed to fit a new vision for the company, as Polestar wants to be the guiding star of the automotive industry. Fitting the name, the symbol of Polestar is the North Star [11]. Building on the cosmic theme, many of the names for the colors available for the Polestar 2 are space related, for example, Jupiter, Moon, and Space [12] [13].

Polestar's connection to space continues in future models as well. For example, in the new Polestar 4 model, the different options for ambience are presented as planets, see Figure 2.1. When a planet is selected, the user can see more information about the setting and the actual planet.

Figure 2.1: In the lower right corner of the infotainment system, a planet illustrates the ambience setting in a Polestar 4. Taken from [14].

Another connection to space and the starry sky can be found in the ceiling of each Polestar car. If the driver looks up to the ceiling, a light in the form of the Polestar logo can be seen. This is an allusion to the guiding star metaphor.

Polestar has three words to describe its identity:

Pure
Pure refers to the minimalist design of Polestar products [10]. This can be seen in the singular simple typeface used for everything and the modest colors.

Progressive
Progressive is innovation, for example, using new technology or integration into the user's daily life [15]. A user has a profile connected to their key, and when they unlock the vehicle, it is configured to the user's settings. Sustainability is also very important for Polestar. The cars feature sustainable and recycled materials. A goal for Polestar is Polestar 0, a car with zero greenhouse gas emission [16].

Performance
Polestar has its origin in racing and tuned Volvo engines [15], and therefore performance is an important aspect of the company. However, it is not only about speed but also how a car feels to drive, the joy of it, and the small details [10].

2.4 Fleets Today

Fleets are getting more common, and there are various companies in the sector. Looking at Volvo On Demand and KINTO share, both companies offer plans where consumers pay for the duration of their access. The companies' terms and conditions [17], [18], both state that the user is responsible for any damages to the car resulting from their use. The user must pay additional fees for breaching the terms and conditions. The companies want the user to handle the vehicle with care. Volvo On Demand even states that the user should handle it like a careful driver would handle their own car. Volvo On Demand writes that the car *feels like yours* when you drive it, since the car does not feature any ads or logos on the exterior [19]. Both fleets offer Apple CarPlay in their vehicles, allowing users to connect their phone to the car and use their own apps [19] [20].

2.5 Related Projects

As the popularity of electric cars grows, new challenges are rising, for example, how one can drive and use an electric car in the most environmentally friendly way possible. Mercedes has created an app, Mercedes me Eco Coach, where they coach their users to drive in an environmentally friendly way by using the benefits of gamification [21]. Through completing challenges, their users will learn more about the car and how to use it in an environmentally friendly way. They argue that the app has had a positive impact on drivers' behavior and led to improving their charging and driving routines.

3

Theory

The Theory chapter aims to introduce relevant theory and frameworks that will be used in this project. This includes an emotional framework, user experience theory, object attachment, psychological ownership, brand, and motivational strategies.

3.1 Emotions

Emotions are individual. An object might not elicit the same emotion in different people and can also change with time. An object can evoke one emotion now and another one later. An object does not have to elicit only one emotion, nor does it have to elicit only positive or negative emotions. A person can feel many different emotions toward an object, both positive and negative, simultaneously [22]. This is important to think of when designing for emotions.

Pieter Desmet [22], presents nine sources for product emotions. This framework is based on three different approaches to product emotions from three different authors. The first is a pleasure based approach, by Patrick Jordan [23], that takes four types of pleasure into consideration: physio-, psycho-, ideo-, and social-pleasure. The second approach is by Donald Norman [24], who states three design focuses for product affect. These are visceral, behavioral, and reflective designs. The third approach is by Desmet [25], the appraisal approach, where he proposes that emotions are elicited by an appraisal from stimuli and concern. Based on these approaches, Desmet created a new framework. The framework describes three stimuli (product, usage, and consequence) and three concerns (attitudes, goals, and standards), that combined is a source of emotion. The first stimulus, product, relates to the object's physical aspects, such as how it looks or feels to touch. Usage is how it is to use a product. It could be easy, fast, or cumbersome. The last stimulus, consequence, is about the results of using a product. The user's concern has an effect on what emotion is elicited from the stimuli. Attitude is the user's opinions and preferences of the product. This could be towards the product, usage, or consequence. The goal is something that the product should help the user strive towards. Lastly, standards are how the user perceives how things should be. The stimuli and concern can be combined to create a source of emotion elicited for the product, for example, consequence - attitude is about how a user feels towards the results of using a product.

Emotional engagement is one of the key factors when it comes to changing people's behavior, and to form this engagement between humans and cars, social interaction

is an important part [5]. It is also connected to the attachment people experiences with their cars.

3.2 User Experience

User experience (UX) is defined by ISO 9241-210:2010 [26], as "person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service". Roto et al. [27], describe how a user experience is not limited to the time the user spent using the system. User experiences can be divided into four different time spans: anticipated UX, momentary UX, episodic UX, and cumulative UX. Anticipated UX is before the user uses a system and their expectations of it. Momentary UX is the use of a system in the present. Episodic UX is when the user reflects on their past use of a system. Cumulative UX is the use of the system as a whole, over time.

Marc Hassenzahl [28], presents a model of user experience from both the designer's and user's perspective. A product's features (content, presentation, functionality, and interaction) are designed for a particular product character. However, how each user perceives the product character is specific to them. The product character consists of attributes divided into two groups, pragmatic and hedonic. The pragmatic attribute (manipulation) is about function and if it can help the user reach an external goal. The hedonic attributes (stimulation, identification, and evocation) relate to the user's psyche and using the product rather than reaching a goal. A product that does something well or interesting can stimulate the user. People use objects to express themselves and tell others about their identity. Objects can also be used to evoke memories. Hassenzahl [28], describes a pragmatic product as an ACT product and a hedonic product as an SELF product. The goal, a product that fulfills both attributes, is desired, while one that fulfills neither is unwanted. It is also stated that the bond between a SELF product and a user can be stronger than an ACT product. This is because the SELF product relates to the user's self rather than an external goal. Interacting with a product results in consequences, such as if it worked as they hoped or if it gave them pleasure. The consequences are dynamic and dependent on the situation and user. A product does not have to have the same consequences every time it is interacted with by the same user [28].

3.3 Object Attachment

Dozier and Ayers [29], define object attachment as "... the experience a person has when they feel an emotional attachment to an inanimate object and may even feel a sense of loss if they were to part with the object." [29]. A person could also be attached to a product category or a brand [30].

Mugge et al. [31], presents two ways object attachment can be used and why it is important. The first is that object attachment can help create emotional experiences for the user, which means that it does something more than its pragmatic use. It can benefit both user and producer, since it can generate more pleasure for the users

than similar products. In fact, [30] suggests that a product's pragmatic use might not have an effect on attachment between user and object, unless it does something better than usual. If a product is better, easier to use, or made with higher quality, it can elicit pleasure and affect the attachment between user and product [31].

The other reason presented by Mugge et al. [31] is from a sustainable aspect. By creating attachments to an object, owners might be less likely to get rid of them before they have broken down and need to be replaced. It is also stated that attachment to a product can result in the consumer handling it with better care. This might prolong the lifespan of the product.

A study by Schifferstein and Zwartkruis-Pelgrim [30], suggests that objects that aim to form an attachment between person and object should evoke enjoyment or help create memories with the object. One way to do that would be through pleasure, by stimulating the user and creating an engaging and enjoyable experience. Pleasure could be evoked from visuals, such as beautiful design, or other sensors. They also propose using surprises to make the product experience enjoyable for the user. The design solution should also support the user in creating memories with the object, which can be difficult since the users must do so by themselves. However, if an object is enjoyable to use, the user might use it more often and therefore, there are more possibilities for memories to be created. Ways to encourage memory association in the product include designing for social interaction and physical traces of events.

According to Mugge et al. [31], attachment builds up over time. It does not happen in a moment but from multiple different interactions with the objects. These interactions should result in positive emotions in the user and should continue to do so over time for an attachment to form between user and object.

Mugge et al. [31], presents four determinants for object attachment and how to use them to enhance the connection between person and object. Two of them, pleasure and memories, have already been covered. The other two determinants are self-expression and group affiliation, both connected to the sense of self. Users form stronger attachments with products that define and express their personal identity. Two possible strategies to encourage this are product personality and product customization. Through design, products can convey personalities that can reflect users' identities. Customization allows people to put their personal touch on a product, which can increase their attachment to the product. The customization should have enough options that the user can create a unique product that represents them, but not make it too difficult to design something that looks like they want it to. People also want to belong and feel connected to other people. One way to encourage this is by designing products used together with others in a social setting.

Anthropomorphism is when human-like characteristics are found in something non-human, such as an object or animal. This can create an interaction similar to human-to-human rather than human-to-object [32]. Anthropomorphism can also have the opposite effect on object attachment, for example, the object can become eerie if it is too lifelike, or the user might have difficulties identifying with the object if it has an opposite personality than the user.

Koles and Nagy [33] introduce a conceptual model for digital object attachment. They define a digital object as one with no physical properties and can only be accessed in a digital space. Complexity, interactivity, and user control are important aspects in the creation of object attachment. Objects that do not allow the user with much control or interactivity are usually used for their informational or utilitarian value. In contrast, objects that are more complex might be used for their hedonic, self-expressive, or social value. These objects allow users to gain a more active role, as they can be part of the creation and personalization of them. This allows users to express themselves through the object and, in certain cases, identify with them. Users can also gain sentimental value for these objects. Users also need to dedicate time to the digital space to understand the possibilities and gain knowledge of it. Users can create narratives for objects, as they can represent milestones and other memorable moments. These narratives help create attachments and can evoke positive emotions. Psychological ownership can be used to strengthen the digital object attachment by, for example, allowing for customization.

3.4 Psychological Ownership

Ownership is usually connected to owning something. That the user has paid for an object. The transaction between a producer and its buyer has been the focus when it comes to ownership [34]. Psychological ownership is generating the feeling of something being *mine* without owning it [35]. According to Baxter and Aurisicchio [34], psychological ownership has three motives; efficacy and effectance, self-identity, and having a place to dwell. These three aspects, together with three routes; control, self-investment, and gaining intimate knowledge, create an understanding of how to develop feelings of ownership.

One example of psychological ownership is that a rental car is often presented as *my rental car* or a hotel room as *my hotel room*, even though the user has no legal ownership of it other than having rented it for a decided time [34]. It is a difference between having multiple users sharing an object where you either perceive it as *ours* or if each individual perceives it as *mine* [35].

Baxter and Aurisicchio [34], discuss that psychological ownership is about a human-object experience and how that is created. It stresses the importance of the design as it is the design that forms the experience. The design can only be used to create the conditions for the ownership, and within this, the user can build an attachment to the object through affordances [34]. Each person's interaction with a certain object will affect the built ownership, which can be seen as one of the boundaries of human-centered ownership.

To be able to design for psychological ownership, it is important to shift the focus on designing a possession and having the user and the object's relationship in mind instead of a product [34]. This should be done by creating meaningful experiences to increase the feeling of owning something and have the overall user experience in mind.

There is a strong correlation between object attachment and psychological ownership

[35]. The fear of losing or the eagerness to gain something can impact the feeling of ownership. Research has proven that the feeling of ownership increases if the user has invested in the object, for example, through time or money [35]. Other factors that are proven to affect the user's feeling of ownership are if the user gets to choose the object and if the user has a say in when, how, where, and at what rate it is used or consumed.

People also have an easier time finding more value in something they feel they have contributed to compared to just going and buying something mass-produced. This phenomenon can be called the "I designed it myself" effect, according to Franke et al. [36]. One example is that amateur painters hang up their paintings, even though they lack artistic value. This can be applied to other fields as well, for example, pottery and knitting. The subjective attributes overshadow the objective facts.

Psychological ownership is a feeling or state of mind that can increase and decrease. Baxter and Aurisicchio [34], discuss when U2, together with Apple, added their album to all iPhones. The intention and goal with this was that the users would appreciate it. Instead, the users felt that the company infringed on what was theirs and that someone else had direct control over something they felt was theirs.

Finally, Baxter and Aurisicchio [34] breaks down how designers can design for psychological ownership into four guidelines. The first guideline is *Identify Meaning in Non-ownership*. The author suggests that initially, designers should focus on offering value to the users and the three motives efficacy and effectance, self-identity, and a place for the user to dwell. The second is *Structure the Ownership Experiences*, designing the interaction between user and objects to enhance the feeling of ownership. An example would be allowing the user to be part of the creation process to make it feel like *theirs*. The third guideline is about *Limiting Redundant Effort*. Investment can strengthen the feeling of ownership by spending time with the design or customizing it to one's liking, but if it seems too daunting, it can discourage users from using the product. It is suggested that designs should not differ too much from each other so that the users do not have to relearn them, and it is also a good idea to save preferences for the users. The final guideline talks about *Mitigate Contaminated Interaction*. Contaminated interaction is more prevalent in shared objects, such as access-based consumption, since users do not spend enough time with the object to remove the physical or psychological traces of previous users and make it *theirs*.

Kirk and Swain [37] review the relationship between psychological ownership and digital technologies. They describe digital technologies as intangible and impermanent, only accessed through devices, and can be replicated perfectly. The authors discuss how ownership has changed over the years, from owning physical products to streaming digital content without owning anything. The quality of an object might have been important before, but in the digital domain, the focus might instead be on personalizing or in other ways interacting with the content. The three routes of psychological ownership, control, self-investment and intimate knowledge, can be applied to digital technologies. Using the phone as an example, users can change the settings of it and therefore have control of it. The users could also invest themselves by personalizing the phone and having valuable information on it, such as contacts.

One study indicated that the users did not feel ownership of the hardware but rather the content they had created on it. Lastly, intimate knowledge could be knowing what app to use for a certain task. In the case of access-based consumption, digital technologies could be used as a medium to create a feeling of ownership of the accessed product. The authors mention past research that indicates that users of access-based services do not want to develop feelings of ownership and suggest that a touch screen can have a positive effect on psychological ownership, since it enforces the feeling of control. Interactivity can also affect the feeling of control, which can strengthen the perceived ownership.

3.5 Brand

Loureiro et al. [38] have found a correlation between a user's attachment, emotional identification, and feelings about a brand. Trust needs to be built between the user and the brand to strengthen this connection. They continue discussing the advantages of a strong relationship between a brand and its users. One benefit is that the user becomes more forgiving towards mistakes. Another benefit is that the user often will re-buy from a brand they feel connected to and trust.

To create a strong relationship, the brand should communicate its core values and beliefs to the users [38]. It allows the user to relate to the brand's standpoints and can match their personality and value, which can become a way of self-expression. If this is achieved, the brand love can grow.

3.5.1 Branded Interaction

Interaction aesthetics takes the user's action into consideration to understand how it affects an interface [39]. As the digital format becomes more and more present, the online presentation of the brand becomes more important. How the user experiences the brand in different formats will affect their view and relationship with it. One wants to achieve a memorable moment for the user to have a deeper effect on the relationship. So far, the use of visual aesthetics has been used to be able to communicate the brands' personality, but according to Roto et al. [39], the use of interaction aesthetics for digital objects still is a bit unexplored.

Interaction aesthetics can be a strong tool for strengthening how the brand's identity is communicated [39]. One brand that has managed to explore this, at least in its physical objects, is Apple. They want to communicate "Think different", and one way they managed to communicate this was through the click wheel on their iPods. Roto et al. [39], discuss that all examples are related to physical products but there is a lack of examples where interaction aesthetics successfully have been applied to fully digital products. According to them, there is great potential for taking advantage of interaction aesthetics to strengthen the brand's identity in the digital world.

There is a difference between the user experience and the brand experience, and they do not need to go together [39]. Roto et al. [39] describe this with an example of a banking service where the user's experience is connected to the service itself, while

the brand experience is based on how they view the bank as a whole.

3.6 Motivation Strategies

There are multiple strategies for motivating users to a certain behavior. In this section, two of these strategies will be explained.

3.6.1 Gamification

Gamification is becoming more common and is a proven way of improving the users' motivation and engagement [40]. By applying game features in other contexts, the benefits of games can be used to encourage users, create a higher motivation among them and foster behavioral changes.

Gamification is proven to have the ability to support positive behavior among people or to encourage behavior changes [40]. It is often used to motivate people to change bad habits, which is done through encouraging engagement.

Another important aspect of gamification is the psychological issues that are included [41]. To create effective gamification, it is important to understand the behavior and cultural context of the users to know what motivates them. Motivation can be either intrinsic or extrinsic. Where intrinsic is about internal goals and doing things you feel enjoyment for, and extrinsic is actions you do for a desired outcome only. To create an effective gamification, it is important to include both to be able to maintain a users interest in an activity.

3.6.2 Nudging

Caraban et al. [42], define nudging as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any option or significantly changing their economic incentive". It is a tool for subtly affecting peoples' behaviors. Changing how and when things are presented can affect how users handle the information and form their reactions. Caraban et al. [42], present many examples of how this has been implemented in real life. One of the examples is that switching out cake at the cashier in stores to fruit led to customers buying more fruit and less cake than before.

The effectiveness of nudging is strongly dependent on the context and how well the implementation fits the context needs. Caraban et al. [42], created a model for how to reach an effective nudging, and according to this model, three main aspects need to be fulfilled by the user; sufficient motivation, sufficient ability, and an effective trigger. They continue to describe three different types of nudging that can be used at different times depending on the user's ability and motivation. The different nudging types are Facilitator, Spark, and Signal, where facilitators focus on simplifying a task, sparks on increasing motivation, and signals on reminding of the task.

3.6.3 Slow Technology

Hallnäs and Redström [43] present the concept of slow technology, as we go "... from creating only fast and efficient tools to be used during a limited time in specific situations, to creating technology that surrounds us and therefore is a part of our activities for long periods of time." [43]. Fast technology is designed to be as efficient as possible and take as little time for the user as possible. Not only should it be fast, but it should also feel fast. This does not necessarily mean that the interaction with slow technology should take more time, but that it slows it down and allows for the presence of time. Slowing down our interactions allows the user to reflect. A product does not have to be fast or slow. Depending on the use case, it might switch between the two states [43]. Slow technology is supposed to be used over a long time and become part of the users' daily lives [44].

The Olo Radio utilized slow technology to let users reflect on their past using data of their listening activities [44]. They found that radio became part of the users' lives and let them reflect on their past memories. Another project by Grosse-Hering et al. [45], used slow design, a similar concept to slow technology, to elicit product attachment between user and product to reach a more sustainable use of the product. They found that slowing down interactions with products could potentially strengthen the product attachment, but it has to be done carefully and at the right time. Slowness should not become irritating, then it might discourage users from using the product.

4

Methodology

This chapter will present potential methods that are relevant to the project and more thoroughly describe the methods used.

4.1 Double Diamond

The Design Council's design process model, the Double Diamond [46], consists of four phases: discover, define, develop, and deliver. The first phase, discover, is about understanding the problem and gaining insight. The findings from the first phase are then analyzed to define the problem in the second phase better. Next, possible solutions to the problem are developed and tested in the develop-phase. Finally, a finalized solution is created in the deliver phase and can be evaluated.

The Double Diamond design process will be used in this project. The process will ensure that all relevant steps in the design process will be covered. Following the Double Diamond approach will help to keep the users in focus during the process, by first understanding them and the problem. Double Diamond will also allow for exploring the problem area before narrowing it down and defining it. A similar process will be applied to the solution, first explored and then narrowed down. The methods used will be divided into the different phases of the process.

Another design process model that would suit this process is the Design Thinking process. There are a few different versions of the Design thinking process, where the number of steps can differ, three examples are the Nielsen Norman Group [47], DiscoverDesign [48], and Interaction Design Foundation [49]. The main principle of this way of working is to have an iterative process.

4.2 Discover Phase

The discover phase is about understanding the problem. This can be done in multiple ways, but some suitable methods are Literature review, Interviews, Focus groups, Competitive testing, and Questionnaires [50]. For this project a literature review and interviews will be conducted to understand the user and the problem area better.

4.2.1 Literature Review

Literature review is a method used to gain knowledge about previous research in relevant fields [50]. Relevant literature is sought out, and important information is summarized in order to understand the areas and what has been done before. The results of the literature review are divided into categories to create a good structure, to both understand how the data is related and to easier get an overview.

A literature review will be performed at the beginning of the project to better understand what has already been done within relevant areas. This will create the foundation for the project and its later stages. Using existing research as a base is a lot more time efficient, compared to having to conduct the research at the start of the project. The previous research can span many years and involve experts in different fields.

4.2.2 Interviews

Interviewing is a method to collect qualitative data about participants [50]. Interviews can be performed in many different ways. They can be unstructured or structured, depending on what the conductor wants to get out of the interview. An unstructured interview allows for a more exploratory approach, asking questions based on what the participants say, while the results from structured interviews are easier to analyze since they are consistent. Interviews can also be performed individually or in a group. Interviewing groups can have benefits, for example, being more time efficient, but it is important to remember that the participants can also influence each other with their answers.

Throughout this project, interviews with different user groups will be conducted to understand the users and the problem better. Interviews let the project get qualitative data from the user and can create a deeper understanding of the user group and certain issues. The participants will be interviewed individually, to let them speak freely and without any influence from other participants. The interviews will be semi-structured, and a script with questions will be used as a guideline, but other questions can be asked, allowing them to add information that the project could not anticipate. Because of this, questionnaires were not chosen as the participants could not be asked to elaborate or be asked new questions.

4.3 Define Phase

In the define phase, Mind mapping, Affinity diagramming, and Thematic analysis will be used to analyze and structure the data from the first phase. Other methods that also could be used in this phase are for example Personas, Word clouds, and User journey maps [50].

4.3.1 Affinity Diagramming

Affinity diagram is a method for clustering relevant data to give a better understanding of how the data is related [50]. The data are written down on sticky notes and grouped together, creating different themes.

In this project, affinity diagram will be used for understanding and analyzing the collected data from the literature review. The result of this method will create the foundation for creating the guidelines.

4.3.2 Thematic Analysis

Thematic analysis is an analysis method for qualitative data [51]. It is used to identify larger data themes and find common meanings. Thematic analysis can be performed in two different approaches, deductively or inductively. A deductive approach is theory-driven, meaning the data is analyzed and interpreted through already-known theory. An inductive approach is the opposite. The data guide the analysis and themes. Before analyzing the data, it is important to get familiar with it by reading or listening to it and taking notes. The first step of thematic analysis is to code the data. This is done by going through the data and highlighting relevant data by labeling it with a code. The coded data is then reviewed, and similar codes are grouped together to create larger themes.

In this project, thematic analysis will be used to analyze qualitative data from interviews. Since the interviews will be transcribed, the data will be large, making it difficult to find interesting data. It will therefore be advantageous to structure and divide the transcripts according to thematic analysis to better find interesting results. Both deductive and inductive approaches will be used, depending on the situation.

As an addition to the thematic analysis, the method word clouds can be used. By combining the methods one would be able to understand the data qualitatively and see quantitative patterns.

4.3.3 Mind Mapping

Mind mapping is a method that can be used for structuring and organizing a lot of information [50]. It creates a visual connection between items and gives the team an overview of the information. This will help the team understand the problem space and see how to move forward.

Brainstorm Graphic Organizer - Brainstorm Web

To analyze the result from the brainstorming sessions, Brainstorm Graphic Organizer - Brainstorm Webs (BGOBW) will be used. BGOBW is a method to help the team organize their ideas and visually connect elements, and through that, challenge the ideas. The advantage of BGOBW is that it gives the team a strong overview of the result and is a useful tool for breaking ideas down further. In addition, BGOBW allows the team to see connections between the different concepts and the possibilities of combining them.

