Behind the Wheel

Exploring the influence of cognitive ergonomics in peer-to-peer car-sharing interactions

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List of Definitions

01
The name of the car model of Lynk & Co.

AVN screen
The screen that contains features such as audio, video and navigation (AVN). Often located in the middle of the dashboard.

Borrower
Someone who borrows a car via a sharing platform.

Business-to-businuess (B2B)
Form of car sharing in which only members of a specific company can take part, such as pool cars.

Business-to-consumer car sharing (B2C)
Another form of car sharing is where the user can rent a car via the sharing platform hosted by a company. This company is also the owner of the to-be-borrowed car.

Car Culture
The car culture is a culture in which society is built around cars. It is combined with the politics of the car industry, the car infrastructure, the land use for cars and the neglect of public transport.

Car owner
A car owner is someone who subscribed to or bought the Lynk & Co 01.

Car-sharing
A service by which members get access to a fleet of vehicles and share the usage of this on a per-trip basis.

Cognitive ergonomics
Is about mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.

Consumer-to-Consumer (C2C)
This is the same form of car sharing as peer-to-peer car sharing.

Digital key
The digital key is a way to open, start and close cars. This type of key is available with some services on the phone.

DIM/Cluster/Drivers display
The driver's display is the interface in front of the driver that shows relevant information.

Free-floating
Free-floating is when cars can be parked in a certain area and do not have a specific parking spot. It also relates to 'service areas', which are small free-floating sections.

Haptics
Haptics falls under the field of kinaesthetic communication, which focuses on tactile contact as a form of communication.

Human Machine Interface (HMI)
The HMI are features and components of car hardware and software applications that allow drivers and passengers to engage with the vehicle, as well as the outside world.

Infotainment system
Is a collection of hardware and software in automobiles that provides audio or video entertainment.

Lender
Someone who owns a car and lends it to borrowers to use it.

Modality
Mode of transport, such as the train, tram, car, bike or bus.

One-way
With one-way the car can be returned somewhere different from the pickup location.

Peer providers
People who offer their private car for car-sharing.

Peer-to-peer car sharing (P2P)
In the peer-to-peer version of car-sharing, individuals offer their car for rental to other individuals, via an online platform, provided by an external party.

Sharing economy
An economy in which consumers grant each other temporary access to under-utilized physical assets, possibly for money.

Two-way
This indicates the type of sharing. Here the car must be returned to the same location as where it is picked up.

Executive Summary

This graduation project, conducted in collaboration with Lynk & Co, delves into the examination of their current car-sharing service. Lynk & Co, an automotive brand featuring the 01 model, provides a comprehensive sharing platform allowing owners to share their vehicles, even with strangers. However, concerns arise when sharing with strangers regarding the ability to trust the borrower and their driving behaviour. Consequently, owners often reject booking requests from unfamiliar individuals, resulting in a low acceptance rate.

A thorough literature review and a questionnaire revealed five primary motivations for owners' reluctance to engage in sharing: emotional attachment to the car, car availability, financial risks, trust in the user and system, and user behaviour. Furthermore, a journey map identified critical points in the car-sharing service, stimulating owners to offer their idle cars, providing a means to assess borrowers, and ensuring a sense of control during bookings. These insights collectively highlighted a predominant theme—the lack of control and trust in users.
However, amidst the identified challenges, an opportunity gap emerged: the car's interior, a shared space between lender and borrower, with the potential to influence users through cognitive ergonomics. The proposed concept, named Stimulus, capitalizes on this opportunity by utilizing Lynk & Co's distinctive car features and existing sensors to collect driving data. This data creates a profile of the borrower's driving behaviour, addressing owners' concerns about control during bookings.

The designed concept employs existing sensors to enhance the car-sharing experience by providing borrowers with real-time feedback on their driving style. This feedback is delivered through haptics in the steering wheel and visualizations on the car's infotainment screens. Prototyping, both physical and digital, demonstrated the efficacy of this feedback system. Testing with 41 participants affirmed that haptic feedback effectively notifies users, and visualizations encourage careful driving. Moreover, borrowers expressed willingness to share this driving data, recognizing its benefits.
The culmination of driving behaviour data is made into a trip score. In addition to in-car modifications, the mobile app is redesigned to emphasize borrower trust. Parts that are added are a different review system, detailed user profiles and a market for placing requests. In essence, Stimulus aims to empower lenders by enhancing their ability to assess potential borrowers themself and from the system, thereby increasing trust and control, ultimately leading to a higher acceptance rate.