The team will identify the different aspects of ideas and draw them on a whiteboard. By doing this, the team can connect the aspects and how they relate to each other and will end up with a network visualizing the connections between different parts of the ideas.

4.4 Develop Phase

The third phase will use different brainstorming and ideation methods to ideate concepts as part of the solution. Prototypes will also be developed to test and iterate the design.

4.4.1 Brainstorming

Brainstorming is a common technique for idea generation, and it can be performed in many different ways. One key factor for successful brainstorming is not being critical of other ideas [52].

Two methods for brainstorming will be used during the course of the project, 6-3-5 and Crazy 8. These two brainstorming methods have been used previously by the team and have proved to be efficient and generate many ideas in a short amount of time.

Crazy 8's
Crazy 8's is a method to quickly develop ideas and gain inspiration [53]. Each team member draws eight different ideas in eight minutes. Drawing so many ideas in a short amount of time will probably not result in great ideas. However, the time pressure does not allow the members to think and critique their own ideas, which can result in weird and creative ones that can give inspiration to other ideas.

Crazy 8's is one of the two ideation methods that will be used. It will be used on two different occasions. First, during a workshop, allowing the participants to generate ideas quickly before discussing them with their group members. Later, the method will also be used as part of the final ideation.

6-3-5 method
The 6-3-5 is a method for generating ideas [54]. The concept is that six people generate three ideas in five minutes. After these 5 minutes, the ideas are passed forward to the next person who gets to add or modify the ideas. This process is done in silence, which makes it effective as the person only needs to focus on the idea generating. The outcome of this method is multiple concepts and ideas that can be prioritized and evaluated after the session and worked on further.

6-3-5 will be the second ideation method used in this project. The method will be used during the workshop, where the participants will use it to continue exploring ideas done with crazy 8's. Since the workshop will be done in smaller groups, where the group members collectively will pitch one idea, 6-3-5 will be used to let the group members work on ideas together.

Other Brainstorming Methods
Other methods that can be used to generate ideas are for example, How might we [55], and Worst possible idea [56]. These brainstorming methods can give another perspective on the problem and let the team see the problem from a different angle.

4.4.2 Sketching

Sketching is a process that has many benefits. According to Greenberg et al. [57], sketching can help designers to think more openly about ideas and help with creativity. Sketching is a way to record ideas and a strong tool for discussing ideas and getting others' input. [50] emphasizes sketching's ability as a communication tool. They continue by stating that drawing can be used to examine, explore and explain.

Sketching will be used throughout the project in various stages. The method will be used to explore ideas and ideate on concepts. The sketches will also help with communication within the group, as the concepts can be explained visually. A further step of sketching can be to use Storyboards. Storyboards are a strong tool for communicating ideas and capturing surrounding factors [50]. It can also be used for building empathy and an understanding of the product or concept.

4.4.3 Design Workshops

Design workshops are a way to work together as a team to solve design challenges [50]. It is an activity-based research method that allows the team to get direct input from the stakeholders. The workshop itself can be carried out in different ways and contain different kinds of exercises depending on the goal of the workshop. When planning a workshop, it is critical to keep the time schedule and ensure that everything runs smoothly. It is also important that the process during the workshop and the result from it are documented well.

One of the first methods that will be carried out in the ideation phase is design workshop together with the Innovation team at Polestar. Having a design workshop early in the process allows many to give input on possible directions for the project. This gives the chance to get more perspectives and solutions for the problem. It can also be an advantage to be able to discuss the ideas together with the team, to work on them together.

4.4.4 Prototyping

Sharp et al. [52], describes prototyping as a manifestation of an idea. They are used to communicate and explore ideas. Prototypes are limited in scope compared to the final product and do not consider all features of a product. Prototyping is great for testing ideas with users without having to develop a complete product. A prototype allows the designer to test one or more aspects of an idea without having to develop it completely.

Low-fidelity

A low-fidelity prototype is not as functional or good-looking as the final product, but it is cheap and quick to produce. For example, the prototype could quickly be made with pen and paper. Therefore it can be used early in the design process when changes are more common and alternative designs are being explored [52].

In this project, the low-fidelity prototype, consisting of wireframes created digitally, will be used to get feedback on the design and improve upon it before developing the high-fidelity.

High-fidelity

Compared to low-fidelity prototypes, high-fidelity prototypes are closer to the final product in looks and functionality. For example, a high-fidelity prototype could be a piece of software and take more time and effort to create [52]. High-fidelity prototypes are used for user testing to evaluate the design, although later in the design process.

The high-fidelity in this project will be created as an Android application and be part of the final evaluation.

4.5 Deliver Phase

The deliver phase is the last phase and will consist of evaluating the high-fidelity prototype. This can be done in multiple ways, for example using A/B testing, Heuristic evaluation, Focus groups, Think-Aloud, Wizard of Oz, Interviews, or Questionnaires [50].

4.5.1 Questionnaire

Questionnaires are a method of information collection, where respondents can self-report data without any observer or interviewer present [50]. This means that the method can gather a lot of data in a short time, since the respondents can answer the questionnaires on their own. However, no follow-up questions or further elaboration can be done since no researcher is present, which is a drawback of this method. The questionnaire could be structured in many different ways, for example, the respondent could be presented with a limited choice of options or an open approach, where they write their own answer. It all depends on what the researcher wants from the study.

For this project, the User Experience Questionnaire will be used to evaluate the high-fidelity prototype. The questionnaire will feature one additional item to capture one more aspect of the product.

User Experience Questionnaire

The User Experience Questionnaire consists of 26 questions and is a way to measure the user experience of an interactive product [58]. It can be used together with qualitative methods. The 26 questions cover six scales that measure both pragmatic and hedonic aspects [59]. The scales are: Attractiveness, Perspicuity, Efficiency,

Dependability, Stimulation, and Novelty. The questionnaire has been evaluated and appears reliable and valid [58].

4.5.2 Think-aloud

Think-aloud is a method where the user completes a set of tasks while verbally explaining the process and how it feels. It is a tool for understanding how the user perceives the interface when using it [50]. The methods let the team understand what aspects work and what aspects can be perceived as frustrating and confusing. This type of think-aloud protocol is called Concurrent Think aloud.

When conducting think-aloud protocols, it is recommended to test specific aspects of the interface instead of the whole application at once [50]. This method is cheap to conduct, flexible, and robust, making it an effective method for user testing [60]. It can be used at different stages of the process, both on low and high-fidelity prototypes.

The think-aloud protocol will only be used on the high-fidelity prototype as part of the final evaluation of this project. It will help to get an understanding of the participant's thoughts as they navigate through and use the application.

4.5.3 Wizard of Oz

Wizard of Oz is used to simulate responses from a design that the participant interacts with [50]. The method can be used for evaluation purposes when a system, or parts of a system, has not been implemented and can, therefore, not yet be tested. However, by using the Wizard of Oz method, it is possible to evaluate the experience by tricking the user into believing that they are interacting with a real system. During the evaluation, one person will act as the system and respond to the user's interaction. Using the method, it is possible to test features before they are implemented or features that depend on systems that are not yet completed.

Since not all aspects of the concept will be captured by the high-fidelity prototype, Wizard of Oz will be used to give the illusion of their implementation to evaluate them during the final evaluation.

5

Process

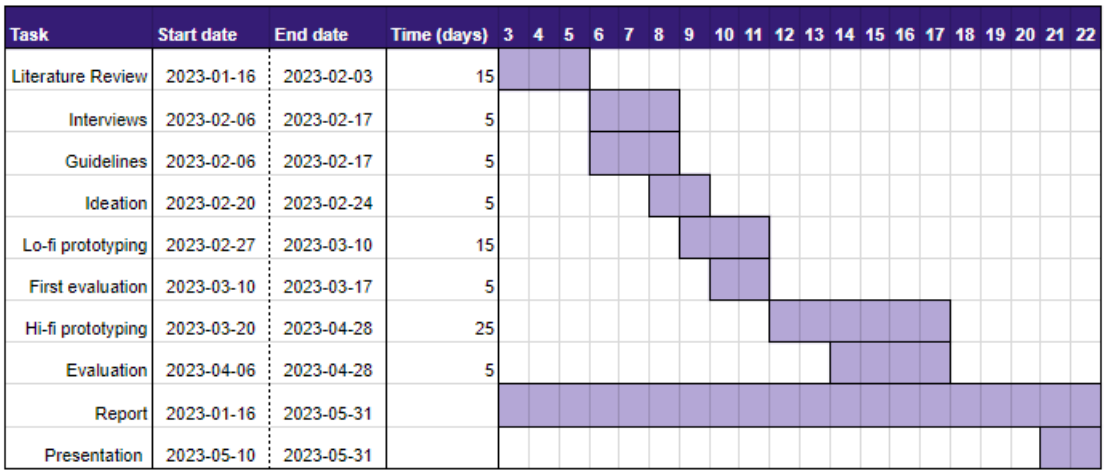
The execution of the project's process will be described in this chapter. The process is divided into nine sections: Initial Plan, Pre-study, Themes From Interviews, Result From Interviews, Ideation, Concepts, Wireframes, Development, and Final Evaluation.

5.1 Initial Plan

This project is part of a 30-credit course and was executed in the spring of 2023. The total execution time was 20 weeks and during this time period, all four phases of the Double Diamond were executed.

The initial plan for the project was to start with a literature review to better understand the topic and what has been done in this field. The learnings from the literature review would create the foundation for conducting interviews. The goal of the planned interviews was to understand the users better and strengthen the connection between literature and cars. This first phase was predicted to be done in six weeks. In parallel to conducting and analyzing the interviews, the plan was to generate guidelines for how one encourages emotional connection. The guidelines would be based on both the literature review and the interviews.

The next step of the project was to start ideating on how one can apply the guidelines. This process was predicted to take two weeks. The ideation was planned to involve other persons at Polestar as well as the authors themselves, using different ideation methods. The ideas would then be iterated upon, sketched, and then a few ideas would be further developed and made into low-fidelity prototypes. Between the seventh and ninth week of the project, it was planned that the low-fidelity prototype would be tested. The result of the first evaluation would then be taken into consideration before starting on the high-fidelity prototype. The high-fidelity prototype was planned to take six weeks to develop, and at the end of development, the final evaluation would be held. According to the schedule, see 5.1, the final evaluation was planned to take four weeks and be done parallel to the development of the high-fidelity prototype. These four weeks contained planning the evaluation, finding all necessary resources and participants, as well as conducting a pilot test, the actual tests, and finally analyzing the result of the evaluation.



Task	Start date	End date	Time (days)
Literature Review	2023-01-16	2023-02-03	15
Interviews	2023-02-06	2023-02-17	5
Guidelines	2023-02-06	2023-02-17	5
Ideation	2023-02-20	2023-02-24	5
Lo-fi prototyping	2023-02-27	2023-03-10	15
First evaluation	2023-03-10	2023-03-17	5
Hi-fi prototyping	2023-03-20	2023-04-28	25
Evaluation	2023-04-06	2023-04-28	5
Report	2023-01-16	2023-05-31	
Presentation	2023-05-10	2023-05-31	

Figure 5.1: The initial time plan for the project.

5.2 Pre-study

A pre-study was made to understand the problem area better. The pre-study consisted of a literature review and interviews.

5.2.1 Literature Review

Before starting the literature review, see subsection 4.2.1, literature from previously taken courses was examined. One course, *DAT157 Designing User Experiences*, had relevant literature and became the starting point and laid the groundwork for the literature of this thesis. Google Scholar was the primary search tool for academic literature, but ResearchGate and ScienceDirect were also used.

The first keywords used were “Emotional connection to objects”. This did not result in any used literature but gave knowledge about new keywords such as “Object attachment”, which produced results of more relevant literature. References and citations were reviewed from the newly found literature, deepening the search. The concept of “Psychological Ownership” was found from searching for “What gives the feeling of ownership?”. Lastly, “Access Based Consumption” was searched for after having learned the concept.

Relevant literature was then analyzed in order to create design guidelines. First, the literature was summarized. Then, key elements from the literature were extracted as quotes, and later analyzed using affinity diagramming (see Figure 5.2). The analysis was performed by grouping similar quotes together, and then identifying larger themes. Themes too small or unrelated to connecting to objects were either overlooked or seen as a route to a larger theme. The themes found were: Control, Design, Personification, Identification, Customization, Time, Uniform, Memories, Beyond, Experience, Bond, Social, and Engagement. The themes were then drawn on a whiteboard, using mind-mapping (subsection 4.3.3), to get an understanding of how they related to each other and what paths one could take to reach them (See

Figure 5.3). Based on this, the gathered literature was reviewed again to find how they related to the established themes. Finally, the first iteration of the five design guidelines was created.

G1: Each interaction is unique, the design can only set the conditions for the user and vehicle

G2: Create space for user modification without hurting uniformity and limiting contamination

G3: Design for multiple interactions over a longer time period

G4: Design for meaningful experiences

G5: Allow for social interaction

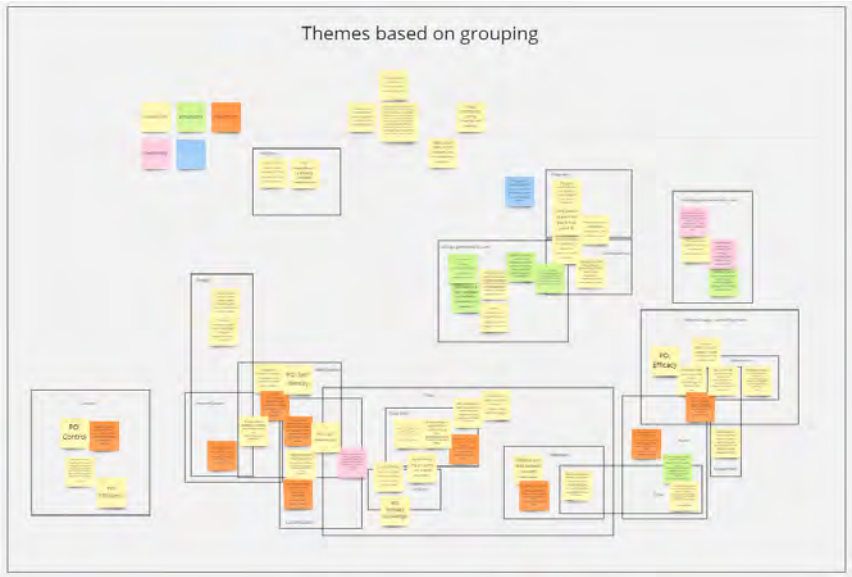


Figure 5.2: The Affinity diagram from the Literature review.

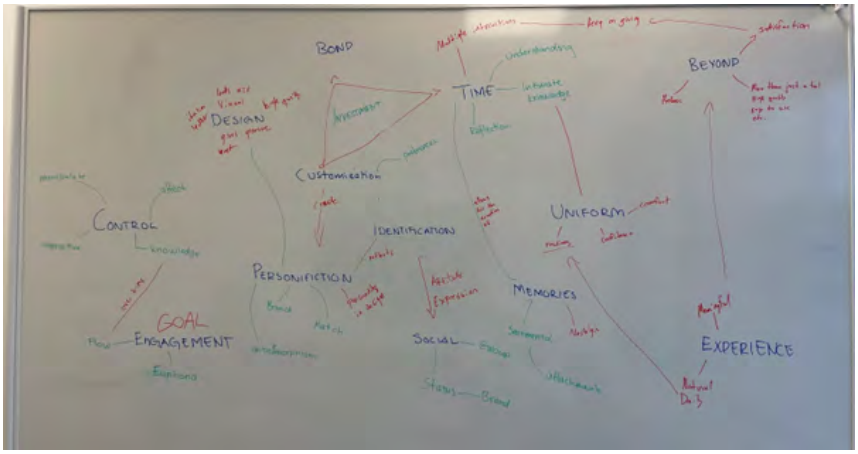


Figure 5.3: Connecting the themes.

5.2.2 Interviews

Structured interviews were conducted to better understand the target users and people who have already established a strong emotional connection to cars, see subsection 4.2.2. This study's participants were people who saw themselves as fleet users or car enthusiasts.

In total, 16 persons were interviewed, 9 were car enthusiasts, and 7 were fleet users. The participants were mostly gathered by word of mouth, meaning that most of them either worked at Polestar or were connected to the moderators. However, the interviewees did not have any previous knowledge about the project. All participants were based in Sweden, with a majority of them being based in Gothenburg.

The interviews were carried out both online and in person. Each interview had one moderator, one note-taker, and one interviewee. All interviews were recorded in consent with the participant, to allow the interview facilitator to rewatch when analyzing. The script for the interview contained 14 questions for fleet users and 16 questions for car enthusiasts, and the interviews were between 20-30 minutes. The full script can be found in Appendix B.

The questions were connected to the literature found in the literature review. After writing the script, one pilot interview was carried out to investigate how the questions were interpreted and understood, as well as how long the interviews would be. The pilot interview confirmed that the questions covered the field it was supposed to do, and only one question was further added to the script for the actual interviews. 16 interviews were enough to reach saturation and to be able to draw conclusions from the data.

5.2.3 Analyzing the Interviews

To analyze the result of the interviews, the method thematic analysis was used, see subsection 4.3.2. Since the interview resulted in a lot of new data, it was decided to use an inductive approach to identify new guidelines and challenge the ones already established based on the literature. The first step was going through all the transcriptions to encode relevant quotes. Then, based on the codes, themes could be established. The themes identified were: Part of life, Part of me, Pleasure, Freedom, Social, Personality, The Practical Aspect of the Car, Positive Attitude Towards Car Sharing, and Obstacles of Car Sharing (see Figure 5.4).

Figure 5.4: The identified themes from the Thematic Analysis.

5.3 Themes From Interviews

The identified themes from the interviews will be further described in this section.

5.3.1 Part of Life

Cars have long been part of many participants' lives. Some participants could recount their love for cars since childhood, how they ran around the parking lot looking at exhaust pipes, their time playing racing games in front of the TV screen, or how they would stop crying when placed inside a car.

Spending time with the car seems to be a common way to connect to the vehicle. The car is part of everyday life, and many enthusiasts choose to spend more time with cars than simply transport. A lot of the car enthusiasts that participated talked about how they do maintenance, cleaning, and upgrades on their cars. They also spend time reading and watching videos about cars. The knowledge they have of their car seems to be important to their connection to the car. Participant 12 describes it as "It feels like there are no secrets. It's the next step of the relationship.". This is not something exclusive to the car enthusiasts, the fleet users also talk about how the familiarity of an object makes it personal. One fleet user (Participant 11) makes a comparison of using a new car model to visiting a friend and trying to do the seemingly impossible task of finding a cup in their cupboards. Another fleet user (Participant 15) used a fleet service where almost all cars were the same model and noted how the car felt like an extension of themselves, since they knew everything about it and how it was to drive it.

Memories and history, what the users have experienced with their cars, also seemed important. Many users spoke about good memories they have had with their car, road trips they have taken, or the first time they drove in the car with their significant other, and how those memories have formed a bond between car and driver. However,

it is important to note that when asked about a memorable moment with a car, many recounted experiences that had been negative, for example, their first accident or when something went wrong. A memorable moment did not have to be based on positive emotions.

The participants described how difficult it was to separate from objects they were attached to. For example, one participant (Participant 10) said that the car will follow them to their grave, and another (Participant 6) how they were forced to sell their car and described it similarly to a breakup.

5.3.2 Part of Me

One of the main factors, according to the majority of participants, for making something feel personal is to work on, customize or modify the item. By spending time changing the object, a stronger connection is built between the user and the item. It allows the user to adjust it to fit their needs and preferences. Some of the participants said that this makes the object reflect them and who they are. It becomes an extension of themselves.

Having something unique can generate the same types of feelings, where the object can be connected to the person's identity. One participant described their car as one of these objects, where they had put a lot of time and effort fixing the car to make it fulfill their desires, and the car has become strongly connected to their identity. Participant 3 said, "If it is the same thing for all, then it does not feel personal.". Adding their own touch to the car can make it stand out from the other cars on the road and make it feel more unique.

One participant described the car as a way to express themselves. In the same way as a pair of pants or a T-shirt that you really like, the car can be a way to show your identity to the world. Participant 16 continues discussing that the car lately has represented their interest in sports.

Another common theme throughout the interviews with the car enthusiast was the factor of time. Participant 1 describes that spending time with the car allows you to get to know how the car works and all of its quirkiness. Learning this will deepen the connection to the car and make it feel like mine. Participant 15 emphasizes this as well, as they always rented the same car model, the more they learned how the car worked made the car felt more like their own rather than a rental. That, together with modifying the car to fit your preferences or making it better, is something that the majority of the participants agree on have a positive effect on the connection to the car.

Participant 15 describes how they have modified their phone to make it feel more personal. Changing the background, downloading certain apps, and adding different modes depending on where they are have made the phone feel like it belongs to them. Participant 15 continues by saying, "What makes it personal is that I can modify the software to fit me.". Not being able to modify the software in cars in fleets is something that reduces the feeling of *mine*.

Participant 14 brought up that a lot of people like to be able to customize it to make the car feel more personal, but for them, it is rather the factor that they had chosen the object or been part of the process of when the car was made.

Having the fleet car's settings match your own settings when starting is something that Participant 4 describes as a factor that makes it feel more like mine.

Having the car for a while allows the user to create memories together with the car, which makes it feel more personal, according to a few of the participants. The feeling of control can also emphasize the feeling of the object belonging to them and the sense that it is theirs. For example, leaving the car and knowing it will still be there, in the same spot, the next time the user wants to use it, or having the chance to leave objects in the car.

5.3.3 Freedom

One theme that could be identified during the interviews was that many of the participants saw a strong connection between their car and the feeling of freedom. The term *Freedom* was used by many but could describe different situations. A few of the participants described freedom as the car letting them go wherever they wanted, when they wanted to go, without having to plan or adjust it according to a timetable. Others saw the car as a way to get a break from life, to get time to reflect, and to calm down. One even described the car as their therapist.

The connection between cars and the feeling of freedom was especially strong for people growing up in the countryside, where the public transport system was limited. Taking their driver's licenses and getting a car of their own opened up new possibilities, freedom, and flexibility that had not been available before.

The sense of freedom has been a strong factor in strengthening the love for cars and the connection to them.

5.3.4 Simplifies

When the participants were asked what makes a car feel that it is theirs, a lot of the answers were related to availability. Constantly having access to the car, knowing where it is, and having it nearby were factors that were strongly connected to the feeling of *mine*. Having this feeling, some sort of control over the vehicle, was something that added to the feeling of it belonging to them, but also a factor used as one of the counterarguments for using carpool or sharing their car with others.

Fleet users explained situations where all cars nearby were already booked at the time they wanted to use them, which weakened the feeling of ownership. It could generate feelings such as frustration as they needed to adjust their plans according to the availability of the cars. Fleet users also discussed availability as one of the key factors when deciding what car to rent. One requirement was often that it had to be nearby and that it fits their current needs, for example, having a large trunk for shopping.

Having constant access to a car decreased the need for planning. One could go wherever, whenever, which amplified the sense of control. This, together with the chance of leaving objects in the car and not having to empty the car after using it, created a stronger feeling of it being mine.

A few of the participants mentioned that they would be open to sharing a car with others if they had two cars where one would always be available. Sharing a car led automatically to planning and would limit their sense of control and the availability that they highly valued with the car.