Stimulus addresses the challenges in Lynk & Co's car-sharing service by leveraging cognitive ergonomics in the shared interior space, utilizing existing sensors for driving behaviour analysis and enhancing user trust through real-time feedback. The findings from the project present a holistic solution that contributes to more trust in and over borrowers, leading to a more beneficial car-sharing experience for the lender.

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Chapter 01

The Project

This chapter introduces the project and shows how it is approached. It explains the method used and shows what type of research and design activities were performed during this project.

1.1 Project Context

Throughout Europe, the car is the most widely used means of transport. In the Netherlands, it even accounts for 62.2% of all trips (European Commission, 2022). Owning a car means it is always available, creating the freedom to go anywhere. It can be adapted to the user's needs and thus is a comfortable way of travelling. Besides the benefits of the car itself, the infrastructure is built with the car in mind, often making it the fastest travel option.

Intercity travel can be done without having to transfer between transport modalities during the journey. However, this fast way of travelling comes with a price. According to the European Commission (2023), public transport in the Netherlands is one of the most expensive for the user. Besides the price issue, there are other concerns: such as hygiene, delays, crowdedness and safety in the public transport.
Travelling from urban to rural areas with public transport is an even bigger hassle. There is not enough investment in the infrastructure of public transport, vehicle capacity is low and connections between different transport modes are inadequate (Jorritsma et al., 2023). Being completely dependent on public transport is therefore not always possible. By looking at this information, the demand for a car will stay high in the coming years. Whether this is how we know the car now remains to be seen.

The 'car' concept is already changing. It looks like the image and the usage of it are different compared to the past. In the past, the car was mostly seen as something to express yourself. However, it looks like people are now starting to see the car more as a means to get from A to B. Therefore, referring to a car is often done with 'mobility' and the car is not a stand-alone product anymore but part of a connected service.

Not only do users have a changing attitude towards cars, but governments also do. To improve the quality of life in cities and to combat climate change, they are getting rid of cars inside the city centres. By removing public parking spaces, moving cars towards garages and hubs outside the city, and introducing environmental zones, car-free streets and future neighbourhoods are built without places for cars to drive (Gemeente Rotterdam et al., 2017).
However, cities are increasingly committed to shared vehicles. They are creating 'Mobility Hubs', commonly seen as physical places that connect a variety of transport modes, such as cars, mopeds and bicycles (Arup & RISE, 2020). Instead of banning the car altogether, people are already looking at how the car still fits into the city and can be part of a connected service for the user. To make better use of the already existing cars.

This relatively new approach to sharing cars brings opportunities for organizations and people to share their cars, also for Lynk & Co.

1.1.1 Initial assignment

This project is done in collaboration with Lynk & Co, a relatively new company in Europe. The automotive brand was introduced in Europe in 2020 (Lynk & Co, 2023). It is not a regular car brand, but one that tries, and has proven to disrupt the conventional automotive industry. They offer their car, the model called the 01, in multiple ways. It can be bought, leased and acquired via a Netflix-like way: a monthly subscription. However, this is not the only thing that makes them unique, they also provide a sharing platform on which owners of a 01 can provide their private car to be shared with others, for a self-determined time and price. When the 01 is acquired via lease of monthly subscription it means that the owner must pay a monthly all-included price for the car and services, which comes with a limited amount of mileage. However, when sharing the car this does not add up to the mileage.

This idea of sharing vehicles came from the fact that cars are parked 96% of the time (Lynk & Co, 2022), so Lynk & Co's idea is to share these cars during the time the owner does not need them. This way, fewer people need to buy a new car, which reduces the use of resources and thus reduces the environmental impact. Anyone who has the Lynk & Co app on a mobile device can borrow the 01. Currently, in 2023, around 20% of all 01 owners in the Netherlands provide their car via this platform (Lynk & Co, 2023). This number is based on making the car available once and thus not on a regular basis.

Lynk & Co is going to shift its focus in the future. By not only actively promoting flexibility but also car-sharing. From a business point of view, this has two reasons. Through car sharing, the cars are more on the street which creates brand awareness and loyalty. In addition, for every sharing booking, there is a service fee that goes to Lynk & Co, which creates additional revenue.

Currently, the amount of people providing their car is too low, around 20% of all owners (Lynk & Co, 2023c). To make car-sharing in the near future a sustainable part of the business more people must provide their 01 on a regular base. Therefore, the project started with the following initial problem statement:

> " Not enough people provide their car on the sharing platform. "

Initial problem statement.

1.2 Project Approach

The project started via a 'User-Oriented' and 'Strategic Design' approach. A User-Oriented design approach is one that focuses on the user perspective to create valuable and usable products, interfaces, services or systems (Van Boeijen et al., 2020). This approach was chosen because the main focus lies on the needs and desires of the users of the car-sharing service and the users were involved in testing the designed product.
The Strategic Design approach is to bridge business and design to innovate within organizations (The Fountain Institute, 2023) and is used to make car sharing sustainable in the future.

To investigate the initial problem statement, this report uses the Double Diamond Method (British Design Council, 2005). This method consists of four phases: discover, define, develop and deliver. These phases are used as a guideline for this project. In which the problem is first explored in a divergent way, to gather as much information and insights as possible. After that, convergent thinking is used to define the direction in which will be designed. When the middle of the diamonds is reached, again divergent thinking is used to explore the possible solutions, which are then worked out, tested and detailed in a convergent way.

Discover phase
The first phase is the discover phase, in which the focus lies on discovering what aspects are related to car-sharing.

In Chapter 2: Theme, the domain of car-sharing is broadened to explore everything related to the initial problem. First, literature research was done by looking at already existing studies by Lynk & Co. These studies are supplemented with relevant literature about car-sharing in general, more specifically peer-to-peer car sharing, the motives from (potential) users to participate in car-sharing. Field research was then conducted, in the form of a questionnaire with people who travel, owners of the 01 and people who used car-sharing before. This was done as a starting point, to see what the main concerns are. Again, the results were supplemented with pre-existing literature after which a link could be made to ergonomics, in-car but also other points during travel.

Chapter 3: Context, a business and strategic view of the problem is shown. Lynk & Co itself and external factors affecting its car-sharing service are discussed. It consists of a business, market and stakeholder analysis. Next to that, benchmarking was done with other peer-to-peer (car) sharing services and products that exploit cognitive ergonomics.

In Chapter 4: Interaction, a deeper understanding of the current interaction for both borrower and lender is shown.

Define phase
In this phase, the insights of the previous phase are connected to draw conclusions and arrive at a more detailed problem statement, an opportunity space and a vision.

Chapter 5: Journey, shows a final journey map for the lender. In this map, the critical points within the journey are highlighted. Together with a persona, which represents the most common user of the Lynk & Co sharing service and will be used during the design process.

In Chapter 6: Design Brief, the new problem definition is stated. Next to this, a scope is created with the time and area in which will be designed. At last, a vision for this domain is created, which is used to start generating ideas.

Develop phase
This phase starts with ideation and ends with a chosen concept direction together with the parts that will be developed.

Chapter 7: Exploration, elaborates on the ideation phase and showcases which methods from the Delft Design Guide were used to actively generate ideas. The ideas were later developed into concept directions, these concepts were tested against the needs and requirements. Eventually, there is the chosen concept direction with reasons why this was chosen.

In Chapter 8: Conceptualising, the two different parts of the concept were worked out and explained. Prototyping, user testing and the related insights are shown.

Deliver phase
The deliver phase consists of two chapters, in which the final design is shown and explained.

Chapter 9: Showcase, highlights the final design. The complete service is shown, how different parts are related and how they interact with the user.

At last, there is Chapter 10: Conclusion. In this chapter, the whole project is reflected on. Next to that, there are recommendations towards the company and there is a personal and project reflection.