A few of the fleet users described the system for different car-sharing companies that they have used. Something that was highly valued was the simplicity of having the car key in their phone, which made it easier to get started. Having to look either for the key or other functions in the car was described as hurting their experience and enforced the feeling of borrowing someone's car rather than having control. A lower learning curve was appreciated by the user, and a few mentioned it as a factor for faster reaching the sense of mine.

One solution for strengthening the sense of owning or feeling that the car is *mine*, which was brought up during multiple interviews with fleet users, was if the car would remember them. Having the car seat in the right position, the right radio channel playing, etc., when entering the car were a few of the aspects that could be pre-defined when unlocking the car.

Participant 4 described the car as a luxury, something that is not necessary but simplifies many situations. They said that it is something that they are prepared to spend money on, even a few thousand SEK a month, to be able to have access to this luxury. Other participants confirmed this, saying they often use the car when they need to carry something heavy or move something. The car is more flexible and easy than public transportation and needs less adjustment or planning, especially when going outside the city center. A car can also give a sense of independence, as one can go wherever, whenever without having to time the public transportation or confirm with others.

One participant described that the need or dependency on the car had been built over time. Spending time with the car and learning how it works, its size, and its quirkiness builds a stronger bond but also makes it easier to use the car. One described it as taking the relationship to the next level, where there are no secrets. You know everything about the car, which makes driving it easy.

5.3.5 Pleasure

Many car enthusiasts expressed how the car is more than a transport, it's fun to drive and gives them pleasure. Some even said it was a passion for them. Not only did they like to drive around with their car, but also tinker with it. A participant (Participant 12) felt that there was meaning in the time they spent cleaning their car and described it as purposeful.

The enthusiasts, but also some fleet users, talked about the feel of driving a car.

Some wanted it to feel safe and well-built, while others liked the speed or the raw feeling of the car. The feel of the car and what it conveyed seemed important, as described by Participant 7. A lot of the enthusiasts talked about the design of the car. Participant 14 explained how they would never buy a car that "says nothing" and is boring. Other participants explain how they like how high quality a car feels, how cute it is, or how cool it is. This is contrasted by Participant 3, a fleet user, who used to care how beautiful and fast a car was, but has started to care less and less about that.

5.3.6 Social

When asked what object they could not live without, most interview participants answered a phone. Almost all of them said that it was because it allowed them to keep in contact with others, friends, and family. It does not matter if they live close or far. This object allows the participants to connect with them.

Cars also seemed to connect people. Some participants were part of larger communities and attended car shows and meetings. One participant (Participant 10) described it as a lifestyle. Participant 7 reflected on how they did small upgrades on their car that only another enthusiast would notice and appreciate, which could enforce a sense of community. A fleet user (Participant 15) described that they felt the users of the fleet service were part of a community, even though they had never spoken to another user of that service, and would have liked an even stronger community around the service. The car was also present in other social contexts, for example, driving with friends, doing car maintenance together, and visiting friends or family living far away.

5.3.7 Personality

Even though not all car enthusiasts interviewed expressed that they thought their car had a personality, almost all of them had some kind of name for their cars. At first glance, many of the names seemed to have been given for only practical reasons, a way to refer to the vehicle when talking about it. In fact, all participants except two had named their car after a physical aspect of the car or the model name. Calling a car by its model name might not seem that personal, but by, for example, shortening it and adding a "y" to the end of the model name, it becomes a name rather than just a way to refer to the vehicle. One participant's (Participant 16) car had been named by others, but when they referred to the car themselves they called it "babe".

Participants that had multiple vehicles, and valued them differently, reflected this in their naming. Participant 10 had one summer car that they drove for fun, they described the car as "cute", "charming" and that it "spread joy", and had given the car a cute name. The other car, used for day-to-day driving and commuting, was described as "grumpy" and had a more boring name. This was very similar to Participant 13, who had given all their vehicles feminine names except their bike. When asked why, they said, "Yeah, because he's scrappy. I mean, that's a super scrappy bike. Like I've bought it second hand and like, yeah, you don't deserve a

good name.". They went on to explain that the design and driving experience of a vehicle triggers something, and that they talk to you as a man or a woman. This seemed to be very individual since the participant had owned the same car model as a friend, but they had different interpretations of the car's personality and gender.

Some participants expressed that the car's characteristics, for example, design, sound, or how they drive, give it a certain charisma. Another participant (Participant 14) conveyed their concern about how modern and electric cars have less personality than older cars by striving for perfection. The imperfections and quirks of a car and how you needed to get to know it gave it a personality. Participant 1 shared that thought, saying that you need to get to know the car, especially older cars, and learn their quirks to form a connection. The quirks were part of the charm. Other participants speak of similar things and that the connection over time and memories give it a personality. One participant (Participant 12) said that the car is more than an object but not on the same level as a pet.

5.3.8 The Practical Aspects of Cars

The practicality of a car, its ability to transport newly bought furniture or take you from one place to another in a short amount of time, is mentioned quite frequently. Some participants that grew up in smaller cities felt that the car was a necessity if they wanted to roam around on their own. Multiple participants stated how this view changed as they moved to another city, where owning a car was not the only way to move around in the city. One participant (Participant 2) sold their car since they did not need it anymore and instead used fleet services. The participant only viewed cars as a tool, a view that was shared by others. Another participant (Participant 3) said, "Now I only see it as a tool. It only needs to work. It should be comfortable and not annoying. I don't want any problems, and it should take me from A to B and so on.". Some car enthusiasts had multiple cars, one for pleasure, that they adored and one for commuting, with no other requirements than to work and be as cheap as possible. That a car is cheap and easy to maintain was something that many valued.

5.3.9 Positive Attitude Towards Car Sharing

When asked what they thought of car sharing, the first response was often positive. It was easy, environmentally friendly, and an effective way to use the car. But when asked if they would share their own car, the reaction was a bit different. Many of the car enthusiasts were open to the idea of sharing one of their cars, but they needed one car to themselves that was only theirs.

The majority of the participants agreed that carpools were a great solution for when they had a lot to carry, for example, when going to a furniture store or grocery shopping. Those that had used cars from fleets were impressed by the fact that they could go to a parking lot nearby, jump into the car, run their errands, and then leave the car and the responsibility. Most of them had at least one fleet company close to their home. It was especially effective in larger cities.

One participant described that it was a positive experience when the fleet service

onDemand decided to remove the striping of the car, as they felt that they no longer were going around as an ad for the company.

One of the benefits mentioned was that it was more economical for those who did not use the car regularly as they only have to pay when using it and do not need to think of other expenses around it.

5.3.10 Obstacles of Car Sharing

When asked about car sharing, some car enthusiasts expressed doubt since they could not tinker with a shared car. They do not want to share their enthusiast car. Participant 7 said, "...as soon as we put all this effort into design and engineering and things like that, then when it becomes a bit more of a passion object that you buy because you feel a connection, I wouldn't want to share an object like that.". As noted by a number of enthusiasts, they would be okay with sharing a commuting car but not their own enthusiast car. One worry was that people using the car would misbehave and that they did not care about the car enough to properly take care of it when driving. They felt they would have to take responsibility and deal with the consequences if they legally owned the shared vehicle and someone else damaged it. This worry was strengthened by two participants that used fleet services frequently, as one shared how they had driven dirty cars that showed signs of damage, and the other that they would not care if something happened to the car since they only have to pay a small fee. Another participant (Participant 3) remarked on how they instantly felt like they were driving another person's car when using a service that rented out privately owned vehicles. A similar sentiment was shared by others that had driven fleet-owned vehicles, that the cars seemed to be adjusted to other people. One participant (Participant 4) did not have to readjust the car that often since they drove with similar settings as many others. This participant, along with another fleet user (Participant 15), had the opposite experience regarding misbehaving users, as the cars were almost always clean and fresh. Even though the feeling of responsibility was described by many as a concern and a reason they would not want to share a car, it also seemed to give them the feeling of *mine*.

5.4 Result From Interviews

Even though an inductive approach was used, the interview results seemed to align with the guidelines established based on the literature. There were two other findings not related to the guidelines:

Almost all car owners that participated in the interview had names for their cars. Many described some form of personality of their vehicle that, together with the design and characteristics, had formed over time with the experiences they had together. Since they had formed the personality based on using the vehicle, implementing a personality by anthropomorphism might ruin or prevent this personal attachment and projection on the car if the two personalities clash. Therefore it might be better to lay a foundation for the user to create their own personality for the car, rather than presenting them with an already finished one.

One aspect that was mentioned quite frequently was responsibility and how it affected their view of the vehicle. On the one hand, it seemed to strengthen the feeling of a car being *mine*, but on the other hand, it also seemed to discourage people from sharing their cars as they were afraid of the consequences of careless drivers and some enjoyed the feeling of not having any responsibility. Therefore, it was decided not to implement this into any guideline.

5.5 Ideation

The next phase in the project is Ideation. In this phase, the guidelines from phase one will be used as the foundation to create new concepts. The concepts will work as proof of concept for the guidelines.

5.5.1 Workshop at Polestar

The ideation phase started with a workshop together with the innovation team at Polestar, see subsection 4.4.3. The goal of this workshop was to find new ideas within the subject of emotional connection, using the created guidelines as the starting point. The participants in this workshop had different backgrounds, such as UX and software development. In total, there were 6 participants.

The workshop started with an introduction to the theme of the workshop, where the moderators explained briefly the topic and the defined guidelines. Then, the first exercise in the workshop was a warm-up question where everyone had to answer the question: “What is your favorite color and why?”. A warm-up question ensured that everyone got to talk, which might make it easier to express their ideas later on and get into the ideation way of thinking.

For the second exercise, crazy 8, see subsection 4.4.1, was used based on the presented guidelines. However, due to the time limit, it was decided to reduce it to crazy 5 instead. All participants got pen and paper, and the timer was set to five minutes. After five minutes, the team was divided into two groups of three, where they got to present and discuss their ideas.

Figure 5.5: Participants ideation using crazy 5.

The third exercise was a version of the method 6 - 3 - 5, subsection 4.4.1. Each participant had to choose two ideas from the previous exercise to continue working on. The timer was set to three minutes, and the next person got to continue working on the ideas when the alarm went off.

Figure 5.6: Participants discussing after using 6-3-5.

When everyone had contributed to all ideas within the group, it was opened up for discussion. The goal was that both groups should either combine their ideas

or choose one of them and continue working on it. Finally, after 15 minutes of continuous work, the groups had to present their ideas to each other.

The ideas developed during the workshop could afterwards be divided into three themes; Personalization, Anthropomorphism, and Fleet. Ideas connected to personalization highlighted the ability to customize the car to fit each user's preferences and to make a seamless transition from one car to another. It should be possible to make the modification both from the car and remotely, and the changes are both software and hardware changes. Anthropomorphism focused on making the car more human-like by giving it a name and making it communicate to the driver. This could be achieved with, for example, the help of an avatar. The car would meet the driver's needs, as well as communicate the car's mood and needs. The third category contained ideas such as giving the driver ratings and rewards for good behavior.

The two final ideas, see 5.7, contained a mix of the three themes.

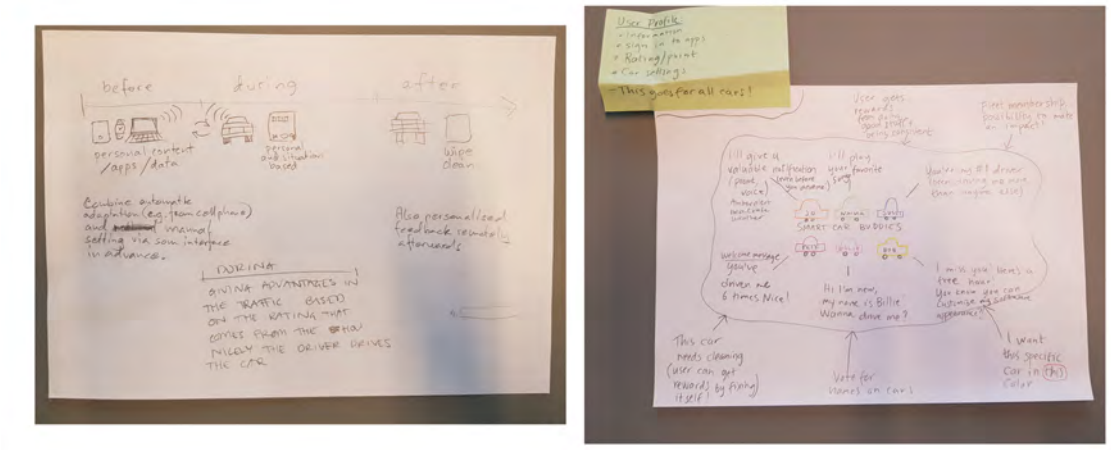


Figure 5.7: The final ideas from the workshop.

5.5.2 Further Ideation

The next step in the ideation phase was to continue brainstorming within the team. To generate a lot of ideas in a short time span, the Crazy 8 method was used. To ensure that all guidelines were considered, it was decided to execute Crazy 8 for each guideline (except G1). The results of the ideation can be seen in Figure 5.8 and Figure 5.9.

After ideating on all guidelines, the ideas were discussed to see if there were any similarities and to deepen the understanding of the ideas. This resulted in four main concepts which could be developed further. The concepts were Astro, a Profile with an Avatar, Collectables, and Memory Map.

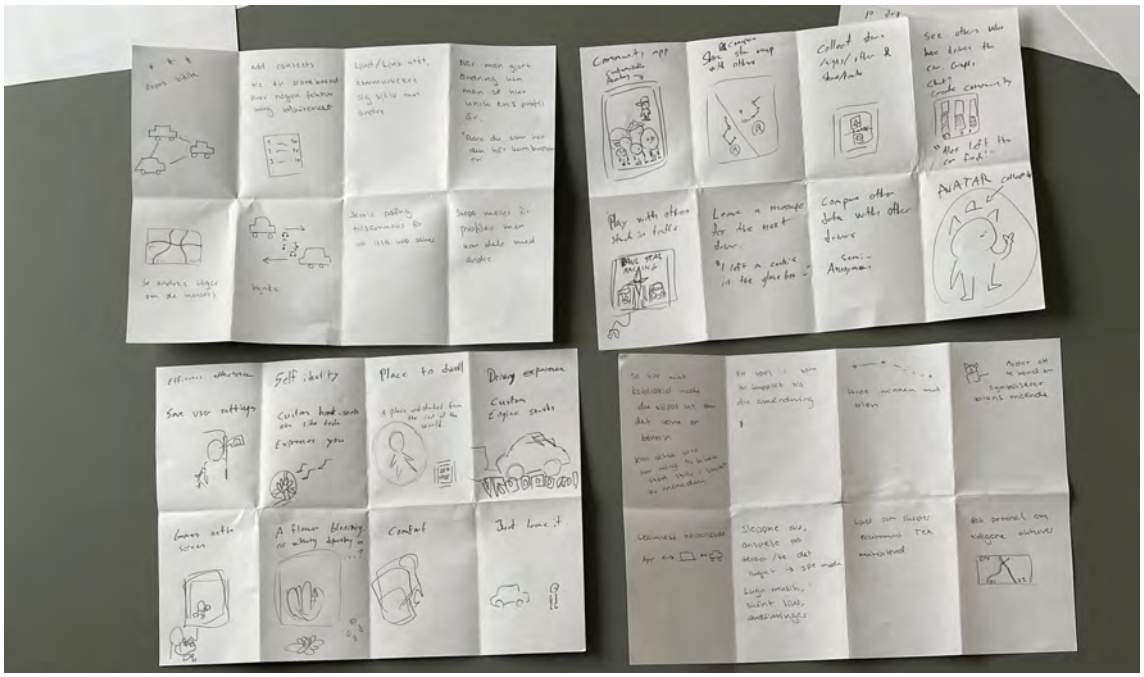


Figure 5.8: Result from Crazy 8 - G2 and G3.

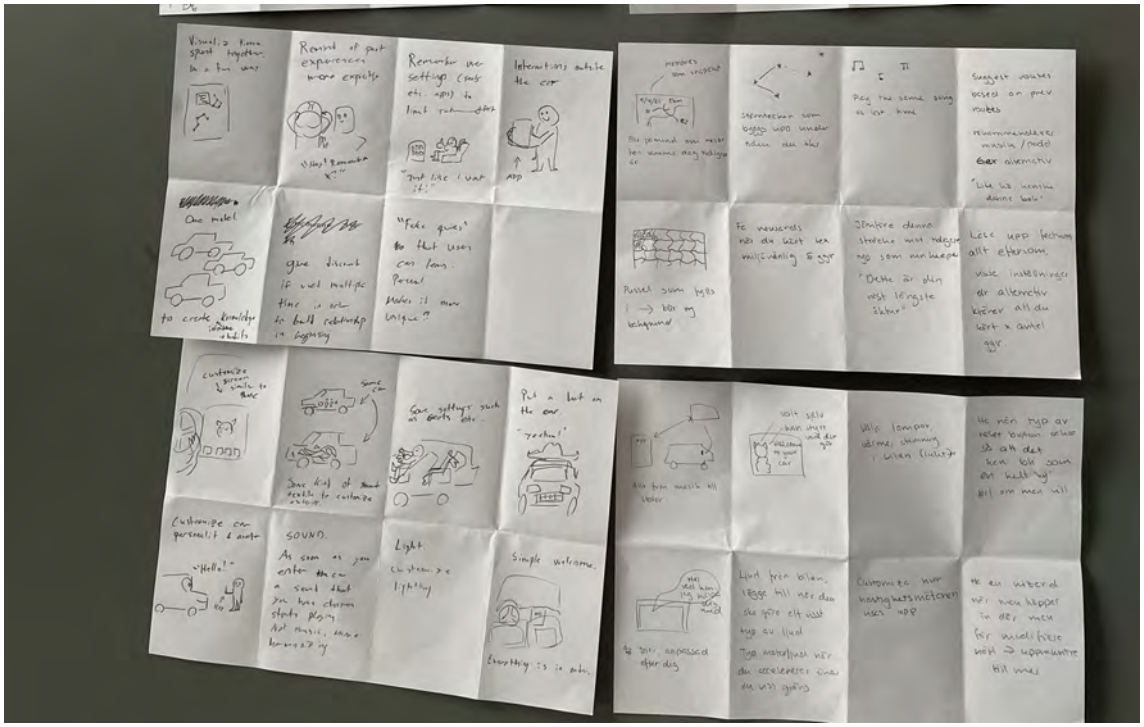


Figure 5.9: Result from Crazy 8 - G4 and G5.

To develop the concepts, Brainstorming graphical organizer (Brainstorm Webs) was used, subsection 4.3.3. This allowed the team to establish what the concept would contain and what guidelines it fulfills. Creating Brainstorm Webs made it easier to see how the different concepts could be combined. The results can be seen in Figure 5.10.

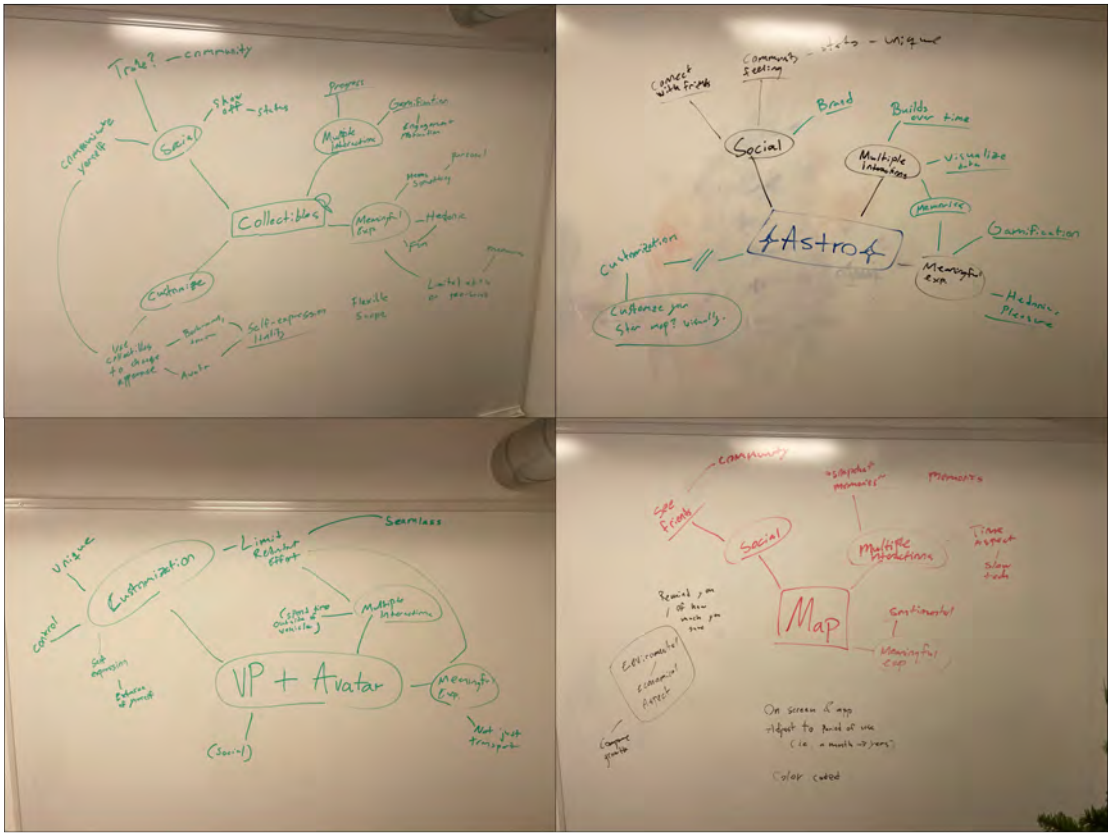


Figure 5.10: The result from the Brainstorming graphical organizer (Brainstorm Webs) method.

The concepts were then illustrated with quick sketches done digitally, and short descriptions were written to simplify discussion with others. The descriptions were written with the 4 Ws method (What, Why, When, Where) to better understand how it works and why it fits the situation. Based on this, the concepts were broken down into different features, which were then prioritized according to the MoSCoW-model. More details about the different ideas can be found in Appendix A.

The MoSCoW-model was used to clarify the key aspect of each concept and to understand what aspects that should be prioritized to implement within the time limit. Using the MoSCoW-model also made it easier to see how the different concepts could be combined as one understood the core of each concept better.

5.6 Concepts

After iterating on the result of the ideation, two concepts were developed; The profile and Astro with some aspects from Collectibles. The combination of these two ideas captured all the different guidelines. The two ideas combined became both pragmatic and hedonic, and from the MoSCoW method it was deemed possible to be able to create a high enough prototype for the final evaluation. The two concepts seemed to fit well together, fulfilling two different purposes.

The profile makes the experience of moving from one car to another seamless. It stores the user's data in the profile instead of in the car, which makes the profile available in all cars unlocked by the user. In the profile, all types of settings can be saved, both logins to different accounts and physical settings for the seat, heater, and light. This will move the car to the profile, making the car a shell and the profile the *brain*.

The profile is mainly connected to G2 and G3. As the user can modify their profile according to their preferences, it can be argued that this fulfills G2. The user can make their profile mirror themselves, but the changeable aspects are only software changes, ensuring that one user's experience will not affect the next one's.

In the profile, the user will be able to create an avatar, which will be a further way to make the profile feel more personal and connected to the user. Having the user set up their profile, and through that simplifies the process of changing a car, it encourages multiple interactions over time. One of the goals of this concept is to make the experience of renting a car seamless, making it feel like their own car, and through that, encourage usage over time.