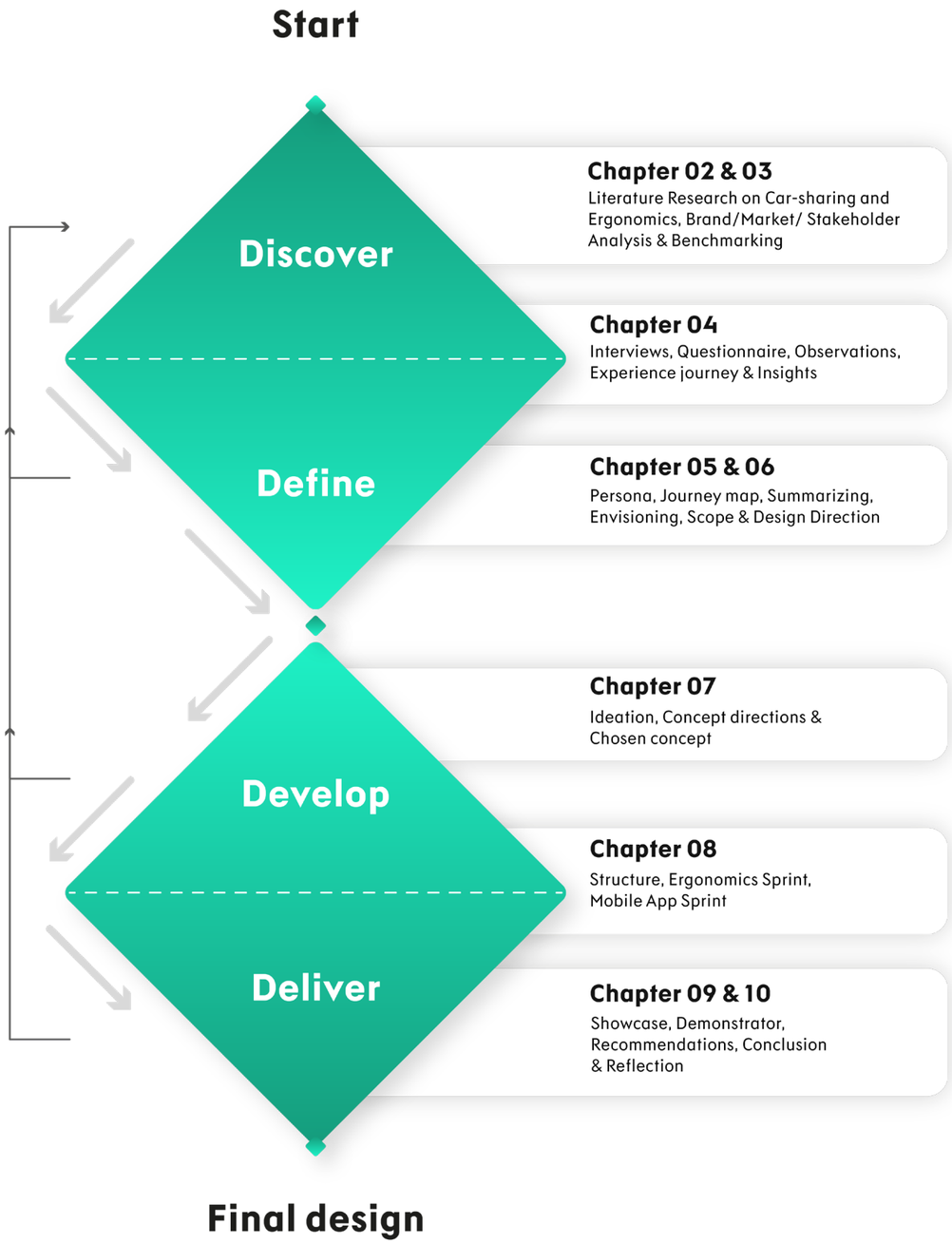
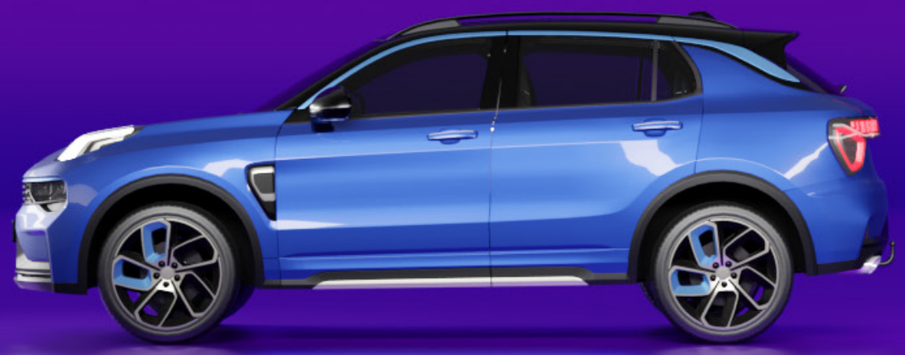


Figure 1: The double diamond method, supplemented with project activities.

Chapter 02

Theme

This chapter explores the theme and explains topics related to peer-to-peer car-sharing. First, the sharing economy is explained, and how it relates to car sharing. The different car-sharing types are shown and literature research is used to supplement the conducted questionnaire, explaining why people use or do not use car-sharing. At last, car-sharing is linked to ergonomics and the relevant domains are explained.



2.1 Sharing Services

The term sharing economy is used for a lot of products and services. In order to design a car-sharing service it is needed to know what a sharing economy is and more importantly how and why it differs from other closely related services.

2.1.1 What is the sharing economy?

'Sharing economy' is described by Frenken and Schor (2017) as:

> " Consumers granting each other temporary access to under-utilized physical assets ("idle capacity"), possibly for money. "

The first important aspect of this definition is 'temporary access'. This term makes sharing different from the second-hand economy, a closely linked economy. Where consumers sell each other goods and thus grant each other permanent rather than temporary access to their goods.