The second concept is called Astro. The goal with Astro is to visualize data in an interesting way, and since Polestar, as a brand, has a connection to stars and space, constellations were a valid choice. Polestar's vision is to be the guiding star in the automotive industry. The first concept of Astro (see Figure 5.11) was inspired by slow technology, see subsection 3.6.3, and designed to prompt the user to reflect. Star constellations would be drawn on a star map based on the user's driving. Line thickness, color, texture, etc., would represent different aspects of the driving, for example, battery health and range. The user would then be able to view the star map, for example, by having it as a home screen or projected onto the window on the roof, and reflect on their driving. However, this was changed to make it easier to understand and feel more structured. An example of this was that the constellations had challenges that explicitly stated what was needed in order to collect it, which was more in line with gamification, see subsection 3.6.1. In Astro, the user will be able to collect constellations by achieving certain challenges. The Astro concept can be connected to all guidelines, based on how far it is taken, but the base concept has its strongest connection to G3 and G4. The vision for Astro is that the user is building their own constellation map over time, and to be able to finish the tasks will require time and multiple interactions. The longer the user uses Astro will make it more personal. The goal is that the user will feel a connection for contributing to the star map and make driving feel like something more than just a way of transport.

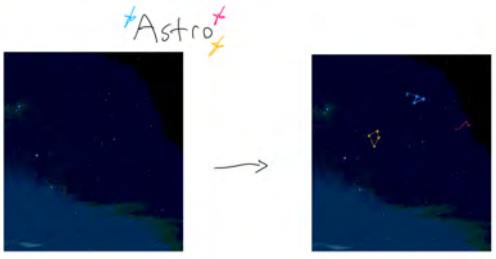


Figure 5.11: First sketch of Astro.

Astro also has the possibility to be a social connection between the fleet community, in accordance with G5. This could be done by adding a filter option where the user can see other active fleet drivers' star collections. This can give a sense of being part of something bigger and a way of enforcing the feeling of being part of a community.

G2 can also be achieved by Astro. Letting the user create their own star map, changing the color, etc., can give a sense of control and strengthen the connection. The Astro theme can be applied to avatars as well, letting the user create their avatar based on a few stars and different colors, generating their own constellation. This could also make it feel more meaningful.

5.7 Wireframes

When the concept was established, the next step was to create wireframes. The wireframes were created digitally and focused mainly on the Astro concept.

Astro will be created as an app but will give the user the option of having their star constellation collection as a background on the home screen. Figure 5.12 shows the home screen where the Astro app is available, together with other apps.

Figure 5.12: Wireframe of the Home screen.

Figure 5.13: Wireframe of entering Astro.

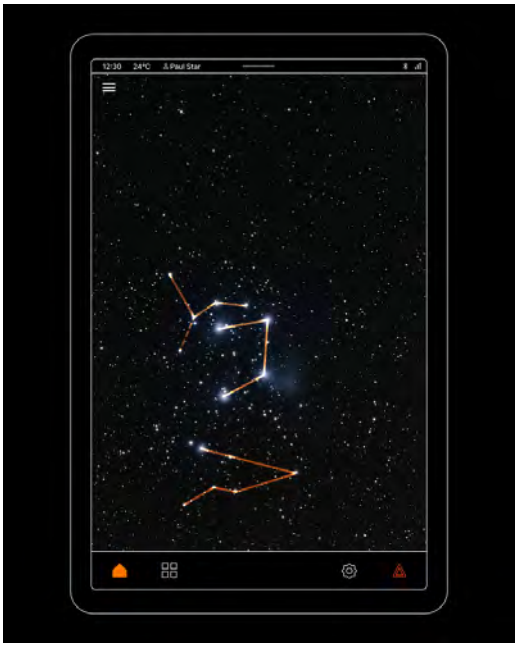


Figure 5.14: Wireframe for View your constellations.

When the user clicks on the app, the user will be sent into space, see Figure 5.13. When the app is loaded, the user will see their collected constellations, see Figure 5.14. The user can navigate around in space by dragging on the screen. It is also possible to zoom in and out to help navigate around the stars.

More information about the constellation will be presented if the user clicks on a constellation. Figure 5.15 visualizes what information the user will be given. Here

Figure 5.15: More information about a constellation.

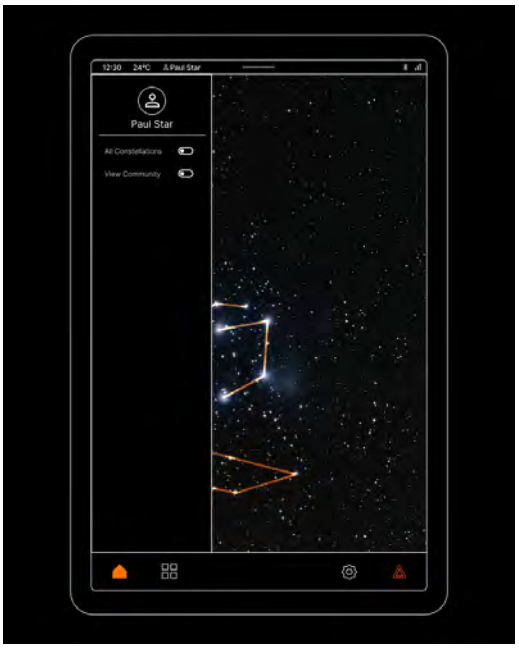


Figure 5.16: A hamburger menu to enable more options.

one can see when the constellation was collected and what needed to be done to be able to get it. One can also see the rareness of the constellation.

A hamburger menu is placed in the top-left corner, see Figure 5.15. When the user clicks on this menu, they will be presented with two options: to see all constellations and to see other users' collections, see Figure 5.16. These options are controlled by a toggle button since they only have two options; on or off.

Figure 5.17 shows when the option *View all constellations* is on. The user can then see what constellations are possible to collect, and by clicking on them, they can find out what needs to be completed to collect them.

Figure 5.18 shows when the *View Community*-option is active. The constellations will then visualize what others in the community have collected. The colors can be connected to persons in the community or how popular each constellation is.

Figure 5.17: View all constellations.

Figure 5.18: View the Community.

Figure 5.19 and Figure 5.20 are wireframes for the profile view. As mentioned in 5.6, to connect the profile with Astro and make it more coherent, the profile image is a personal constellation. In Figure 5.20, the user can create their own constellation by placing a set amount of stars. The user will be allowed to use more stars and therefore be able to create more advanced constellations based on how many constellations have been collected in Astro. The user will also be able to change colors, and more colors will be available based on the user's constellation collection.

Figure 5.19: Wireframe of the Profile settings screen.

Figure 5.20: Wireframe for modify one's avatar.

5.7.1 Team Feedback

When the wireframes were done, a small feedback session was carried out. This was to get input from others to see what needed to change before the start of development.

The concept and wireframes were presented to 8 people at Polestar with backgrounds in UX, software development, and business analysis. They were given a presentation of the wireframes and the concept and were then asked to provide feedback.

One of the main takeaways from this session was to make the gamification aspect more central to motivate the user more. This can be done in several ways, but making it more competitive can help the user get engaged. One suggestion was adding a progress bar to give the user instant feedback on how many constellations they have collected without having to show all constellations and compare them. Another suggestion was adding a leaderboard to the social view, emphasizing that the user can compete with their friends. This could encourage the user to collect more constellations.

One potential risk with the application being discussed is how the user will navigate on the star map. Since there is no reference point in the space, the user might lose track of their position and where the constellations are. One suggestion was to add a small map in the bottom corner to show where the users are on the screen to help them navigate.

Another concern that was brought up for discussion was if there was a risk that the constellations will be collected too fast and the user will run out of possible constellations to collect. The challenges themselves were also discussed, what they will be related to, and how they will be implemented.

Other feedback collected from this session was that they would like more information about the constellations, for example, origins and variations. They would also prefer to make it feel more 3D to make it easier to explore the stars. One suggestion was to have the users' avatars visible when viewing the community to make more use of the avatar. Another suggestion was to have the Polestar logo as the final constellation to collect or make the Polaris star in the shape of the Polestar logo.

5.7.2 Re-iterating

After the feedback, the design was iterated again. A progress bar and map were added to the user's Astro view, according to the feedback, see Figure 5.21. The progress bar can be toggled on and off in the menu shown in Figure 5.16.

Figure 5.21: Added the progress bar and a map based on feedback.

The community view was also iterated upon again based on the feedback given. The new idea was to be able to visit friends' star maps. Different ideas were sketched, as seen in Figure 5.22, where each friend can be identified with their personal constellation. Figure 5.23 and Figure 5.24 show the conceptualization of a social view that better fits the theme of stargazing and uses the metaphor of visiting other galaxies to see friends' star maps. A leaderboard was also added to encourage competition between the user and their friends.

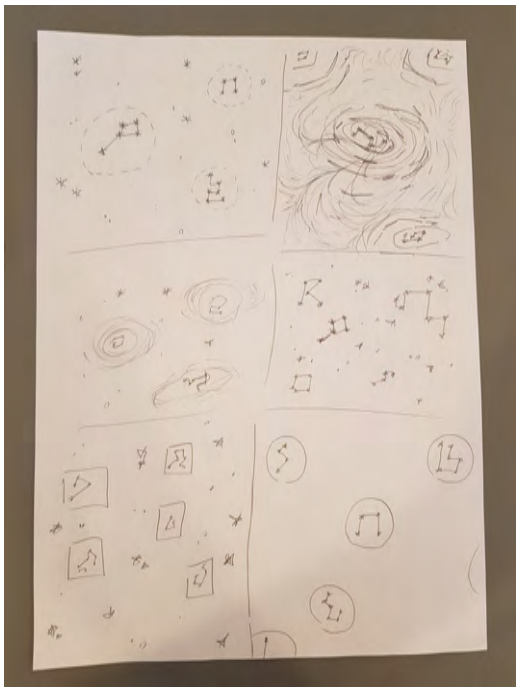


Figure 5.22: Different ideas for how to visualize friends' star maps.

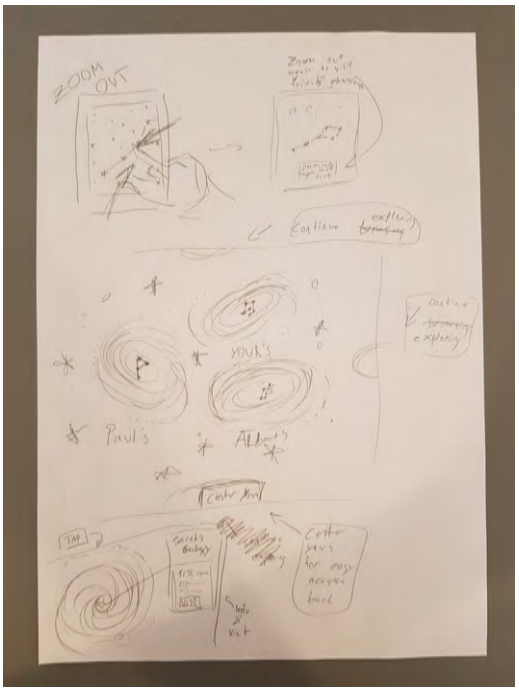


Figure 5.23: Sketch on how to explore and visit friends' star maps.

Figure 5.24: Digital visualization of how the friend map could look.

5.8 Development

The Polestar 2's infotainment system is running Android Automotive [61], and therefore it was decided that the project would be developed as an Android application using Kotlin. To test the application, a Polestar 2 emulator was used.

5.8.1 Basic Functionality

The main feature of the application is the star map, which therefore was developed first. This was done by storing information about stars in a JSON-file containing their position in the sky, as well as their ID and brightness. Their position was then translated into screen space, which resulted in a circle containing all the stars (see Figure 5.25). The constellation Ursa Minor, or Little Bear, was drawn by defining the stars that represented the start and end of each line. It was also possible to pan and zoom around the star map.

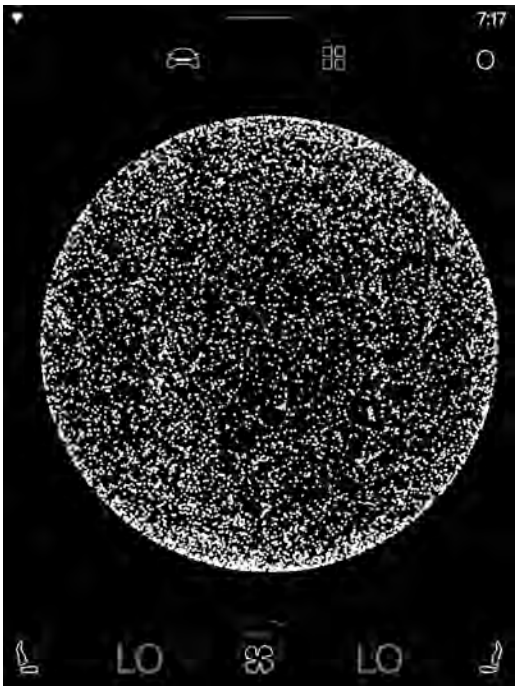


Figure 5.25: Screenshot of the emulator showing the stars, as well as the constellation Ursa Minor.

The rest of the constellations, the 88 constellations defined by International Astronomical Union [62], were also stored in a JSON file defining their start- and end-points. These constellations were then drawn on the star map. A button to show the collected constellation in orange was added. Since the stars were placed in a circle, it was difficult to see stars and constellations close to the edge (see Figure 5.26). To fix this, the panning of the map was changed to rotating the stars' positions around the x- and y-axis, giving the illusion of rotating a sphere. For clarity, stars and constellations that faced away from the screen were hidden, strengthening the illusion of a sphere (see Figure 5.27). Finally, the circle was projected onto a rectangle to better fit the screen and mental model of stargazing (see Figure 5.28).

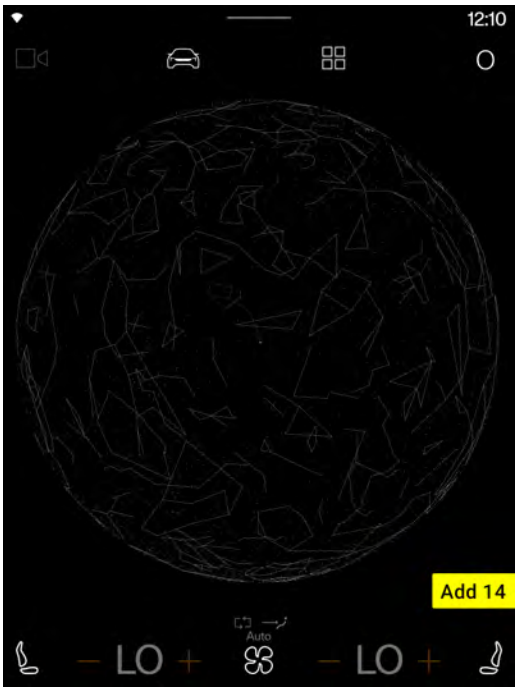


Figure 5.26: Screenshot of the emulator showing the stars and constellations. Ursa Minor is drawn in orange, because of its completed state.

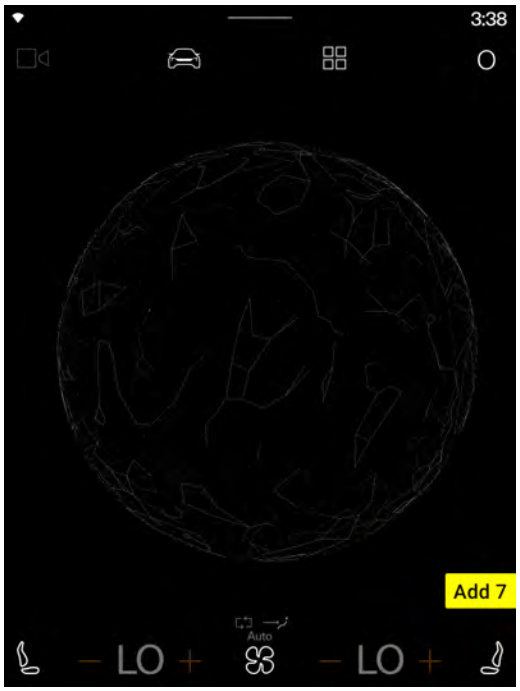


Figure 5.27: A spherical view of the star map.

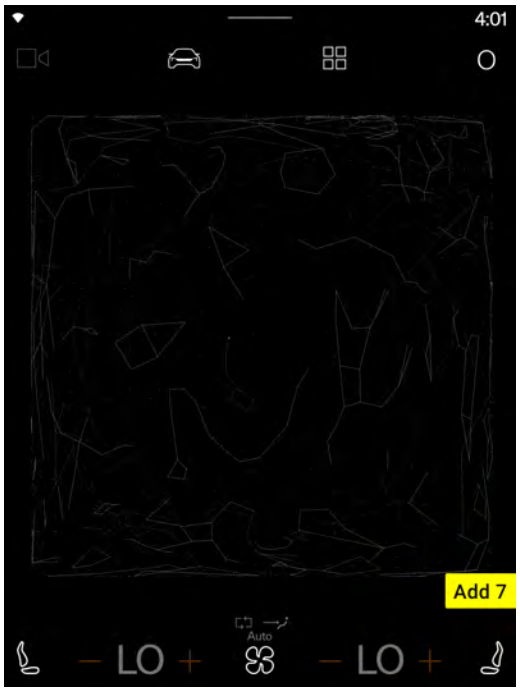


Figure 5.28: Star map projected on a rectangle.

5.8.2 More Information and Social Features

To be able to test the different aspects of the concept, more functionality and features were needed. A home screen with widgets was added (see Figure 5.29) to give the

illusion of a whole system being implemented. The user can view their profile settings, illustrating the ability to change their preferences of the car (see Figure 5.30), and also draw their own personal constellation. The user can place down up to seven stars, connected with lines, to create their own constellation (see Figure 5.31).

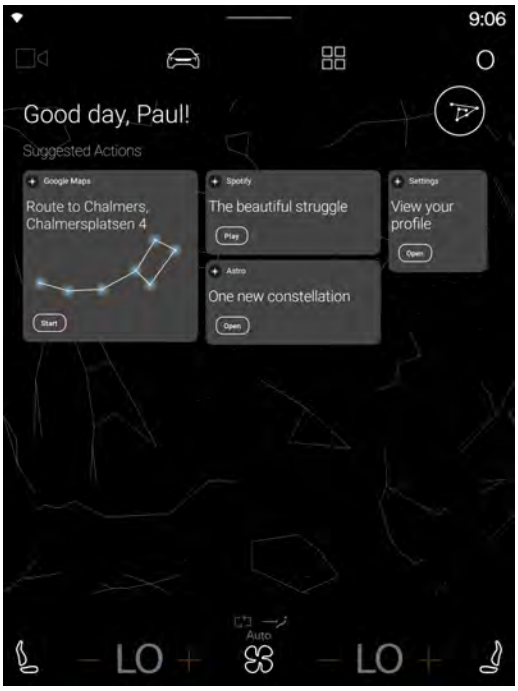


Figure 5.29: Home screen of Astro.

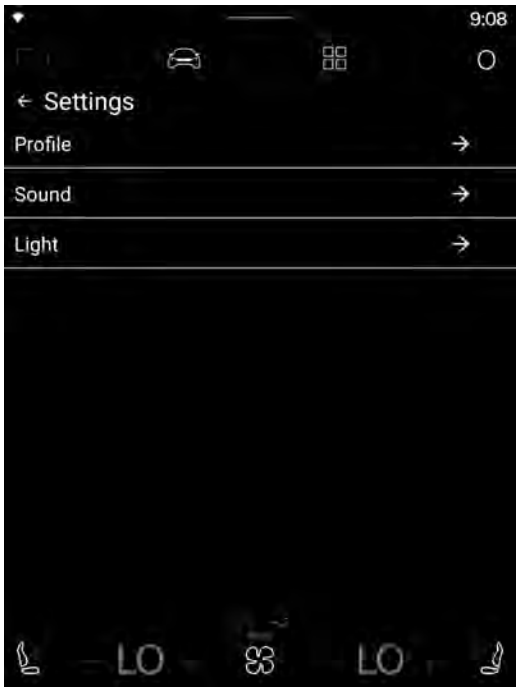


Figure 5.30: The Profile settings screen.

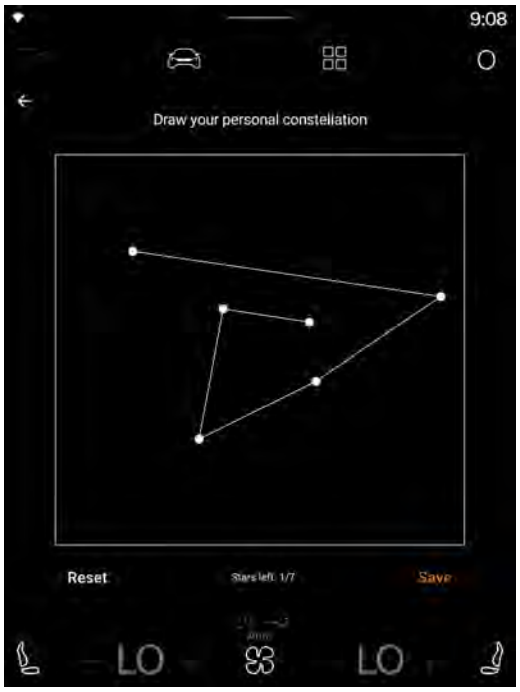


Figure 5.31: A drawn personal constellation.

The star map was updated in many areas. The view was zoomed in, and a limit was added to ensure the user could not zoom out far enough for empty space to be visible (see Figure 5.32). Constellations that have not been completed but are in progress are now indicated by their dashed lines to differentiate them from the completed constellations. A checkbox to view all constellations was also added (see Figure 5.33). To view challenges and their progress, a pop-up box was implemented to show up when tapping on a constellation (see Figure 5.34). Ten challenges were added that are repeated throughout the constellations. They are not supposed to represent the final challenges but rather give an idea of what's possible and in what area the challenges might lie.

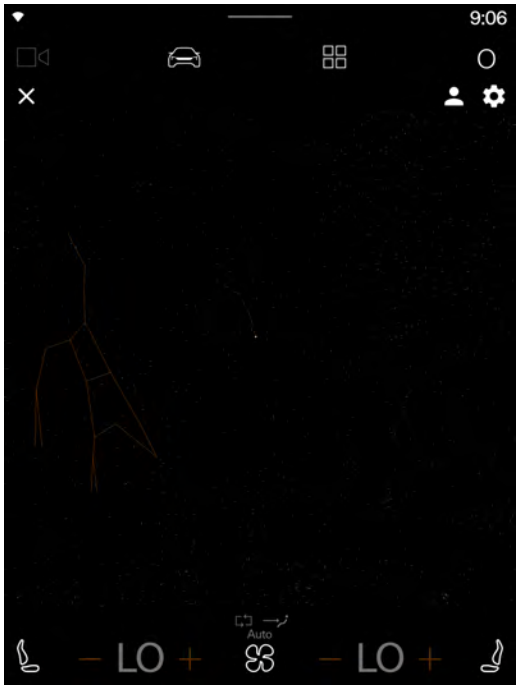


Figure 5.32: A view of the star map showing Ursa Minor as in progress and Ursa Major as completed.