Another important characteristic of the sharing economy is that participants offer their 'under-utilized goods (idle capacity)'. These goods, called shareable goods, can be products and services. In essence, they are goods that by nature provide owners with excess capacity. Excess capacity of a consumer good is present when the owner does not consume the product all the time, such as cars. In order to be 'sharing', it does not always have to include goods. It can also be members of a community that share the costs of an investment, and then following its implementation they also enjoy the benefits accruing from the project, this is also called 'Collaborative consumption' (Botsman and Rogers, 2010; Meelen and Frenken, 2015).

The notion of 'idle capacity', combined with the purpose of why someone bought a good, is also key to describing the difference between 'sharing' and 'renting'. Renting goods from a company rather than from another consumer is seen as the product-service economy. The service provided by the company consists of giving the consumer access to a product while the company retains ownership of it. Once the product has been used and returned, it becomes available again for another renter. However, currently getting a car from a company or organisation for a short time is also considered as sharing. So, time also plays a role in whether something is 'sharing' or 'renting'. Companies call it sharing when it is actually renting because of strategic purposes, it is a growing business that is seen as new and sustainable and therefore trendy.

At last, there is a difference between sharing goods and on-demand services. The notion of sharing 'idle capacity' distinguishes this. With the on-demand economy, a consumer creates new capacity by ordering something on demand, Uber is an example of this. By contrast, with the sharing economy, the consumer uses something that is there, that would otherwise not have been used at all (Benkler, 2004).

As summarized in Figure 2, the sharing economy can thus be distinguished from three other types of platforms: the second-hand economy, the product-service economy and the on-demand economy. The main features of the sharing economy are temporary access, idle capacity, shareable goods (excess capacity), the amount of time, peer-to-peer and the sustainability drive. However, some of these features of the sharing economy create some overlap with other economies.

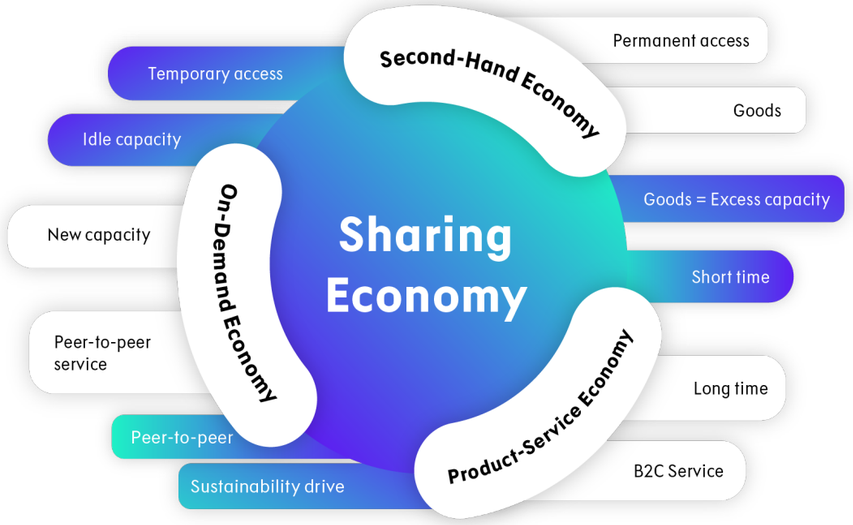


Figure 2: The sharing economy in relation to related economies and their main features.

2.1.2 Definition of car-sharing

Car-sharing represents a promising solution for sustainable transportation. Considering that there are already many cars that are not used to their full capacity. Car sharing can be done in different ways but can be captured in one definition. It is defined by Nobis (2006) and Katzev (2003) as:

> " A service by which members of shared-use vehicle organizations get access to a fleet of vehicles. "

The emphasis here is very much on getting access through a service to a fleet of vehicles. But car-sharing goes beyond that. According to Ferrero et al. (2018), this fleet of vehicles is used for making trips on a per-trip basis:

> " Share the usage of a vehicle fleet by members for trip making on a per trip basis. "

This report therefore uses a combination of the two definitions for the term 'car-sharing'. The definition is as follows:

> " Car sharing is a service by which members get access to a fleet of vehicles and share the usage of this on a per-trip basis. "

2.1.3 Differences in car-sharing

Although car-sharing can be defined in one definition, the service can be offered in different ways and between different actors. In total, there are nine types, based on the classification by CROW/KpVV (2015), Ferrero et al. (2018) and Münzel et al. (2019). At first, there are differences in the trip and locations, also visualised in Figure 3.

Two-way (station-based)/Traditional/Round trip
In the Two-way (Nourinejad & Roorda, 2015) mode the available cars are parked in pick-up stations, which are predefined parking lots by the service provider or local administration. The journey must start and finish in this same space and this operational model does not consider the intermediate parking, which are the stops that the customer may plan for personal needs. Dutch examples of this service are Greenwheels or MyWheels.