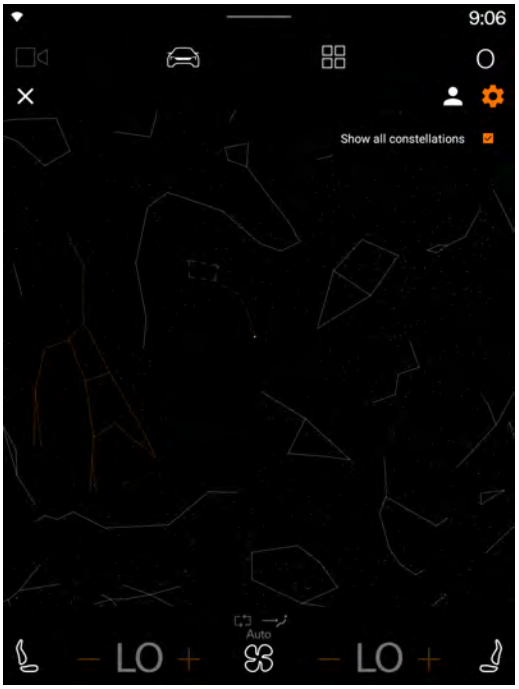


Figure 5.33: Star map with all constellations visible as indicated by the checkbox.

Figure 5.34: Star map with a pop-up box showing information about the constellation Crater.

Finally, the social page was implemented (see Figure 5.35) where the user can see their friends' star maps, indicated by their personal constellations. The page is currently an image, but the idea was that the user would be able to look around, similarly to the star map, to browse their friends' star maps. When clicking on a friend's constellation, the user will visit their friend's star map (see Figure 5.36). Just like when viewing their own star map, the user can look around and zoom. The user can also make their own constellations visible (see Figure 5.37) to compare their progress with their friend.

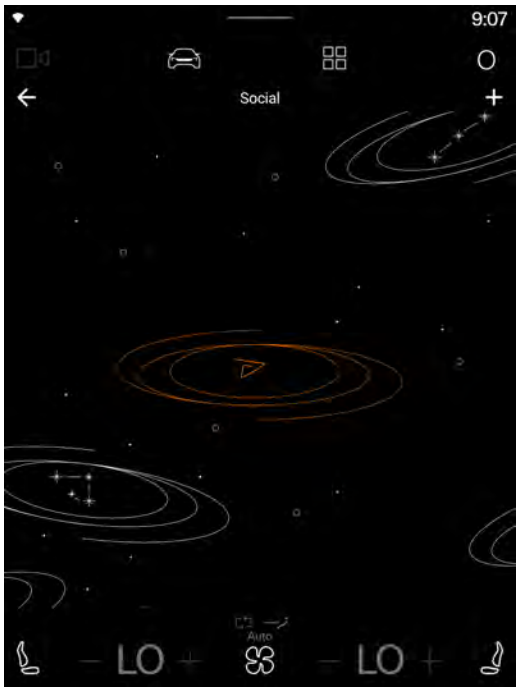


Figure 5.35: The social view showing the user's and two of their friends' star maps.

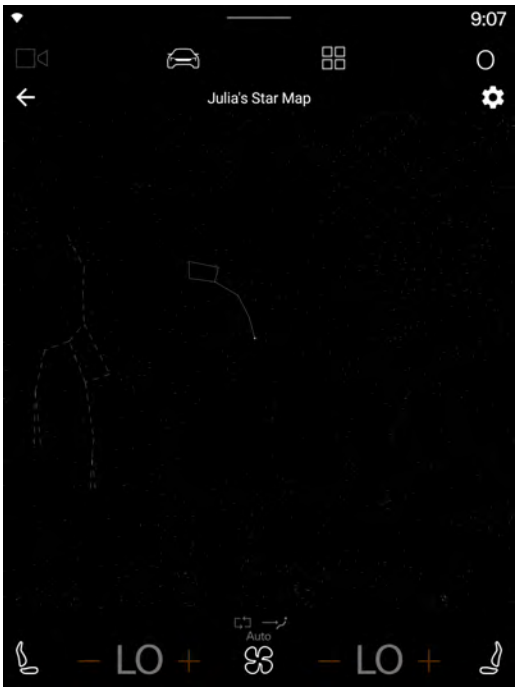


Figure 5.36: The user's friend's star map when one has entered their galaxy.

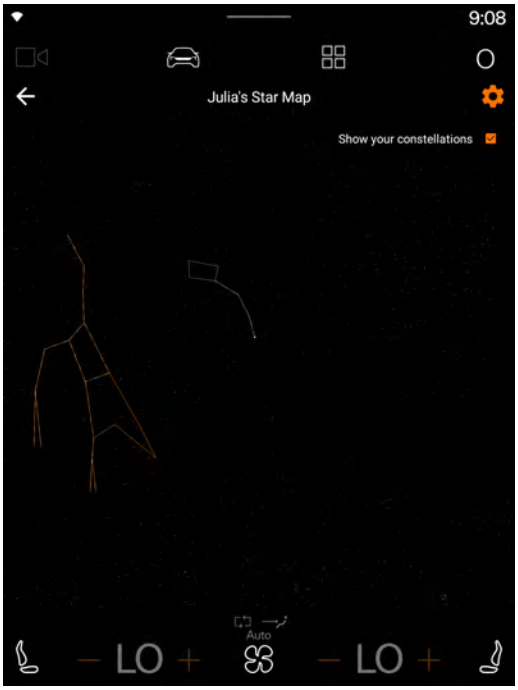


Figure 5.37: A comparison between the user's and their friend's progress.

Test in Rig

The next step was to test the app in a rig, see Figure 5.38. Since Polestar has its own emulator available for Android development, the step from the emulator to the

rig was not supposed to be large. As expected, the app worked similarly on the rig as it has done on the emulator, and only small changes were necessary to do. The only change made was the speed of the panning, as it felt too fast in the beginning.

Figure 5.38: Testing the application in a rig.

5.8.3 Database and Final Additions

A database was added in order to make it easier to change user data and perform user tests, since the data can be changed to fit them. The progress of the challenges is controlled by the database and can be changed in real time. The most recently completed constellation will also be highlighted with thicker lines (see Figure 5.39). The name of the user and their friends can also be changed in the database, as well as their profile constellation.

The application has also been polished. A button to re-center the view on the star Polaris has been added (see Figure 5.40) to help users if they feel lost, since implementing a map would take too much time. The top bar has also undergone some changes. It now features an orange line and is a lot more consistent between the different views. The home screen has been changed to better fit the wireframes (see Figure Figure 5.41)

Figure 5.39: A view of all constellations in the star map. Ursa Minor is drawn with a thicker line since it was recently completed.

Figure 5.40: A different view of all constellations in the star map. *Center on Polaris* is enabled in the right corner and can be pressed.

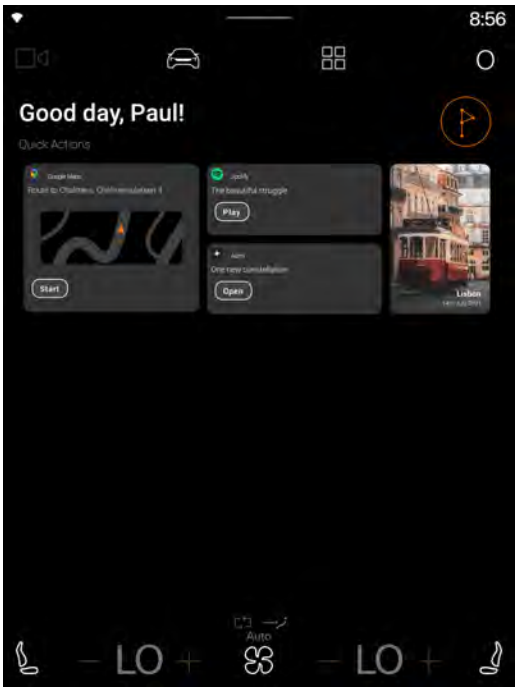


Figure 5.41: The home screen now has a simple black background and looks more similar to the wireframe.

It was also decided to reiterate the pop-up boxes to give the challenges more focus

and emphasize the game element of Astro. This resulted in two new pop-up boxes, one for the constellations that are not yet completed, and one for the ones that are completed, see Figure 5.42. The orange color is used to make it more visibly clear that the constellation is completed and makes it easier to differentiate between the ones that are not.

Figure 5.42: New design for the pop-ups.

In this iteration, more features were added based on the wireframes. One feature was a leaderboard on the social view to make it easier to compare the user's collection to their friends. The goal of the leaderboard is to emphasize the competitive aspect of Astro to encourage the user by comparing their accomplishments to their friends. Another feature implemented in the final iteration was the progress bar on the user's star map. The progress bar will help the user to get an overview of how many constellations they have collected and possibly encourage the user to reach more as they can see how many constellations that is possible to collect.

The stars were initially designed to be more intricate (see Figure 5.14 and Figure 5.24) rather than being circles, but due to development time, they were kept. It also felt in line with the *Pure*-aspect of Polestar's identity, subsection 2.3.1.

Test in car

Before the final evaluation, the application was tested in a test car to see that everything worked as intended (see Figure 5.43). When setting up the app in the car, one minor error was identified regarding the app's connection to the database. Otherwise, the app worked as intended, and only a small adjustment to the design was needed. The lines for the constellation were made a bit thicker due to the limited lighting in the car.

Figure 5.43: Setting up the application in the car.

5.9 Final Evaluation

The goal of the final evaluation is to evaluate how the proof of concept was received by others. One concern with the final evaluation was the time limit. As attachment is something that one builds over time, it would be ideal to do a test over a longer time period to see how it affected the user's view and connection to the app and concept. However, since this is not possible within the frame of this project, the final evaluation had to take another direction with a different focus. The final evaluation was a formative evaluation and indicated possible future directions for further development.

To find the best way to test this, it was necessary to break down the project and its goals. The project's main goal is emotional connection, which can be achieved through psychological ownership and attachment. The established guidelines are tools for reaching this, and therefore the guidelines were used as the foundation for forming this evaluation.

As the main focus has not been on usability, it was important to find a way not to let potential flaws in the prototype distract from the important aspects. Therefore, it was decided to start the evaluation by informing the users about the concept and the app, and letting them play around with it. As the goal of this concept is to have the user interact with it over time, it would be preferable if the user had already used the app for a while for this session. However, it could not be done, and therefore the solution was to give them a scenario of how they have used it for a while and instructions on how it works and what it can be used for. Based on this, it was possible to have an interview with the participants to better understand

their thoughts on the app and future improvements. However, potential comments regarding usability will be noted and taken into consideration as well for future improvements, but not be the main focus.

To be able to conduct a realistic test, the method Wizard of Oz was used, see subsection 4.5.3. Using this method made it possible to illustrate that the user made progress during the test session, without having to complete an actual challenge. Some aspects of the app that were easier to test were the customization feature and social feature, as both of these features are something the participant can do and interact with within the app. Therefore, it was decided to give them a task to perform and think aloud while doing it, see subsection 4.5.2, and then ask follow-up questions on their experience. From this, it would be possible to get a better understanding of both the usability as well as the concept.

A survey was used to complement the evaluation to evaluate aspects not covered in the think-aloud session. The survey's main goal was to capture if the application felt meaningful and how well connected it is to Polestar's identity and their overall view of it. To do this, the User Experience Questionnaire (UEQ) was used, see subsection 4.5.1. Using the UEQ ensured the questions were well formulated, as this form is thoroughly tested and evaluated. The full script (in Swedish) for the final evaluation can be seen in Appendix C.

5.9.1 Pilot Test in Rig

Before the final evaluations took place, a pilot test was conducted in a rig, simulating the experience in a car. During this test, it was discovered that the project description needed to be clearer and more clearly explain the project and the features of the application. Due to this, the description was rewritten to explain the project better. The test also felt unstructured, and therefore, questions were rephrased and restructured for the sake of clarity.

Figure 5.44: Pilot test in rig.

5.9.2 Evaluation in Car

The evaluation took place in a Polestar 2, at one of the Polestar offices. The application was installed on the infotainment system. Five Polestar employees participated in the evaluation. Before the evaluation, the participants were asked to give the first name of two of their friends to populate the prototype with data and make it appear more real. When the participants entered the car, they were given a short description of the application and some context to it. They were then presented with a scenario in which they were a fleet user that had used the application for a while and were on their way to a destination. The participants were asked to explain their thoughts and feelings as they interacted with the application and completed tasks. They were also asked questions on how they felt about certain aspects of the application. Another scenario was presented, in which they had continued to use the application for an even longer period, and the data on the screen was updated to reflect this. More questions regarding their experience were asked, and they had the chance to give their thoughts on the whole concept. Finally, the participant completed a questionnaire regarding their experience and thoughts.

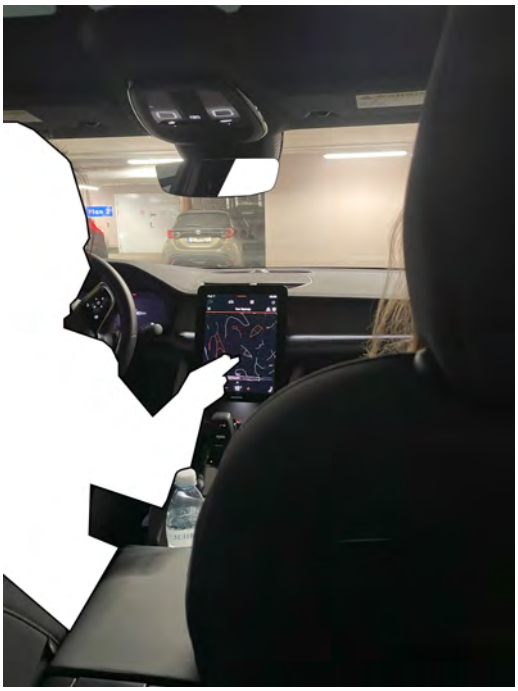


Figure 5.45: From the Final Evaluation, exploring all constellations.

5.9.3 Analysing the Results

The method of thematic analysis was used to analyze the result of the think-aloud and interview parts of the final evaluation. Since the goal of the test was clearly established, a deductive approach was used to analyze it. The first step was to create themes that could be used to encode the interview transcripts. The themes were:

- Usability

- Social
- Gamification
- Environment
- Enjoyment
- Time
- Personalization
- Brand
- Improvements

After encoding all transcripts based on the mentioned themes, all data connected to each theme was collected. From this, it was possible to draw conclusions for each theme on how it related to the concept. In this stage, it was decided to remove *Enjoyment* as a theme and instead split its data between *Gamification* and *Social* as those showed a strong connection to enjoyment. Furthermore, *Usability* and *Improvements* had similar data, and it, therefore, made sense to merge these themes into one theme. Moreover, the theme *Time* was proven unnecessary and therefore removed.

To analyze the UEQ, the handbook, and analyzing tool were used [63]. The result of the final evaluation is presented in section 6.3.

6

Results

In this chapter, the result will be presented. The result is divided into three parts: Guidelines, Astro, and the result of the final evaluation.

6.1 Guidelines

Suggested guidelines have been created to help establish and support the emotional connection between the driver and the accessed vehicle. This should better the conditions for this type of relationship to form. However, it is important to remember that each person is unique, and interaction will differ depending on context and background. How one perceives a product is specific for that user only, section 3.2. This can change over time, a person might react differently to a situation from one day to another, section 3.1.

Since the interviewed participants consisted of car enthusiasts and fleet users, many attitudes toward cars could be captured. A few participants viewed the car as a tool for transportation, while others described it as their passion. Considering this when designing is very important since not all users will view the car the same way. One participant talked about the importance of making it feel like something more than a means of transportation from A to B. It can be something that makes your heart race when you see it or drive it if the design matches the user's expectations. Another participant mentioned how the same car left a different impression on two different persons, what a car conveys can be very individual. This seemed to be in line with the following guideline.

> **G1. Each interaction is unique, the design can only set the conditions for the user and vehicle**

Self-expression is one of four determinants for object attachment, section 3.3. Personal identity is important to form a strong attachment between users and products. One way to allow the users to reflect their identities is through product customization or personalization. Self-identity is one of the three motives of psychological ownership, and self-investment is one of the routes to it, see section 3.4. Users value objects they have invested in higher than those they have not. However, uniformity is also an important aspect as it allows users to form habits and retain knowledge, section 2.2 and section 3.4. The view on ownership has changed, as mentioned in section 3.4, it has moved from owning a physical object to instead using digital content. This has

also forced a shift in focus on what is needed to be considered when designing for a sense of ownership. Interacting with and creating content and having the opportunity to add one's personal touch has become more important. By customizing the object, users can limit redundant effort as they adjust it to their needs. It is also critical that the customizations one user makes are not present for other users. This is because of contamination (also called contagion), which can hinder the user from feeling that the object is "theirs".

During the interviews, it was established that having the opportunity to modify the car according to one's preferences was appreciated. It can either be physical or software changes, both can contribute to the object feeling more personal. As these guidelines are focused on cars within a fleet that multiple users have access to, these changes need to be reversible, meaning that the next driver is unaffected. This was also emphasized by participants that had rented cars, it felt like the car was adjusted for someone else. This led to the second guideline.

G2. Create space for user modification without hurting uniformity, and limit contamination

Interacting with an object multiple times during a longer time period can strengthen the bond one feels towards the object, section 3.3. Attachment takes time to build up, and by allowing and encouraging multiple interactions, the user gets the conditions for forming a stronger connection. The chance of continuous interactions is higher if the interaction generates positive emotions. By spending time with a car, the user learns how it works and can build habits around it, subsection 2.2.1, making the interaction a natural part of the user's life. It can also result in memories which is a key for building an attachment to an object, section 3.3. Letting the design create conditions for the user to form enjoyable memories with the car can have a strong impact on the connection one feels for it. Spending time with the car can also be seen as an investment from the user, which can be one way to create a stronger feeling of psychological ownership, section 3.4. Limiting redundant effort might also invite the user to use the product or service again.

Using the car over time, getting familiar with it, and learning its quirks seemed to be a way to connect to it. Fleet users who had used different cars or services noticed that learning or adjusting to a new vehicle could be difficult. Participants who had used the same car over longer periods spoke about how learning it created a connection between the vehicle and the driver. When spending time with their cars, they also formed memories with them. Some claimed that it was the experiences and memories created that formed a bond with an object. This implies that interacting with the car over a more extended period of time, to gain intimate knowledge of it and create memories with it, can form a connection between driver and car. The third guideline cover this:

G3. Design for multiple interactions over a longer time period

Identifying meaning in non-ownership can be done by focusing on offering value and the three motives of psychological ownership: efficacy and effectance, self-identity, and a place to dwell, section 3.4. A product with hedonic attributes can form a

stronger bond between the user and itself than one with only pragmatic attributes, section 3.2. A product that does something beyond its pragmatic use can stimulate the user and be a source of pleasure, section 3.3. Pleasure is one determinant of object attachment. Identification and memory evocation are two other hedonic attributes. Self-expression and memories are also determinants of object attachment. Creating meaningful experiences can also help the feeling of ownership, section 3.4.

Creating meaningful experiences between the car and the driver can have a positive effect on the connection the user has toward the vehicle. During the interviews, many participants, especially car enthusiasts, explained that their connection to the car was closely related to the time they spent with it outside of transporting themselves from A to B. The car was not only part of them, it was a part of their life. These interactions, which were more than pragmatic, strengthened the bond. Other participants described that they wanted a car to have a purpose, the object should feel meaningful for them and solve more than the bare minimum problem. The fourth guideline is, therefore, the following:

G4. Design for meaningful experiences

If the user feels that an object reflects themselves or can be seen as an extension of them, they can use it for communicating their identity to others, section 3.3 and section 3.5. It can tell others about who you are and what you like. Letting the user add their personal touch to the car and modify it to represent themselves can help strengthen the bond between the user and the vehicle. People are also seeking connection to others, and creating a social setting where people can interact together can encourage attachment to the product, section 3.3. Creating a space for social interaction can also help the creation of memories, which positively affect one's connection to the car.

Human connection was important to the participants, as many described the phone as an object they could not live without because of its social functionality. Not many explicitly expressed the need for cars to be social but mentioned driving with friends, doing maintenance together, and using the car to connect with people living far away. Some also mentioned a sense of community with others who love the same car model or brand, attend car shows, or use the same fleet service. Many also mentioned how the car could be seen as a reflection of themselves and others. This, together with many memories involving other people, suggests that social interaction could be a path to connect with the vehicle. The final guideline focus on the social aspect.

G5. Allow for social interaction

6.2 Astro

Astro is a proof of concept of the guidelines described in section 6.1. Astro consists of two main concepts, one being a new home screen with a personal profile, and the second part is an app for collecting star constellations.

The idea with the profile is that all settings and data related to the user will be stored in a profile connected to the user rather than to the car. This makes it

possible to make all Polestar cars feel like your own. The user will have an avatar representing their profile in the form of a personal constellation that the user can create by themselves. The goal of the profile is to make the transition between cars seamless. The profile will make it possible to get the same experience from renting a car as if owning one.

Astro also features a star map, where constellations will be created over time as the user completes different challenges and reach milestones. It is a way for the driver to challenge themselves and their driving habits at the same time as they are creating a personal star map. The user can compare their progress to their friends as well.

6.2.1 Views

When users start the car, they will be greeted by their name, personal constellation, and favorite applications as widgets, see Figure 6.1. The Home screen can be adjusted according to the user's wishes, and it is possible to make it personal. Users can change the background, add more widgets, and modify their personal constellation. Having the user's name and personal constellation on the Home screen makes it feel personal and connected to the user and enforces the sense of mine.

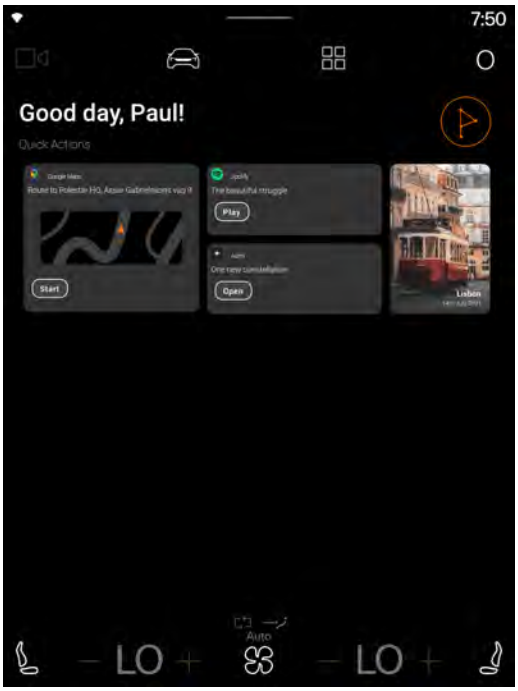


Figure 6.1: The Home screen.

If the user presses on the personal constellation in the top-right corner, see Figure 6.1, the user will navigate to the Settings screen, see Figure 6.2. In the Settings screen, the user can find settings related to their account, such as Sound and Light in the car. One can also access their Profile from here. When entering *Profile*, the user can see and change their personal constellation, see Figure 6.3. The Profile screen allows the user to reset their constellation and draw a new one. There is a

limitation on how many stars the constellation can contain, and the idea is that the number of stars available will grow as the user collects more constellations in the Astro application.