One-way (station-based)
The One-way (Nourinejad & Roorda, 2015) mode is similar to the previous one, but with One-way the parking lot in which the journey finishes can be different from the parking lot in which it started. The set of parking lots is predefined. Sixt but also MyWheels use this type of sharing.

Free-floating
The Free-floating (Firnkorn & Müller, 2011) mode is the last one to come to the market. The cars are freely parked in public spaces within the service area (i.e., the area served by the car-sharing company), and the journey can start and finish at any point in this area. Sixt is also an example of this type of service.
This type of sharing can also be used with virtual fences, which are called **home areas**. Here individuals have the freedom to park their car anywhere in permitted parking locations.

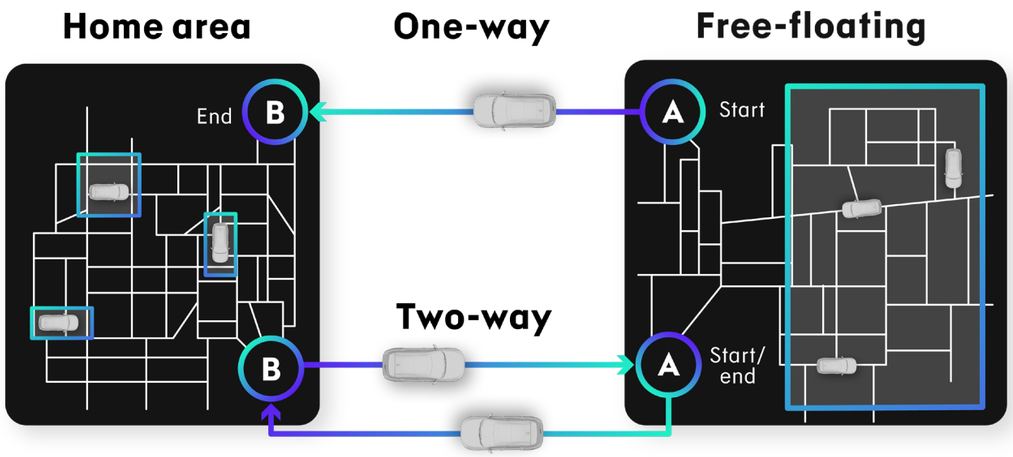


Figure 3: Visual overview on different trip types of car-sharing.

Besides these differences in the type of trip and the parking. There are also differences in the organisation of car sharing. They can be divided into private car-sharing, peer-to-peer car-sharing (P2P), business-to-consumer (B2C) car-sharing and business-to-business (B2B) car-sharing (Figure 4).

Private car-sharing
The oldest type of car-sharing is between private individuals, such as friends, acquaintances and neighbours. This type of sharing can also be identified as 'community-based car sharing'. External parties have no part to play and there is no profit motive involved.

Peer-to-peer car-sharing
In the peer-to-peer version of car-sharing, external parties do play a role. Individuals offer their cars to borrow via an online platform (for example SnappCar). The online platform operator takes care of the legal and administrative aspects. There is a difference in the key transfer, this can happen physically, but it is also possible via a 'digital key'. The user can unlock the car via a connected app.

Business-to-consumer car-sharing
This is a situation where a business rents products or services directly to end consumers. It is the most common way of how car-sharing is provided. Companies provide a platform from which people can borrow a car. The company retains ownership of the cars. When it is for a longer time, more than one day, it is called renting. Whereas a short-time rental is called sharing (examples are Avis, Hertz and Sixt).

Business-to-business car-sharing
The solution is not open to anyone who registers, but only to members of a specific company or community. An example is pool cars, they are usually part of a comprehensive 'mobility package' for employees. With this package, employees can share a number of cars in the fleet.

In this report, the focus lies on the type of car-sharing from Lynk & Co. They use the peer-to-peer car-sharing service, combined with station-based Two-way sharing. An individual is the owner of the car, which is lent out by this individual to another individual on a platform and has to be returned to the same place where it was picked up.