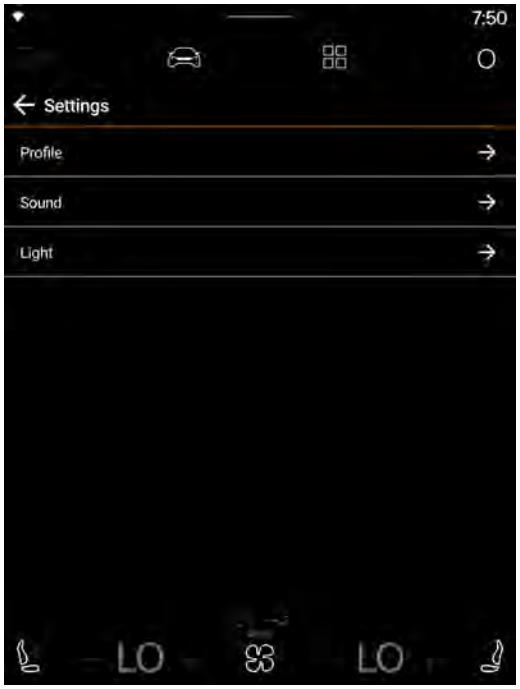


Figure 6.2: Screen for the settings menu.

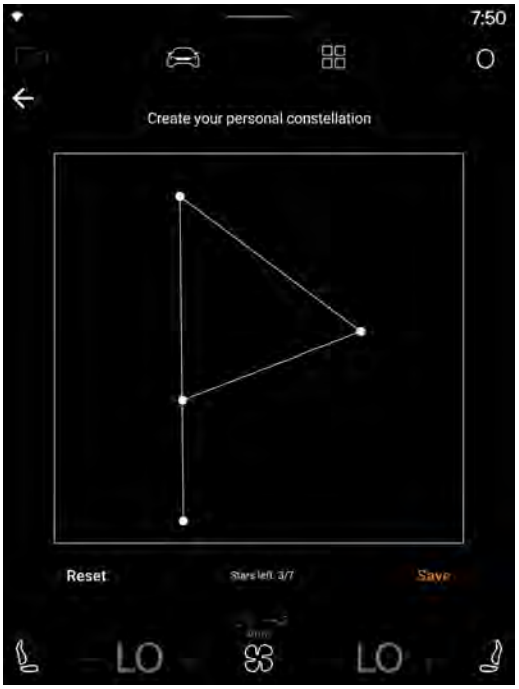


Figure 6.3: Screen for creating the personal constellation.

When the user enters the Astro application from the Home screen, the user will meet the interface shown in Figure 6.4. On this view, the user can see the constellations they have and are in the progress of completing. In addition, the user can also see a progress bar at the bottom of the screen, which summarize how many completed constellations the user has.

Next to the progress bar is a button that helps the user navigate back to the Polaris star. This button is only active when the user has moved around in the space. Figure 6.4 illustrate the button when it is deactivated, and Figure 6.5 shows it when activated.

Each line between two stars is connected to one challenge. When the user completes the challenge once, the first line for that constellation will be drawn in orange. Constellations that are entirely done and completed are illustrated with solid lines, while those in progress are illustrated with dotted lines instead. This makes it possible to differentiate between the ones that are completed and in progress. The challenges are mostly connected to encouraging the user to make more environmentally friendly choices and prolonging the car's lifecycle. Examples of challenges are: "Charge the car with green energy" or "Keep the battery level between 40 - 60 %".

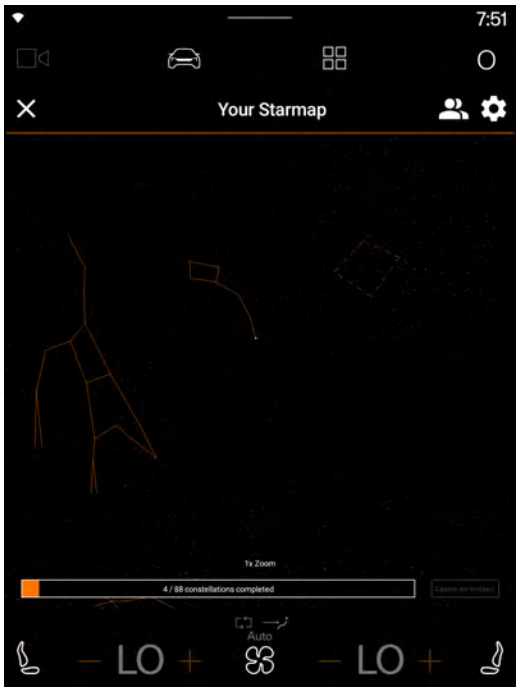


Figure 6.4: The user's star map. Centered on Polaris.

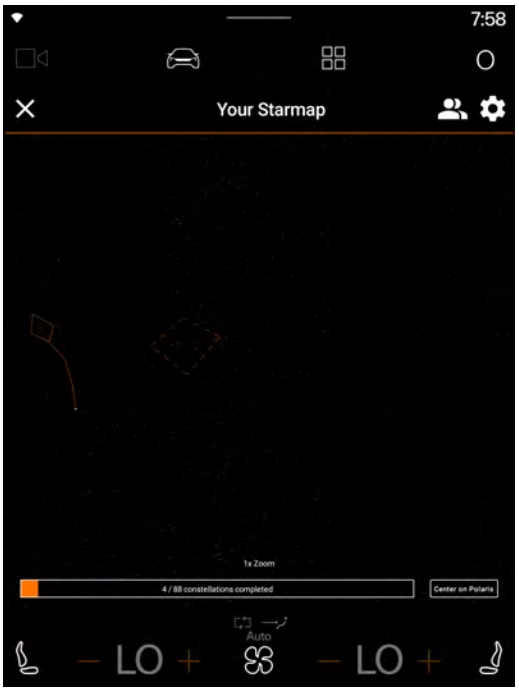


Figure 6.5: The *Center on Polaris* button is active.

If the user wants to see more information about a constellation and how it can be collected, they can click on it. A pop-up will then show up with information about the constellation. If the constellation is not yet completed, the pop-up will be black and white, see Figure 6.6. If the user clicks on a completed constellation, the pop-up will have some orange elements as well, see Figure 6.7. The orange color has been used throughout the application to indicate that something belongs to the user.

It is possible to zoom in and out in the application. To help the user understand how far they have zoomed, an indicator has been added above the progress bar, see Figure 6.8. When fully zoomed out, the zoom is on 1x, indicating that the user can not zoom out further.

To know what constellations are possible for the user to collect, an option to show all constellations is available. This option can be found when clicking the *Settings* icon in the top-right corner, see Figure 6.9. When this option is enabled, the user will see all constellations that are possible to collect, the ones that are not yet in progress or done are visualized in white. The user can click on all constellations to learn more about them.

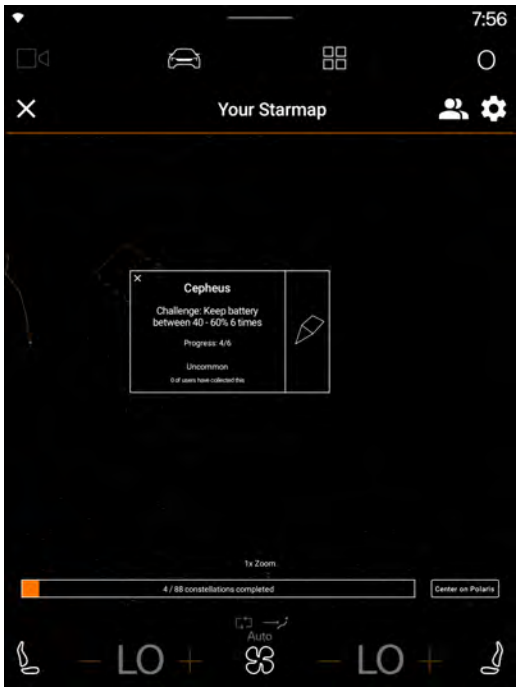


Figure 6.6: The pop-up window for not completed constellations.

Figure 6.7: The pop-up for a completed constellation.

Figure 6.8: The star map when zoomed in.

Figure 6.9: The option *All constellations* is activated.

A critical feature of Astro is the possibility to compare one's progress to their friends' progress. This can be done on the Social screen. The user can find this by pressing the *Social* icon at the topbar in Figure 6.9. When entering the Social view, the

user can see their own and their friends' "Galaxies" and a leaderboard, see Figure 6.10. On each galaxy, there is a personal constellation that indicates whose galaxy it is. The user can also see their own in orange. The friends shown here are friends that the user has chosen to add to Astro. If the user wants to add a new friend to Astro, they can click on the *Add* icon in the top-right corner, see Figure 6.10. The leaderboard is placed in the bottom-right corner, showing the top friends with the most extensive collection. The leaderboard emphasizes the possibility of competing with one's friends and can motivate the user to collect more.

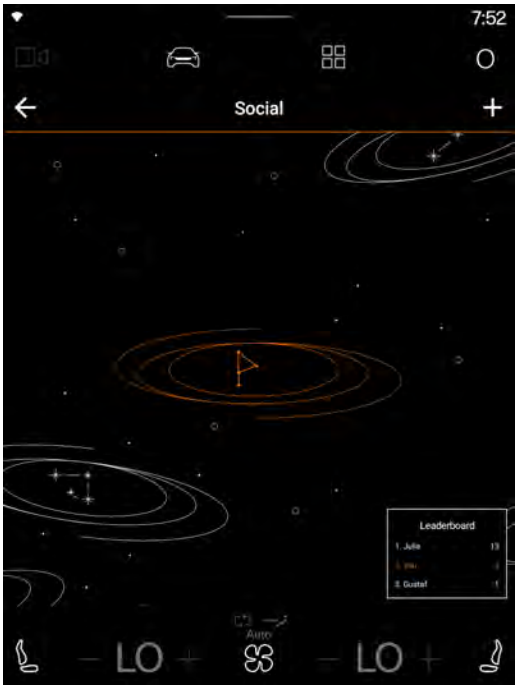


Figure 6.10: The social view, containing friends and a leaderboard.

If the user clicks on a friend's galaxy, they will see that friend's collection. To indicate that the user is viewing someone else's constellations, the constellations are drawn in white, and the friend's name can be seen in the topbar, see Figure 6.11.

One can also compare one's collection to a friend's by enabling the comparing option under the setting icon, see Figure 6.12. When this option is enabled, the constellations can have three colors; orange, white, and a combination of orange and white. The ones in orange are constellations that only the user themselves have collected, and the white is for the ones that only the friend has collected. The ones that are a combination of orange and white are constellations that both users have in their collections.

Figure 6.11: Viewing a friend's star map.

Figure 6.12: Comparing the user's constellations to a friend's.

6.2.2 Design and Guidelines

This subsection will present how the application Astro adheres to the created guidelines.

G1. Each interaction is unique, the design can only set the conditions for the user and vehicle
G1 is more of a reminder than a strict guideline, but has still been utilized in the project. It is not mandatory to use all guidelines, but using multiple ones will increase the possibility that the design establishes an emotional connection between driver and vehicle since more routes to it will be created. For example, even if a user does not respond to the social aspects of the application, there are other ways that might trigger the connection. In Astro, all other guidelines have been used in various ways, and multiple strategies have been used to make connections and motivate users.

G2. Create space for user modification without hurting uniformity and limiting contamination
G2 is a guideline that can be achieved in multiple ways and to many different degrees. In Astro, this guideline can be seen throughout the application. One way is that all settings and changes the user applies to the car are connected to software only and saved in the cloud. This allows the user to adapt the car to their preferences without hurting the following user's experience. Saving the user profile and settings between cars can also make it easier to use since the user will be accustomed to the settings and will not have to make any changes.

Another customization option is that the user can create their own avatar in the shape

of a constellation. The user gets a set amount of stars and can draw a constellation that is used to represent them. The user gets seven stars for their constellation. The personal constellation is visible to the user and friends in the Polestar community.

It can also be argued that the star map itself can be seen as a way to customize the app based on the user's preferences. The user can decide what challenges they want to complete and create the constellation they wish for by solving certain challenges.

On the Home screen, the user can add widgets for their favorite applications to have fast access to them. This is also one way the user can modify the screen to fit their need and personal preference. The user can have the background of their choice together with personal widgets.

G3. Design for multiple interactions over a longer time period
One of the main focuses of Astro is for the user to let it take time to build and create their star map with the constellations and to be rewarded for using it over time. This is strongly in line with G3.

The challenges are connected to time, as the user needs to do what is asked several times to complete it. The progress will be visualized with a dotted line between the stars in the constellation. The challenges are built this way to encourage the user to come back and use it again to promote the use of the application over a longer time, allowing for a connection to be formed. The application was first designed to be slow, used over time, and become part of the user's life. By visualizing the progress, the user will receive some feedback, encouraging them to continue.

The user can see what needs to be done to complete the challenges by pressing on a constellation. The pop-up window will change color when the user has collected it, from white to orange, to give more visual feedback on completion.

Another way the application has been designed for multiple uses over time is through the saved settings and profile. The same interface, their Home screen, is present throughout all the cars they use, along with their settings and progress. The user will know how it works since they have customized it and will not have to relearn anything when entering a new car. This feeling of uniformity might be strengthened if the same car model is used.

G4. Design for meaningful experiences
G4 is about creating the conditions for the user to build something meaningful and hedonic, to make the car feel like something more than a transportation tool. In Astro, this is done by encouraging the user to spend time on the application and build up the attachment over a long period. The customization options are also part of creating an environment where the user can build a connection to the vehicle and application, which can push the user towards a meaningful experience.

Astro is designed to be fun and stimulating while prompting the user to drive more sustainably. By making the user reflect on their driving behavior, using gamification and nudging, the user might feel like they are contributing to a more sustainable society and, through that, find it more meaningful.

Moreover, the social aspect of the application can also be one building block for

reaching a meaningful experience. As the user can see their friends' progress and feel a connection to them, the connection to the application can also grow.

G5. Allow for social interaction
The fifth and final guideline is to allow for social interaction. For G5, finding a solution for letting the user feel that they have a community and social connection to the object or app is important. In Astro, this is implemented by allowing the user to compare their collection to their friends' constellation collection. The user can visit their friends' "galaxies" to see and compare their progress to their own. The leaderboard makes the connection to the other users feel closer, as it becomes easy to challenge and compare themselves to others.

Moreover, the avatar can also be connected to G5 as it can be a way to let the user communicate and express themselves to their friends. It can be connected to the user's identity.

6.2.3 Branded Interaction

The space theme of Astro was chosen as it can be seen to be related to the star theme that one can connect to Polestar. As presented in subsection 2.3.1, the name Polestar does not originate from space. Instead, it has a connection to racing and has been repurposed to fit the metaphor of the guiding star and, therefore, space. The space connection can be made through the logo and color names, but it seems to be more present in future Polestar models. For example, in Polestar 4, the ambience can be changed by selecting a planet in our solar system. The space theme, therefore, becomes more apparent, as it is a vital part of interacting with the infotainment system. Integrating the space theme through user interactions strengthens the brand's connection to space. This is similar to how Astro was designed.

Pure can be seen in Astro's design. The star map is minimalistic, and the design has a lot of breathing room. As described in section 2.1, car dependency is growing in society, and this is a hinder when it comes to car sharing since people want to feel that they have a car when needed. At the same time, the cars are unused for most of the day. This makes fleet an interesting area to work with, as car sharing could solve this problem and be a more sustainable choice. Sustainability is something that Polestar values, which can be seen in *Progressive* in their identity, see subsection 2.3.1. One of Polestar's goals is to have a car with zero greenhouse gas emissions. Therefore, it is in line to have an app that makes swapping between cars easier and encourages users to improve their driving habits. Astro connects to *Performance* by improving the driving experience and creating user enjoyment.

6.3 Result From Final Evaluation

The final evaluation contained an interview and a questionnaire to test the concept. The findings from this are the following:

6.3.1 Social

The test showed positive results regarding the social aspect of the application, as all participants expressed that they appreciated it, and the majority wanted even more social interaction. Several participants mentioned that it would be fun to have the possibility to communicate with their friends as well, either through default messages or through a chat function. Three participants said they would like to ping others to show their progress and, through that, motivate their friends and get inspired by others. One participant discussed that this would strengthen the presence of others in the application, and one would understand that others used the app as well. It was also suggested that one should get notifications such as "[Friend] just unlocked this constellation. Do you want to try as well?" to trigger the competition between friends. Many said these features would make them more invested and probably use it more.

The participants were asked who they wanted to see in this kind of application, only their friends or the whole community. All participants were positive toward seeing all persons in the community. However, they would like to have it as two different views where they could navigate between them and not have it as a default that the whole community could see your progress.

Currently, the user can only watch their friends progress and compare to their own, but not see more information about any constellation. Although this was something that the participants missed, the majority of the participants tried to interact with the star constellations to find out what constellation it was and the challenge the friend had completed to be able to get it.

The app's social feature seemed to be one of the key elements in the application, and all participants agreed that if their friends stopped using it would affect their usage of the application. One participant mentioned that it would be interesting to see others' usage of the fleet and to be able to discuss it with them when meeting them in person. Participant 3 said, "... and then when I meet [Friend] I can say like damn you drive the fleet a lot, and then talk more about it and create engagement around it".

6.3.2 Gamification

The gamification aspects of the application were met with positivity, and the participants expressed enjoyment for them. Some participants related it to other activities, such as gaining trophies on their smartwatch for reaching milestones or completing achievements in video games, which they enjoy. For example, Participant 1 said, "Yeah, I play a lot, so to be able to play while driving would be perfect. I like to achievement-hunt in games and such. This is exactly what I do in games, so for me personally, this would be really fun." Participant 1 explained further how they thought this would encourage users to use the car more and create a stronger connection between vehicle and driver.

Being able to compare progress with friends was something that all participants were positive towards, although many of them expressed that others might not share

their sentiment of competitiveness and therefore suggested adding a toggle to hide the leaderboard. Some explained that they needed the motivation from competing with friends since they thought that would be fun and result in more continuous use of the application. One participant said they liked being able to compare with friends but would also be fine with using the application on their own if it were stimulating enough. One worry for the leaderboard was if the user was stuck on one position for too long, for example, at the bottom or the top, or if no changes were being made to it. Being last for too long could be demotivating, but the same could be said about being first since always being at the top would not be challenging. One participant mentioned that the challenges had to be quite difficult for them to be engaged and care about their friends' progress. The challenges were another worry for the participants. Some commented on how much time it would take to complete the challenges. If it takes too long, it would not be fun, but if they completed all the 88 constellations, they would no longer be incentivized to use the application. One suggestion was to hide the progress bar, to not show how close the user was to completing all the constellations, and that the developers could add more constellations when someone was close to completing all of them, giving the illusion of an infinite amount of constellations.

6.3.3 Environment

One aspect that needs to be considered is that the challenges should not trigger the user to want to drive more, as it can negatively affect the environment. One participant commented that gamification could lead to a wish to drive more to progress faster and to create a stronger connection. It will therefore be essential to create the challenges with care to ensure that the user's driving habits will only change for the better, or at least not negatively affect the environment.

If formulated well, the challenges can make the user aware of their environmental impact and how they can use the car more effectively and carefully. Another participant mentioned the possibility of learning more about the car through these challenges but also through others and the challenges they have completed.

6.3.4 Personalization

In the final evaluation, the participants could customize their avatars in the form of a constellation, which seemed appreciated. All participants liked the concepts, and three said it was really fun. Participant 5 said, "I love it. I think it's really fun to make your own, and it's so easy as well. It is very, very pretty". A similar opinion was expressed by Participant 3 "That's fun, you can create your own icon kinda. I like that, I like that a lot. Personification of one's application or such. That is very fun". Most participants wrote their first name initial as their avatar. It was also mentioned that the complexity of it was on a reasonable level; it was easy to create your own constellation. Some suggested adding more customization options, for example, colors and being able to place more stars.

6.3.5 Brand

A majority of the participants drew the connection between Polestar and the application themselves without being asked about it. The participants thought visualizing user progress through constellations and stars was fun and well-connected to the brand. Participant 4 described how the application might connect the user to the brand, or something else that the user might associate with the application, rather than the car. They said the user might see the brand as a place where they have their profile and connections, which they thought were positive.

6.3.6 General Feedback

During the evaluation, the participants gave general feedback on the app's usability and suggestions for possible improvements. One common suggestion was to move the *Show all constellations* option, see Figure 6.9, to the start page of Astro. It was recommended to have it on the same level as the progress bar and Polaris button. Another solution could be to trigger "Show all constellations" when clicking on the progress bar. Many participants tried this action during the test when asked to find all constellations.

The lines indicating progress were not straightforward. Multiple participants struggled to understand the meaning of the dotted lines. One suggestion was to add a small wizard in the beginning, to help the user understand the different elements of the application. However, even if some elements were not understood immediately, the participants often figured out the meaning of the features by navigating around.

When the participants were asked to create a new personal constellation, multiple participants indicated they wanted a *Redo* button to delete only the latest star.

Further feedback from the evaluation was that they wished the application was more visually dramatic and pleasing. For example, one participant mentioned wanting to see more "pizazz" in the application, more advanced stars, and create a more magical experience, and another suggested some animations.

6.3.7 User Experience Questionnaire

The last part of the evaluation was a UEQ. The graphs below are all from UEQ's analysis tool.

Figure 6.13 shows that the application and concept were received positively as all areas are on or above "Above Average".

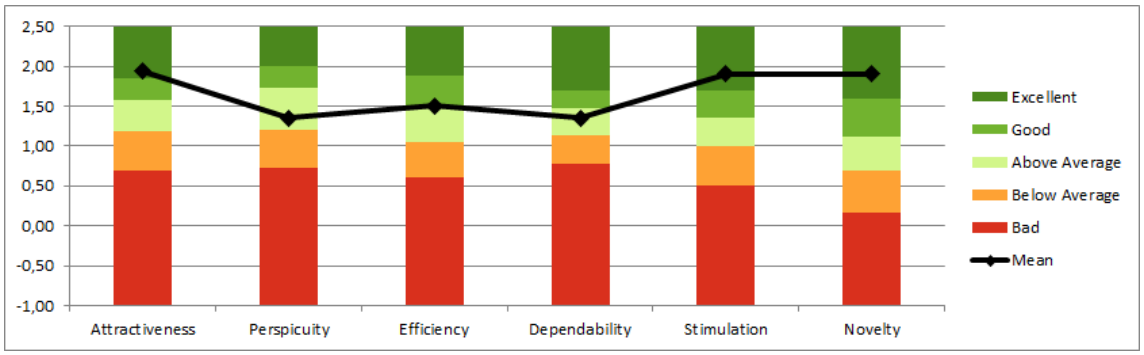


Figure 6.13: Summarized result from the UEQ.

In Figure 6.14, one can see all parameters in the UEQ and its result. All areas are on the positive side of the spectrum. Before the evaluation, some of the parameters were connected to Polestar's identity words *Pure*, *Progressive*, and *Performance*, to evaluate how well the application was in line with Polestar's identity.

The mapping was the following:
Pure: Easy - Complicated, Clear - Confusing, Organized - Cluttered, Attractive - Unattractive
Progressive: Innovative - Conservative, Usual - Leading edge, Inventive - Conventional
Performance: Fast - Slow, Exciting - Boring

Pure got a mean value of 1.4, Progressive got 1.8, and Performance got 2.0 as the mean result, see Figure 6.14.

Further parameters tested by the UEQ were the application's hedonic and pragmatic qualities. Figure 6.15 shows that the application had a higher hedonic quilty than pragmatic.