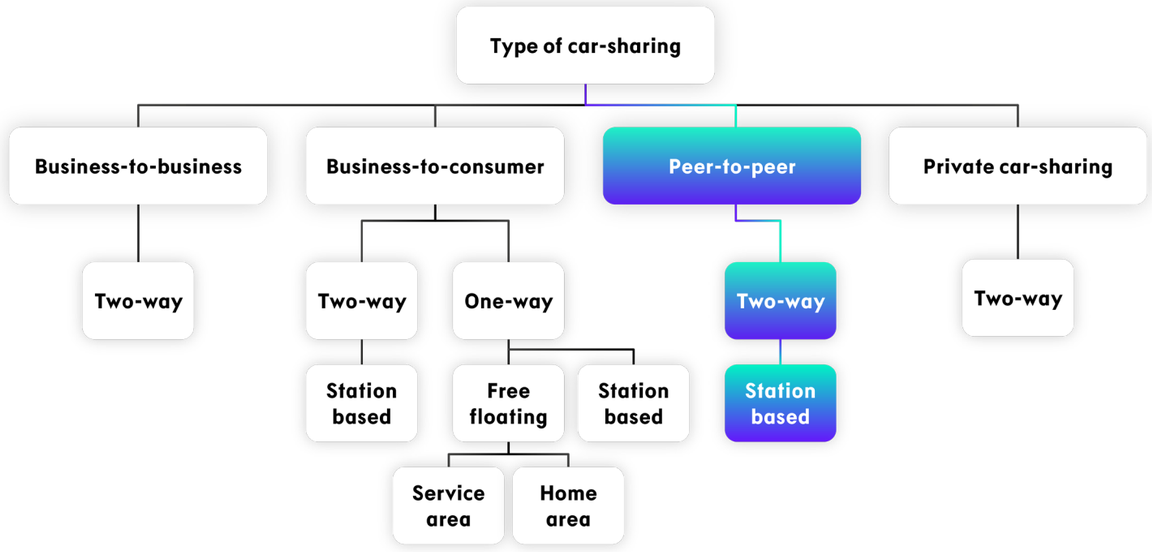


Figure 4: Different types of car-sharing.

2.2 Car-sharing Motivations

Peer-to-peer car-sharing happens via an interaction between two people: borrower and lender. The focus of this report is on the lender, as the initial problem statement is about how to let more people provide their cars on the sharing platform.
However, as this is a two-way interaction the motives of the borrower are also researched. The reasons why borrowers do use or not use car-sharing are shown in Appendix A.

2.2.1 Owners that provide their car

In this chapter, the motivations to provide or not provide the private car are shown. Insights were gathered via a questionnaire, which can be found in Appendix B. Next to that, literature is used to substantiate the motives.

People who provide their car on the sharing platform have personal reasons for doing so. Which can be classified into main reasons. Wilhelms et al. (2017), conducted a study in which participation motives from peer providers in the peer-to-peer sharing economy are researched. In this study, it is shown how these motives are constructed, via attributes, consequences and values. The study showed different values that are built up via different cognitive reasons: quality of life, economic interest, helping others, sustainability and belonging. The findings of this study are in line with the results from Lynk & Co (2023a) and therefore used to supplement these results.

Quality of life
The value relates to the fact that participants of peer-to-peer sharing, use the earned money from providing their car, for other purposes. And thus enhance their overall quality of life.

In the results that emerged from the questionnaire, there is no clear indication of people using money to enhance their own quality of life. However, the majority of the participants did mention that they shared their car 'To lower my costs for having a car'. This is in line with the literature because according to Wilhelms et al. (2017), this is a consequence that is present with this 'quality of life' value.

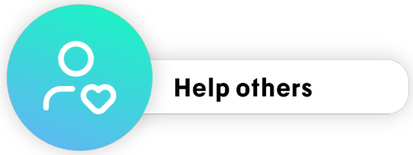
Next to that, some of the lenders that participated in the questionnaire mentioned that they shared their car 'To increase the use of my car', which relates to one of the attributes of the study, called 'low utilization', which is also present with the 'quality of life' value.

This attribute combined with the attribute of 'rental income' enables providers to perceive the functional consequence of 'reduction of fixed costs', resulting in the psychosocial consequence of having money for other purposes and thus enhancing the quality of life (Wilhelms et al., 2017).

The 'quality of life' value is interesting because it focuses on the individual, whereas the sharing economy in general focuses on collaborative consumption (Botsman & Rogers, 2010). This value is also driven by the generation of extra income, which differs from a mere cost reduction focus, as is the case in the next motive: 'economic interest'.

Economic Interest
This value relates to two consequences: 'reducing fixed costs' and 'the car is moved when it is rented out'.

The first consequence of reducing fixed costs is again in line with the answers from the questionnaire respondents: 'To lower my cost for having a car' (Lynk & Co, 2023a). The consequence of the car being moved when rented out comes from the attribute of 'low utilization'. This differs per use case, some people do not use the car for a longer time, and the car stands still for too long which is not good for some mechanic parts. So, being driven by someone else reduces the maintenance costs. Other people do not like the hassle of charging the battery, so renting it out takes this problem away because someone else does this. Next to that, when a car is parked in the city centre someone has to pay money for this, so when it is shared, no parking fee has to be paid.
The value of economic interest shows that temporary disposition is influenced by a desire for savings related to the product to be rented out (Wilhelms et al., 2017).