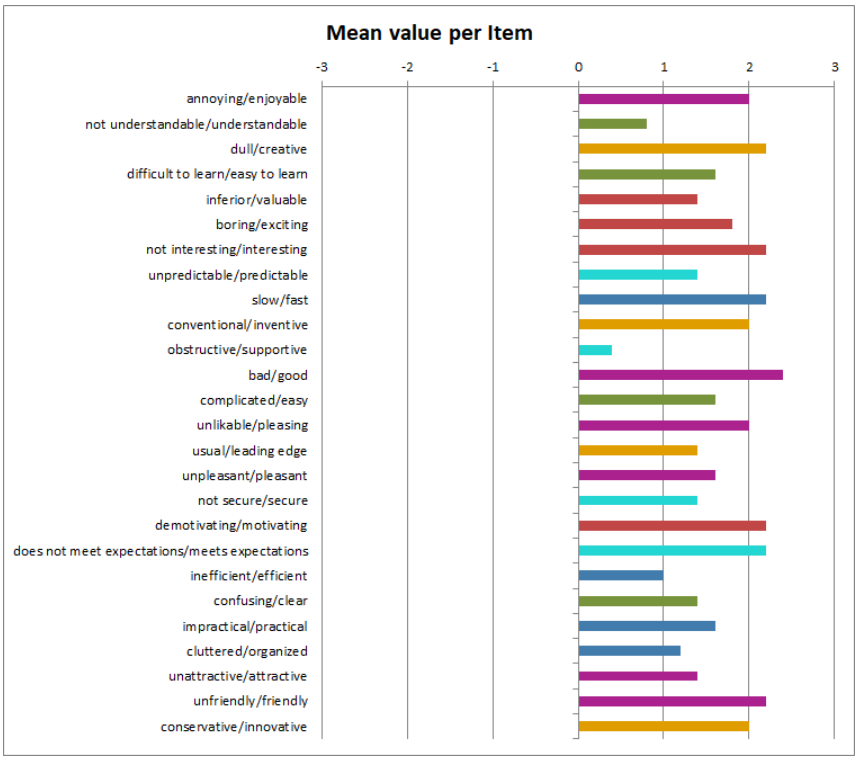


Figure 6.14: The result of all parameters of the UEQ.

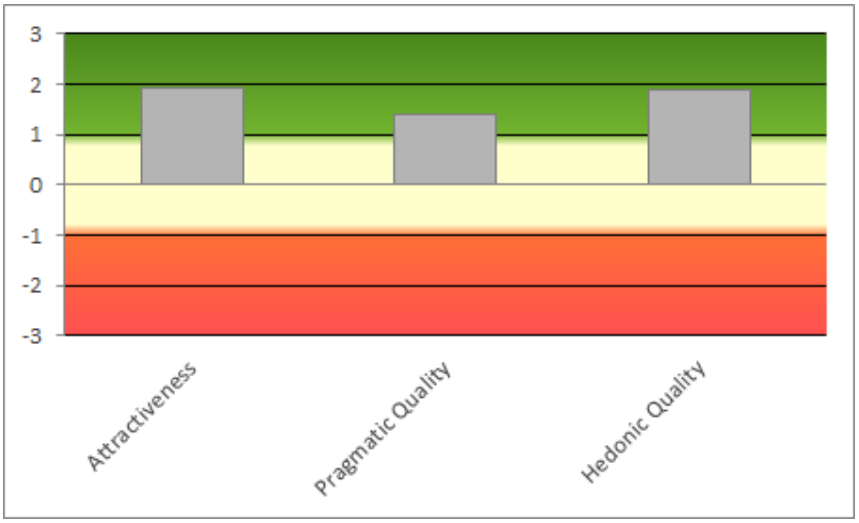


Figure 6.15: The result connected to Pragmatic and Hedonic qualities.

Moreover, one further question was added to the questionnaire; personalized - generic. As this question does not belong to the UEQ, it was not part of the summary above but instead had to be handled individually. The result of this parameter was 1, 1, 2, 3, 3, which gives a mean of 2. Since this question is not part of the original questionnaire, no comparisons to other data can be made, and the only takeaway is that the result was positive and indicates that the participants viewed the application as personalized.

7

Discussion

In this chapter, the result and the process of this project will be discussed, as well as ethical considerations, and finally, some suggestions for future work for this project.

7.1 Guidelines

The literature study and the interviews resulted in five guidelines, where G1 is more of a reminder. The set of guidelines is small, and this is an active choice. Since this is the first iteration of these guidelines, it was important to create guidelines that guide the users but do not limit them in creating solutions for establishing or maintaining emotional connections. The guidelines highlight areas that should be considered when emphasizing emotional connections, but there is not only one way to do it.

The literature study created a solid foundation for understanding the aspects needed for creating conditions for establishing connections to objects based on areas such as attachment and psychological ownership. In addition, the interviews strengthened the connection to vehicles as the ones being interviewed explained their relationship to cars and how they felt about car sharing and other car-related topics. Combining these two learnings strengthen the foundation for creating the guidelines.

Reflecting on the workshop that used these guidelines for ideation, see subsection 5.5.1, the ideas presented were quite different. It is possible that the guidelines are too few and too vague to help the designer create a foundation for emotional connection to take place and instead allow for too many different directions to be taken. Although, it is also possible to argue that the guidelines are easier to apply and allow for more than one solution since the designer can use them in many different ways and does not have to follow all of them. Too many strict guidelines could result in one type of solution, which might not fit all needs. However, the guidelines should not be generic enough for all purposes. The guidelines were created specifically for use when designing for non-owned cars and were strengthened using interviews about car use. Still, it is unclear if the guidelines differ enough from suggestions about designing for all shared objects. Comparing the created guidelines to the guidelines discussed in section 3.4 regarding psychological ownership during non-ownership, there are many similarities. *Identify Meaning in Non-ownership* is similar to G4, *Structure the Ownership Experiences* can be found in both G2 and G3 along with *Limiting Redundant Effort*, and *Mitigate Contaminated Interaction* is also present in G2. One

big difference is that G5 can not explicitly be found in any of the guidelines presented in section 3.4. One can also argue that the guidelines in section 3.4 are less specific than the guidelines established in this project. In section 3.4, the guidelines are only based on psychological ownership, while the guidelines created are also based on other frameworks and theories, such as object attachment and UX. The guidelines have also been strengthened through interviews with different types of car users.

While the workshop was never intended as an evaluation of the guidelines, the results of it can be used to suggest that, for a designer, the guidelines work as intended as they guide the designer while still allowing for creative and different solutions in various realms. However, it is not possible to say if using the guidelines will result in an emotional connection between the user and their temporary car.

It would be interesting to iterate on the guidelines as they are used on more projects and then evaluated by designers and users by working with them and evaluating the final design, respectively, to improve them. It would also be interesting to see if the guidelines would have changed if one aspect of their creation had been based on different literature. Currently, the guidelines and the interview questions are based on similar literature. Had different literature been used for the different parts, it is possible that they would challenge each other instead of only strengthening each other.

The first guideline is mainly a reminder rather than a design guideline. One might argue that the guideline is unnecessary or obvious, but it is crucial to consider it, and if one misses this aspect, the design will be negatively affected. Moreover, when creating emotional connections, it is essential to remember that all people form relationships differently. This goes in line with G4 as well, where a meaningful experience for one person might not be the same as for the next.

G2 discusses the opportunity of customizing to make it feel more personal without hurting uniformity. Uniformity can be connected to having a similar experience based on having the same car model. Since this project was executed at Polestar, which currently only have two models where the Polestar 2 model is more common and what most people think of when talking about Polestar, it was not necessary to consider how different models affect the user's experience. Moreover, one of the goals of this project was to limit the connection to the actual car and move the focus to other areas. Having access to the same car model seemed to positively affect a user's ability to connect to a car, see subsection 2.2.1. Autolib' offered the same car model for their users and saw that the users learned how the car worked, and it emphasized the sense of one car. Focusing on one model might be a key factor for the user to overlook that it is not the same car and see the software as the most important part and create a connection to it. Having only one model also strengthens the connection to the brand as one is only introduced to one brand and can learn how it works. Using the same car model for a longer period can also encourage the user to spend time learning the car's settings and functionality and therefore facilitate G3.

Executing a new test when Polestar 3 is available would be interesting as one might see how different cars would affect the result. Furthermore, it would be interesting to test it on other brands to see better if the connection is connected to the car model,

brand, or the actual software.

7.2 Applying the Guidelines

One important aspect to consider when using or analyzing Astro is that Astro only is a Proof of Concept (PoC) and an example of how one can realize an idea based on the guidelines from section 6.1. The PoC is not fully functional and still has flaws, but it has managed to capture all guidelines and is a solid start for testing the guidelines. Moreover, since the goal of the PoC has been to visualize the guidelines and some aspects have been kept on a concept level, the app's usability has been prioritized as less important. The time limitation of this project has also affected the result of the PoC, as this has been an aspect that has been considered throughout the whole development. This has resulted in the final PoC only having a limited number of features and a simple design.

Astro is an application with the goal of creating an emotional connection to a car, through, for instance, digital psychological ownership, as presented in section 3.4, that is not owned by the user. Astro is not found locally in one car. Instead, the application and the user preferences are available to the user regardless of which car they use. Having the same content available on all cars might encourage an emotional connection to the vehicle since it may be the content they have created, rather than the hardware, that the user feels attached to. Additionally, since the user uses touch to interact with the application, the feeling of control can be enforced. The challenges present in Astro can be used to remind the user of milestones reached, which can help evoke positive emotions and create a stronger bond, as mentioned in section 3.3.

The results of the final evaluation suggest that Astro is more of a SELF than ACT product, as indicated by the scores of the UEQ subsection 6.3.7. Astro scored higher in the hedonic aspects than the pragmatic ones, although both can be seen as good. As mentioned in section 3.2, a SELF product allows for a stronger bond between user and product than an ACT product, which was therefore desired from a design perspective. Having a good score in both attributes would have been even better, and it is possible that if all aspects of the application, for example, the profile, could have been a more significant part of the evaluation or if usability would have been considered more during development, it would have scored better from a pragmatic view. Overall, the results are promising and suggest that the guidelines allow for a good foundation for emotional connection to be made. However, more tests would have to be made to evaluate the guidelines.

7.2.1 Profile

A profile that one could customize and would stay with the user, regardless of which car they are using, was a feature that could be identified in many steps of the process. As mentioned in subsection 2.2.1, Autolib' allowed the user to save GPS and radio settings, which allowed users to personalize the vehicle and connect with it. This way of personalization did not affect other users since it was only changes made

to the display and would, therefore, not evoke contagion for the following user. It is also possible that having already specified one's preferences before entering the vehicle might strengthen the emotional bond between the user and the car. Since the user did not have to readjust everything, it would give the illusion of using the same car, and it is possible that they could use the time spent adjusting the vehicle to create new rituals instead, such as opening their favorite app as soon as they sit down. This could also make using the service easier. This was reflected in the results of interviewing fleet users, as seen in subsection 5.3.4. Multiple fleet users expressed that they valued the ease of use of certain fleet services, such as having the key in their phones. A solution for strengthening the perceived ownership, from the view of the interviewed fleet users, is as if the car would remember them. Instead of inputting their settings every time they use a new car, the car would remember them and adjust to their settings before entering the car. A similar idea could also be found in one of the workshop ideas, seen here in subsection 5.5.1, ideas presented: making switching between cars seamless and allowing the user to personalize the car and change their preferences whenever and wherever they are.

The idea of being remembered and not having to readjust every car the user uses seemed to be a common idea found throughout the early stages of the process. Therefore, it was part of the final ideation and finally became one of the developed concepts. However, designing and evaluating a system like this would require a lot of time and resources since it is a whole system with much deeper integration with the car. Due to the constraints of this project, it was not the main focus of the project. However, based on previous research and interviews, the concept could be identified as valuable for people renting vehicles using a service. Therefore, it was decided to use it as a foundation to build Astro upon and include smaller parts of it in the design and evaluation.

7.2.2 Motivational Strategies

In Astro, both Gamification and Nudging are being used. Gamification has proved to be a strong tool for motivating users and creating engagement, see subsection 3.6.1. It can help users to change their behavior. The advantages of gamification were elements that fit Astro as the goal is to encourage the user to use it for a longer period (G3) in order to bond with it, and to motivate the user to take better care of the car and the environment. When adding game elements to an application, it is important to establish extrinsic and intrinsic goals to create conditions for motivating the user as much as possible. In Astro, the intrinsic goals for the user could be to better their driving routines and make their driving experience more enjoyable. The extrinsic goals for this application can be competing with one's friends or completing all constellations.

Other brands have similar apps that use gamification to motivate users to drive more environmentally friendly. One example is the Mercedes me Echo Coach app section 2.5. Their app has been proven to positively affect their user's driving habits, making it interesting to explore this area further.

Besides gamification, Astro has used nudging to encourage the user towards a certain

behavior. For example, giving rewards for more sustainable behavior and taking good care of the car will hopefully nudge and motivate for more environmentally friendly choices. The effect of nudging is strongly connected to its context and timing, subsection 3.6.2. As the user will see their progress when starting the car, one can see what needs to be done to reach the next challenge. The three different nudging types, *Facilitator*, *Spark*, and *Signal*, have been used to motivate the user and simplify their use. By simplifying the task of using a shared vehicle through saved preferences, there is less friction when using a new vehicle. The constellation map, which can be visible through the home screen, subtly reminds the user of their progress and could show challenges in progress to remind further and motivate the user to drive more sustainably. Another aspect is using social comparisons to increase motivation. This can be done with both friends and the whole community. The goal of utilizing both nudging and gamification is to motivate the users to use the application for a longer time in order to establish an emotional connection, but also to help them drive more sustainably and take better care of the car. It can also result in enjoyment or, in other ways, make the service more meaningful (G4), and therefore help create a connection between driver and car.

The initial concept of Astro was heavily inspired by and based on Slow Technology, see subsection 3.6.3, but the project moved further away from it as it progressed. In the beginning, Astro was meant to interrupt the routine of getting into a car and start driving, or arriving at your destination and directly getting out of it. When the car stood still, as the user entered or was about to exit the vehicle, the map of constellations would appear, allowing the user to pause for a moment. The user could interact with the map, viewing their constellations, and reflect on them: What did they mean? How did they get them? As the user uses the application for a longer time, more constellations would be created. The user could look at their constellations to determine if they had driven sustainably and taken good care of the vehicle. The constellations were also connected to specific journeys, so the user could view a constellation and remember moments in time. However, as the project progressed, other methods were used in combination with this, and the focus changed. Hopefully, the parts inspired by slow technology are still apparent to the user, allowing them to compete with friends while at the same time reflecting on their driving and bonding with the car.

7.2.3 Emotions

As this project aims to create an emotional bond, one interesting framework to relate Astro to is Desmet's framework, described in section 3.1. Desmet's framework consists of nine sources for product emotions based on three stimuli and three concerns. For the first stimuli, *Product*, Astro is accessed and controlled through the touchscreen inside the car. The visual stimuli of the application, as indicated by the results of the UEQ (subsection 6.3.7), were received well by the participants. Astro scored excellent in the *attractiveness* category. However, looking at the *unattrictive/attractive* item, it scored below 2, which still is positive. Some participants suggested that animations and effects could improve the application's visuals. The UEQ also implied that the participants thought of the application as innovative and progressive, which also

could appraise positive emotions for the users. The *Usage* of the application, as seen by the participants' attitude in the final evaluation, was overall positive, but some aspects could be improved. Participants gave suggestions for improvements that were in line to help match their standards. For example, completing challenges and collecting constellations seemed to be a source of joy, but usability could be improved in some areas. The profile will make it easier for the user to get started when entering the car and limit excise for the user. The final stimuli, *Consequence*, is one of the most important in Astro. The consequences of using Astro could be that the user is proud of their accomplishments, as they have completed constellations in the application or reflected on and changed their driving habits. It could also be that they are pleased by the effortless swap between different cars when using Astro and storing their preferences. Hopefully, these sources will lead to positive emotions and enjoyment, strengthening the emotional connection and resulting in continuous use of the application.

7.2.4 Branded Interaction

To create a strong connection between the user and the brand, it is important to clearly communicate the brand's core values as mentioned in section 3.5. This project has been designed with Polestar's identity and connection to space in mind, but no guidelines from Polestar regarding its brand and design have been followed. Information about their identity has been found online, from journals and interviews about Polestar's design. This means that even though the concept can be mapped to the brand's identity and it was received as fitting the brand by a majority of participants in the final evaluation, subsection 6.3.5, the brand might not agree.

In the final evaluation, multiple participants said that the theme fitted Polestar and saw the connection immediately, subsection 6.3.5. This could also be seen in the UEQ, see subsection 6.3.7, where the parameters mapped to Polestar's identity got values between 1.4 to 2.0 (on a scale of -3 to +3). This indicated Astro has qualities that can be tied together with qualities that Polestar values. However, this only indicates that it can be a suitable application and way of implementing challenges in a Polestar.

One comment from the final evaluation was that the connection might be formed to Polestar as a brand rather than to a specific car, subsection 6.3.5. This comment is interesting for many reasons and would be interesting to look deeper into. Connections can not only be built to an object, one can also feel connected to a brand or product category as well, section 3.3. At the beginning of the project, the goal was to move the idea of the car to a profile in the cloud to make the transition from one car to another easier. Therefore, The initial thought was to build the connection one has to a physical car today to the profile. However, moving the connection to the brand might have a similar effect.

It would be interesting to investigate further what the user would make their connection to, as it might not be the same for everyone. Moreover, how the connection might change depending on what the user feels most connected to. As the final evaluation in this project could not contain tests over time, it is hard to get a sense

of what their future connection would be.

7.3 Reflecting on the Process

A noteworthy discussion point is using inductive analysis for analyzing the interview results. An inductive approach was chosen over a deductive one to challenge the established guidelines and create new ones based on those findings. However, no new guidelines were created from the analyzed interviews since the results strengthened the established guidelines. This could be because the interview questions were based on the same literature as the established guidelines, and therefore, no new guidelines could be created. Since one can not perform an entirely inductive analysis without any bias or preconceptions, it is also possible that the established guidelines unknowingly guided the inductive analysis.

Even though this project involved external people in four stages: interviews, workshop, feedback, and evaluation, it would have been beneficial if they were done with larger test groups and a more diverse set of people. One concern with the executed interviews, both in the pre-study and final evaluation, is the lack of diversity. The great majority of the participants were men between the age of 25 - 40, and many of them worked at Polestar. Having a homogeneous selection group can have affected the result of the study due to the lack of different perspectives.

For the first interview, 16 participants were interviewed, where some were interviewed regarding Fleet and some for their car enthusiasm, subsection 5.2.2. This resulted in a good understanding of people's connection to vehicles and how it can differ from person to person. However, interviewing 16 people was enough to reach a saturation point.

The group was relatively small in the workshop and feedback session (six and eight persons), but as these sessions were intended to be intimate, the number of persons was enough. One might have wished for a second group as well, but this was not prioritized due to the limited time.

Due to the lack of time, and limited access to a test car, it was decided only to have one pilot test and five participants for the final evaluation. However, five participants turned out to be enough as they started to give repetitive answers and still got a lot of valid feedback. According to Nielsen Norman Group [64], five participants are when one has found the majority of the usability issues. They continue saying that testing with more than five people even can be considered a waste of time.

The structure of the final evaluation captured many aspects of the project and gave a good understanding of how others perceived and understood the concept. It was prioritized to have the test in a real car rather than using a rig to give the participant a more realistic experience. However, this affected the number of tests that could be carried out.

Since the final evaluation was quite limited in time and done on a prototype without all functionality, it could have affected the results and findings. For example, some features did not have any actual functionality. Some features were done with the

help of Wizard of Oz, for example, using a database to change the progress of constellations instead of reading signals from the car and progressing based on driving, while others were hard-coded, such as the user's friends' progress. This meant that the evaluation had to use scenarios to give the user context, and they themselves could not complete any constellations but instead were told that they had completed them in the scenario. The prototype only featured ten challenges for the 88 constellations, and limited information was displayed about each. One of the created guidelines for designing for emotional connection was *G3. Design for multiple interactions over a longer time period*, however, the evaluations of the concept Astro were done in one sitting, and therefore this could not be evaluated. Instead, questions about the future were asked, and the scenario was described as they had continued to use the application to try to capture some aspects of how they would anticipate their next and continuous experience with the application. Had it not been for the lack of time and the current state of the prototype, an evaluation spanning a larger time frame would have been done and would therefore test the cumulative UX over time. In the current state, the evaluation aimed to evaluate cumulative UX through the other three time spans of UX: anticipated UX, momentary UX, and episodic UX (see section 3.2). However, it is uncertain if this was reached. As mentioned, the anticipated UX was tested by presenting a future scenario. Momentary and episodic UX were tested by interacting with the system and then reflecting on their use of it.

As one of the aspects of this project is the star theme and its connection to Polestar's brand, it would have been interesting to have involved someone from the brand team in the process.

7.4 Final Evaluation Results

As mentioned in subsection 2.2.1, Zipcar users did not want to engage in the community. Interestingly, during the final evaluation of Astro, the participants appeared excited to be actively part of and interact with the community, as presented in subsection 6.3.1. In a social aspect, friends seemed to be more important than the rest of the community, but they were still interested to see how the rest of the community was doing and to interact with it. This could also be seen in the workshop, see subsection 5.5.1, where one of the final ideas presented was creating a community around the fleet service and anthropomorphizing the cars. However, it is important to note that the evaluation took place over a limited amount of time, 30 - 60 minutes, and the participants could not interact with any real community. It is possible that their sentiment towards being part of the community would change if they actually had to interact and share cars with the people in the community. It was also remarked that Zipcar was a cause of embarrassment, not pride, in subsection 2.2.1. It would be interesting to see how Polestar, a brand heavily focused on its brand and design, would affect the users' engagement and willingness to be actively part of the community.

In Astro, users are rewarded with a new constellation when they complete challenges.

However, one question discussed during the project is whether the reward is enough to motivate the user to continue using the application. From the user evaluation, it became clear that this can vary between different users. For example, one participant mentioned that the feature of comparing one's results with friends in the app is enough to motivate them to continue using the app. At the same time, another user said that the challenges would have to be of higher difficulty if they were to be engaged. This can also be connected to the different opinions on the progress bar. According to one participant, the progress bar positively affected their motivation level and encouraged them to continue, while another user had the opposite opinion. They described that the progress bar took away the feeling of it being infinite and raised concern about what happens when one completes it. Moreover, if the progress is experienced to be too slow, the user can become unmotivated.

7.5 Ethical Considerations

The ten different challenges present in the application are not part of the evaluation but are there to populate the view. However, they are also an indicator of the intended direction for the challenges. Most of the challenges are related to sustainability through the car's and battery's health. It is possible that by forming a bond between driver and vehicle and having challenges that promote a more sustainable use of the car, the driver would take better care of the car and, therefore, last longer. A similar effect could be seen with the Mercedes me Eco Coach application, as mentioned in Related Projects section 2.5. This association with the environment could connect the design with Polestar's identity through *Progressive*. Another aspect of the challenges is ethics; the challenges should not be used to promote using the car more, driving faster, or spending money on it. While it is possible that a reward system similar to this would result in more use of the service, none of the challenges are explicitly related to driving more. The challenges should neither encourage reckless driving, such as keeping certain speed limits, nor driving a route as quickly as possible. Instead, the challenges prompt the driver to keep the battery healthy or use the car in a more environmentally friendly way. As mentioned in Ethics section 1.5, it is possible to use a system like this for economic gain, for example, as mentioned encourage the user to drive and use the service more, or by locking certain rewards behind paywalls, for instance, by requiring the user to subscribe to a specific service or pay for a feature to complete a constellation.

When designing for cars, it is essential to have safety in mind and make sure that the design is not a distraction in traffic. This means that the progress of challenges should not be shown when driving, as not to take away focus from the road or influence their driving negatively, but rather should be presented after arriving safely at their destination. A consequence of this is that the user can not see the constellations being drawn in real-time and, as a result, not notice when they are actively progressing a challenge. Instead, they are only shown their progression after they have achieved it, which should be visualized in a good way and ensuring that the user can easily connect how they achieved the progress.

An essential aspect of the design is the saved data between cars to make using

multiple cars seamless and seem like one. Since the cars will greet the user and appear to remember their settings and preferences, data about the users must be stored in the vehicle. Therefore, it is essential that the data can not be accessed by the following user that uses the car and must be cleared after each use. It is also crucial that the user gets the correct data when entering the car so that they are greeted with their name and their own settings and upholding the illusion of using their own car, but also as not to display sensitive data, for example, their saved destinations, to the wrong person. Additionally, this would also hurt G2 since it would remind the user that others use the car, which might result in the feeling of contamination.

Lastly, if users can interact with each other and the community as a whole, it is crucial to think about and prevent harassment and similar. Something mentioned quite frequently in the final evaluation was being able to interact more with other people by, for example, sending messages to them. While this could be used to motivate and compliment each other, it is also possible to use it for malicious intents. For example, users could spam or write hurtful messages to each other. One way to combat this is only allowing friends to write to each other or only including default messages that users can use to cheer on each other or engage in some friendly banter. A limit could also be set to the messages so that the users can not send too many messages in a short time.

7.6 Future Work

The final evaluation resulted in a lot of feedback that should be considered and applied. One of the areas of improvement was regarding usability, and the application could better display central features, explain different elements of the constellation, and show the connection between driving and progressing. The app should also allow users to undo mistakes instead of punishing them and forcing them to start over. As mentioned earlier, usability was never the focus of the prototype, but since there were complaints about usability, the experience as a whole became worse, and the users focused on usability instead of other areas of interest. Therefore, it is possible that the usability affected other parts of the evaluation, either because it harmed the experience or because it took time and effort from the user to give feedback on it. For future development of the application, the usability of it should be improved.

There were some questions regarding the challenges, particularly about balancing it for older and newer users, ensuring they do not run out of challenges, and ensuring that the leaderboard does not come to a standstill. One way to solve this could be to introduce seasonal challenges, where all the users' constellations are reset after some time, and new ones are introduced. This could make it easier for newer users to compete with older ones and ensure that no one has completed all constellations and has no incentive to use the application. One problem is that this could make using the application feel meaningless for the user since the progress will be reset anyway. However, their seasonal progression could be displayed elsewhere on their profile, for example, by rewarding them with customization options for their personal constellation based on their progress. This would reward users while ensuring no one

gets a headstart because they started using the application earlier. Hopefully, this would ensure that a few users do not dominate the leaderboard, instead, it moves and motivates people to drive better.

The current state of the application is merely a prototype. The focus of the prototype is on the star map. Designs for how the user would be notified when progression is made could be created and implemented. One idea during the process was to display the star map on the home screen using a user-chosen background image. The rest of the system would also have to be designed and implemented.

The star map could also use animations and similar to make the experience more magical. The current design was implemented because of time constraints and its relation to the *Pure* of Polestar's identity, subsection 2.3.1. However, it can be interpreted as a bit dull and could be improved. Although, it is essential not to make the aesthetics too exhaustive, as that could be annoying and strive too far away from the brand's identity.

If the application were to be further developed, a more extensive evaluation should take place as described in section 7.4. It is difficult to assess how emotionally invested and connected a user is to a product when they have used it once, very shortly, under limited circumstances. Emotional connection is built over time, and therefore the design should also be tested over time. Other issues with the application could be found as it is used over a more extended period, such as if it is motivating enough and if it challenges the users driving behaviors. However, for such a test to be made, the prototype would have to be developed much more and require much more functionality. In addition, participants that could use the applications over a more extended period would have to be found and recruited. In the end, it is possible that an evaluation like this would require an almost finished application, and even then, it would be difficult to test all the aspects of the application. For example, the social aspect of the application is better suited to be used with friends, which means that the participants either have to be friends or that part of the evaluation has to be omitted.

8

Conclusion

This project has aimed to investigate how one can build or maintain emotional connections between a driver and vehicles in an access-based context. By executing a literature review analyzing relative fields and interviewing people with different types of relationships with cars, it was possible to create guidelines that can be important to consider when designing for emotional connections.

The guidelines, see section 6.1, answer the RQ:

> *What guidelines should be considered when designing for an emotional connection between driver and access-based cars?*

and can be a tool to facilitate creating the conditions for emotional connections.

Based on the guidelines, a concept was developed to illustrate how the guidelines can be used. The concept Astro, see section 6.2, is an interactive concept where all guidelines can be identified. This makes Astro an answer to SQ1,

> *SQ1: How can these guidelines be applied in an interaction design project?*

SQ1 does not only have one answer, and it will be beneficial for more attempts to be given. Applying the guidelines in design can be a way to evaluate the guidelines and iterate on them. As of now, the guidelines were a solid foundation for creating the design, and the feedback from the final evaluation, see section 6.3, indicated that the design was in line with the created guidelines and had the potential to form emotional connections.

Astro and the final evaluation were also an answer to SQ2.

> *SQ2: How can the user's relation to the brand strengthen the connection?*

By utilizing the brand's identity and connection to space in the application's design, results from the final evaluation indicate that most participants associated the application with the brand. However, it has yet to be determined if this will impact the user's connection to the application. Moreover, the results from the UEQ, see subsection 6.3.7, that were mapped to the brand's identity were all positive. It is unclear if the outcome resulted from the participant's view of the brand or if the participants made any other connections to the brand than thematically.

In conclusion, all research questions were answered, and the result was positive. However, it is too early to say how well this prototype has the ability to create

an emotional connection. A more thorough test over an extended period needs to be performed to establish that. Despite that, the final evaluation was a good indication that it meets the guidelines and, therefore potential to create or maintain an emotional connection.

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A

Ideas

In this Appendix, the ideas from the ideation phase are more thoroughly described.

A.1 Astro

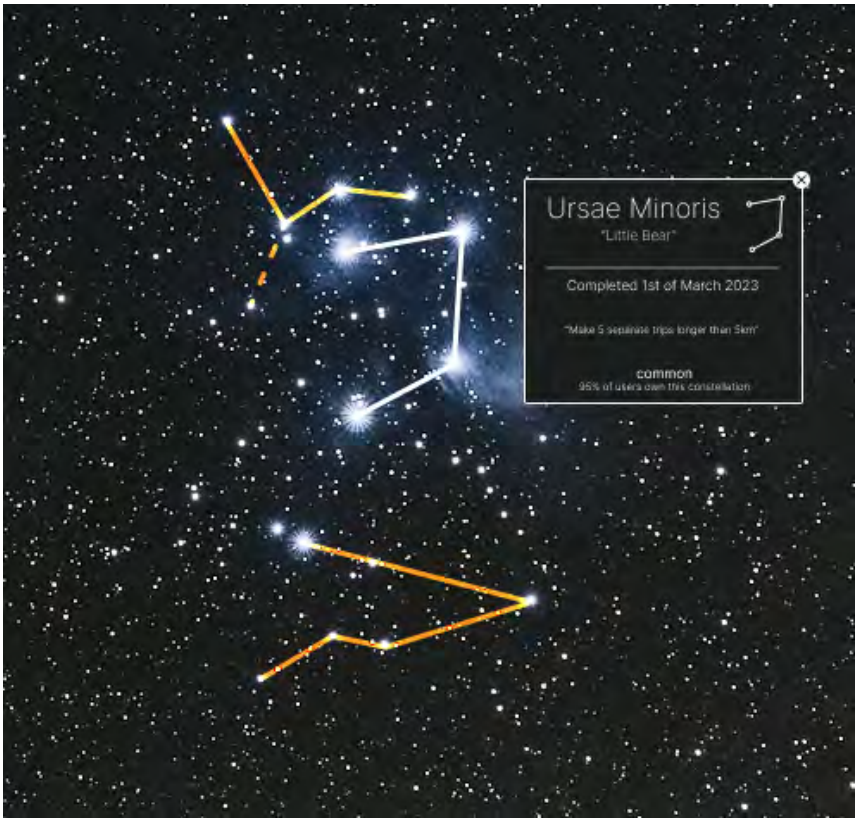

Figure A.1: A sketch illustrating Astro. One constellation is highlighted and a popup showing its status is visible.

What?
Astro is a program that illustrates milestones for using the service/driving. The milestones are visualized as constellations in a star map. In this map, you can both see your own achievements as well as your friends. You will also be able to compare your collection to others.

Why?
Astro is a fun way to capture three out of four of our main guidelines. It encourages users for multiple interactions and creates the condition for making it feel as something more than just a way of transport. Using the service over a longer period of time and having recorded milestones can hopefully support the creation of memories. Adding different challenges for collecting these star constellations can motivate users to, for example, drive more environmentally friendly and enjoy using the fleet. The social aspects, sharing your milestones with friends or comparing your collection of constellations, can create a sense of community.

When?
By driving and using the service, the user can reach milestones. The map is shown when the car is standing still and should not interfere with driving and safety. The map could be used as background (maybe even when driving, since it's quite static), but in focus and interactive when in "stargaze"-mode.

Where?
The star-map will mostly be used in the car, but can also be accessed from the phone to view your map. One more crazy idea is to project the map on the roof glass for a more immersive experience.

A.1.1 MoSCoW for Astro

Must have

- Creates "constellations" based on your milestones.
- Interact with your "constellations"

Should have

- See how other users perform.
- Share your progress with friends.

Could have

- Projected star-map (or another more immersive way of displaying it)
- Leaderboard
- Notify when cars in use create a constellation

Comments:

- The different challenges do not need to be connected to the car, it can be "walk 5000 steps" etc.
- The star-map might only be accessed in the car, the application only shows a list with the challenges

A.2 Collectibles

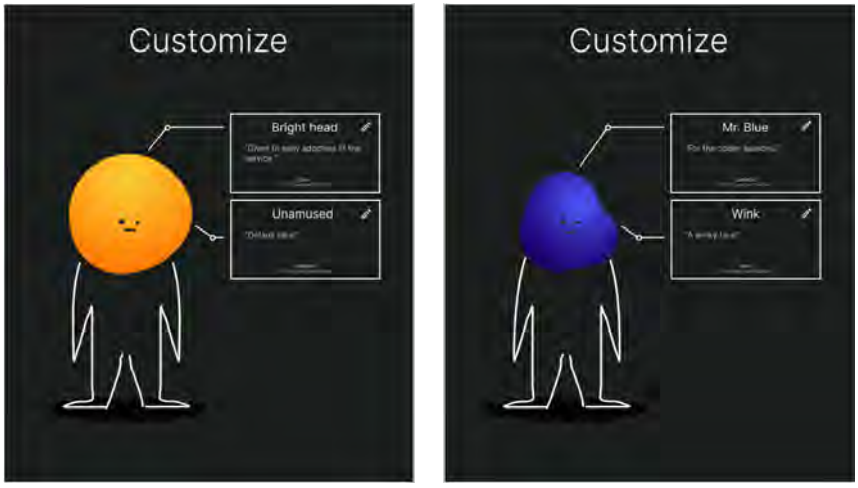

Figure A.2: Sketches illustrating collectibles. The collectibles are used to customize an avatar, however, it is just one example of how this could be implemented.

What?
Gain collectibles by, for example, reaching milestones, participating in events or being part of the community. The collectibles can be displayed on your profile. (One extension of the idea is the ability to trade collectibles with each other, this might strengthen the sense of community since it's quite social).

Why?
Gamification, social, unique, self-expression, status. Collectibles can be a fun way to motivate users to drive more carefully or be part of the community. See how many others own the same collectible as you, if you have rare ones you might want to display them to make your profile more unique. Customize your profile with collectibles. The more items the user collects makes it easier to create a profile that fully reflects themselves. Show off your collections to others, for example, if you own Polestar Performance then other users can see that.

When?
Users are awarded with collectibles by interacting with the service, i.e. driving, watching a new car launch, etc., and can use them to customize their profile.

Where?
In the car and phone.

A.2.1 MoSCoW for Collectibles

Must have

- Collectibles that can be awarded to users
- A way of customizing your profile with them

Should have

- Displayed on your profile, i.e. on an avatar

- Show “rare-ness status”

Could have

- Trading

A.3 Settings + Avatar

What?
In the profile, all settings are the same regardless of which vehicle you’re sitting in. Customize your avatar to express yourself.

Why?
Limit redundant effort, multiple interactions, customization, self-identity. By never having to readjust the settings in the vehicle, the user might feel like it is the same car (and even their own car) on every drive. The users can form habits, since they don’t have to relearn the car each time. By modifying, users can feel control and express themselves and their identity.

When?
When using the car, or customizing settings or avatar on the phone.

Where?
In the car or on the phone.

A.3.1 MoSCoW for Settings + Avatar

Must have

- Settings for to user driving the vehicle
- Driving settings (one pedal drive)
- Chair

Should have

- Apps
- Downloaded
- Logged in
- Customizable avatar

Could have

- Other settings
- Sound
- Light

A.4 Memory Map (suggested name: Memory Lane)

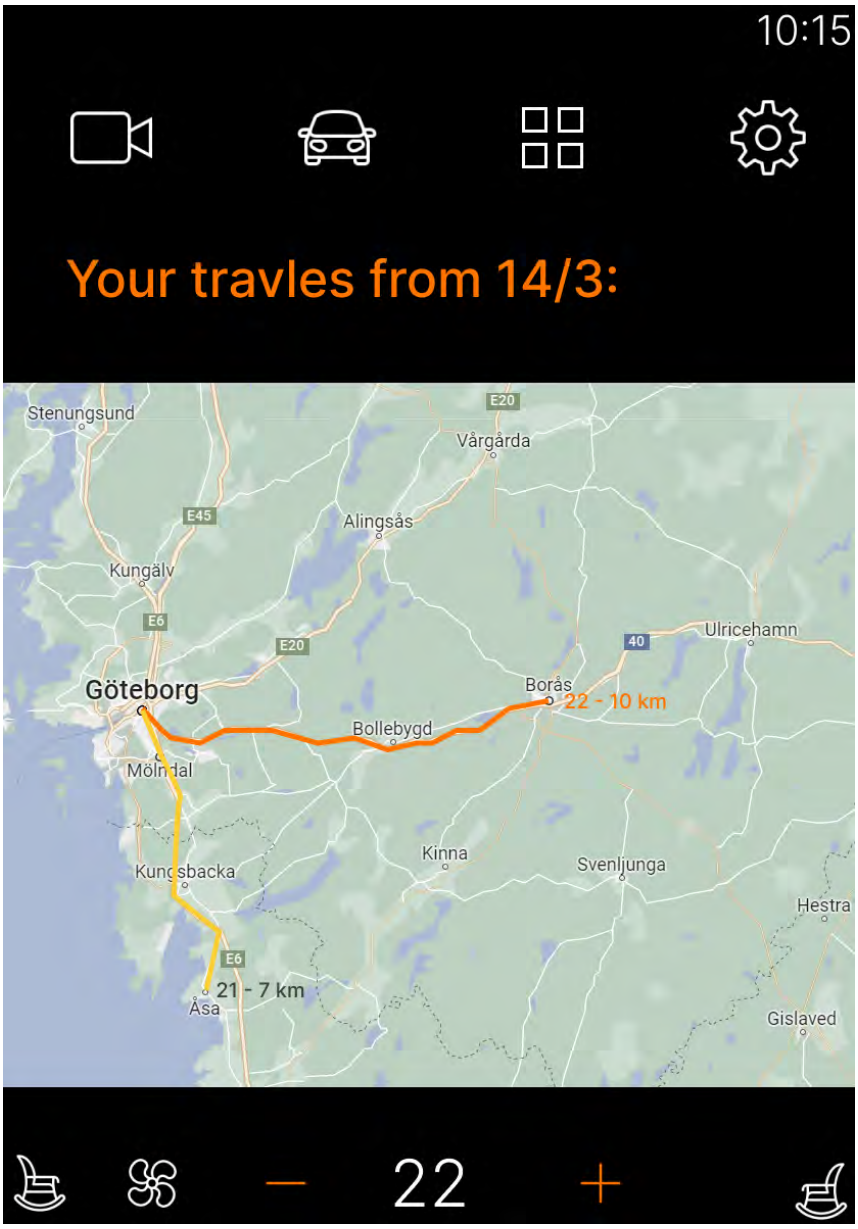

Figure A.3: A sketch illustrating the map concept. Showcased are two travels from previous years done on the 14th of March.

What?
"Snapchat memories - but for traveling". All trips are recorded, a year later it will remind the user of the trip. Could share certain trips with friends.

Why?
Multiple interactions, memories, and social. Adding this map will encourage the user to use it for a longer time. It will also evoke memories when showing where the user has been traveling before. This could also be combined with your friends, maybe adding the feature that one can see when crossing paths with someone else.

When?
Before you start driving. Shouldn't be disturbing.

Where?
In the car, perhaps also in the phone but not quite the same feeling.

A.4.1 MoSCoW for Memory Map

Must have

- Map that saves your driving history
- A notification, one year, later about your driving

Should have

- Interact with the data

Could have

- Share your memories with friends
- See when crossing paths with friends

B

Interview Script

Introduce us and the project
Let them present themselves
Go through the structure of the interview

Questions 1. What is your current car situation?

- If fleet user:
  - For how long have you used some sort of fleet service?
  - Why have you chosen to use fleet?

2. Could you tell us about an object you can't live without and why?

3. What is it that makes an object feel personal to you?

4. How much time do you spend with cars?

- What do you do?

5. What does Car mean to you?

- What has made you feel that way?
- Have you always had that view?

6. Last car you used/current car/fleet, what do you like the most with it?

- What did you not like with it?

7. What is the name of your car?

- Do you think it has a personality?

8. What is your dream car and why?

9. Could you tell me about a memorable moment with your car/a car/fleet?

10. Now that you have described your connections to cars, what is your opinion when it comes to sharing a car?

- Is it something you would be able to do with your car?

11. Now that we've talked about your car and how you feel about it, what would you say makes your car feel like your car?

12. Do you have any further questions or something to add about the interview or the project itself?

C

Final Evaluation

Icebreaker frågor (5 min):

- Har du bil? Vad för bil?
- Om nyare bil - använder du appar i bilen? Isåfall vilka?
- Vad är din syn på appar till bilar? Någon specifik favorit eller drömapp?
- Vilken app har du använt längst (generellt) och varför?
- Vad tänker du på när du hör Polestar?

Introduce them to Astro (3 min): Vi tänker att vi börjar med att bara introducera projektet i sin helhet för att ge dig lite kontext. Vårt projekt handlar om emotionell koppling, hur man kan skapa eller upprätthålla det mellan en förare och bil, och vi har framförallt tittat på situationer där man inte äger bilen. Genom studier har vi lyckats ta fram guidelines som vi anser är viktiga när man just ska skapa förutsättningar för emotionell koppling.

Utifrån dessa guidelines har vi tagit fram en poc som visualiserar ett exempel på hur detta kan implementeras. Vi har tänkt oss att detta är ett större system, där det egentligen finns tre delar; en digital profil, en hemskärm och en app.

Den digitala profilen gör det möjligt för fleet användare att få samma upplevelse som om du äger en bil, dvs att stolen ställs in efter dig, alla dina konton är inloggade och en känsla av att bilen kommer ihåg dig - du behöver inte ställa in allt på nytt varje gång du hoppar in i en bil.

Hemskärmen ger användaren möjlighet att anpassa den lite efter sina egna önskemål, nästan som en mobil, med widgetar osv som ger dig snabbåtkomst till det som du vill ha.

Utöver det har vi tagit fram en app, vilket också är fokuset på detta användartest, där användaren ska kunna utmana sin körvanor och bilanvändande över tid. Detta sker genom att användaren klarar av olika utmaningar och genom det bygger upp en stjärnhimmel med olika stjärnbilder. Detta sker genom lite spel liknande förutsättningar, där tanken är att du över tid ska fylla kartan med konstellationer och du kan även kolla och jämföra dina framsteg med vänner. Du har också en avatar, i form av en egen konstellation som du kan ändra, som både du och dina vänner ser kopplat till ditt konto.

Presentera scenario: För det här användartestet tänker vi att vi ger dig ett scenario för att det ska bli lättare. I detta scenario så har du börjat använda en fleet-service som har tillgång till Polestar bilar. Det var din kompis XX som rekommenderade den här tjänsten till dig, och du har nu använt den i 2 månader. Du behöver inte ändra dina inställningar när du hoppar in i bilen, de är redan anpassade efter dig, precis som att dina konton alltid är inloggade när du kliver in. Du välkomnas av skärmen med ditt namn och avatar, och du ser att dina favoritappar finns tillgängliga på startskärmen direkt. Utöver det har du börjat använda Astro också, och börjat samla på dig konstellationer.

Du är nu på väg från Digital till HQ, och har precis satt dig i bilen. Du ser att du har låst upp en ny konstellation på väg till kontoret i morse, Låt oss kika in det!

Genomgående vill vi gärna att du berättar hur du tänker när du gör sakerna

Star map Tasks:

- Låt dem titta på hemskärm
- Gå in på Astro och navigera runt där
- Därefter ta fram alla konstellationer.
- Få fram mer info om en specifik konstellation

Hur känns det här och vad tänker du kring det?

Social Tasks:

- Kan du hitta dina vänners stjärnkartor?
- Skulle du kunna jämföra den med din egen?

Follow-up questions:

- Hur känns det? Vad tänker du om detta?
- Vad tycker du om leaderboard?
- Vad mer vill du se? Något mer än dina vänner?

Customization Tasks:

- Ta dig tillbaka till hemskärmen.
- Kan du ändra din personliga konstellation?
- Vad tycker du om att ha din personliga konstellation?

Hur känns det - vad tänker du? Är det någon annan typ av anpassning som du känner saknas?

Förklara det framtida scenariot (och uppdatera databasen) Vi tänker oss nu att du fortsatt att använda fleet tjänsten, och Astro under de kommande månaderna. Vi kan nu se vad du har samlat på dig mer konstellationer, och du har även utökat ditt community. Det är inte bara du ,X och X som använder det längre. Vi kan se

att du har samlat på dig 8 konstellationer, och är nu tvåa bland dina vänner som du tävlar mot.

Questions

- Hur känner du?
- Om dina vänner hade slutat använda appen, tror du att det hade påverkat ditt användande av Astro?
- Säg att du fortsätter använda appen över tid, tror du att din syn på den hade förändrats?

Questionnaire - User Experience Questionnaire

26 standardized questions regarding the experience using semantic differential. We're using it since it is tested and evaluated. We will add one question: Personalized - Generic, to capture the aspect of identification and personalization.

Wanted to add questions regarding the three words describing Polestar's identity, but similar questions already existed and instead we have chosen to map them to the existing questions.

Pure: Easy - Complicated, Clear - Confusing, Organized - Cluttered, Attractive - Unattractive **Progressive**: Inventive - Conventional, Usual - Leading edge, Innovative - Conservative **Performance**: Fast - Slow, Exciting - Boring