Help others
From the conducted questionnaire it was also made clear that peer providers participate because 'To share my car with a wider audience', especially with people they know. The study findings of Wilhelms et al. (2017) elaborate on these findings. This 'helping of others', makes people feel better. It generates a positive feeling that is driven by the consequence that 'the car is being moved', which relates to the attribute of 'low utilization'. When the car is used more often, the purchase becomes more sensible (Wilhelms et al., 2017). Another element is that people like to see others enjoy their car. Peer providers like to be part of the experiences of others, they get gratification when providing others with access to their good (Philip et al., 2015). This feeling is a consequence of the attribute 'interest in sharing', which leads to the value of 'helping others'.

This attribute is often indicated by people who not only share their car but also participate in the whole sharing economy. Which also indicates there is some level of environmental awareness.

Contributing to sustainability
Most people relate sharing economies with environmental awareness and being sustainable. The same goes for peer providers in the car-sharing sector. Sustainability is linked with the consequence of an 'overall decrease in the need for vehicles', which is driven by the attribute of 'low utilization'.

This decrease of unused vehicles is a desire from owners, that will allow some people to live without a car. However, according to Wilhelms et al. (2017), environmental concerns are not part of the participation decision, environmental benefits are rather perceived as a by-product. Participants of the questionnaire indicated that they share their car 'To contribute to sustainable mobility', as the second main reason.

Belonging
The sense of community is also one of the aspects of why people want to share their car (Bardhi & Eckhardt, 2012). This feeling of belonging can be split up into two parts: being part of the community that shares their car and being part of the community someone lives in. The first one also relates to a sustainable lifestyle and this reason to provide a private car. Being part of the community in which someone lives, a neighbourhood, is also a reason to provide a car this way people can interact with each other. Both are achieved through collaborative lifestyles, in which people with similar interests are banding together (Botsman & Rogers, 2010).

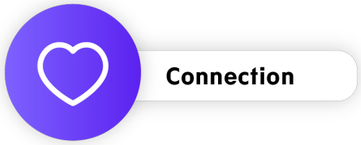
All motivations are summarized and mapped in chapter 2.2.3.

2.2.2 Owners that do not provide their car

The previous chapter, 2.2.1, gave insight into the reasons why peer providers tend to share. However, the main problem is that other car owners prefer not to share. In this part, the reasons for people to decide not to share their car are shown (potential peer providers).

Especially with Lynk & Co, this is interesting. Because people acquire a car that can be shared but do not use it. So, what is the reason for people to get such a car? The reasons that the owners mentioned were the flexibility of the monthly subscription, the fast delivery, the price and that the car is very well equipped.

A study by Havas Worldwide (2014) showed that 42% of the average consumer is willing to share tools, but when it comes to more personal things, like cars, this proportion drops to 15%. Zooming in on specifically Lynk & Co 01 owners, the amount willing to share is roughly the same, around 20% (Lynk & Co, 2023c). In order to study why this number is relatively low, again the questionnaire from Appendix B is used and supplemented with relevant literature.



Connection

Emotional connection
We live in a 'car culture'. A culture in which people see the car as not only a means to get from A to B but as an expression of one's personality, a symbol of freedom and an experience in itself. The car elicits a wide range of feelings and people tend to create a connection with it (Sheller, 2004).

This emotional connection is one of the reasons why people do not want to share their car. Something that someone has an emotional connection with is not simply shared with someone else, and certainly not with strangers.

This connection can be explained by the fact that people refer to them as humans, which is called anthropomorphism. Anthropomorphizing influences people's psychological and emotional bond with objects. It imbues non-human objects with human-like characteristics, which alters people's relationship with these objects, and therefore shifts people's emotional and cognitive responses towards them (Esmeralda et al., 2015). This anthropomorphism creates object attachment. It allows for to strengthening of the individual and relational self, which happens especially with cars (Wan & Chen, 2021).

A car reflects who you are and what you stand for, it is an expression of your self-identity and an extension of your personality (Belk, 1988). This connection seems only relevant for car people but is also relevant for non-car people, humans who say they do not really care about cars. The underlying connection with cars is still present because unfamiliar non-human objects are anthropomorphized. Which enhances the fluency of comprehending the objects and prompts people to experience the objects in a more emotional way (Delbaere et al., 2011).

The reference to humans is not entirely coincidental. Car designers give character to a car. They do this on purpose, not only to be consistent with the brand identity but also for people to bond with it. The overall design subconsciously evokes character, as an example the determined and friendly-looking Lynk & Co 01 is analysed in Figure 5.

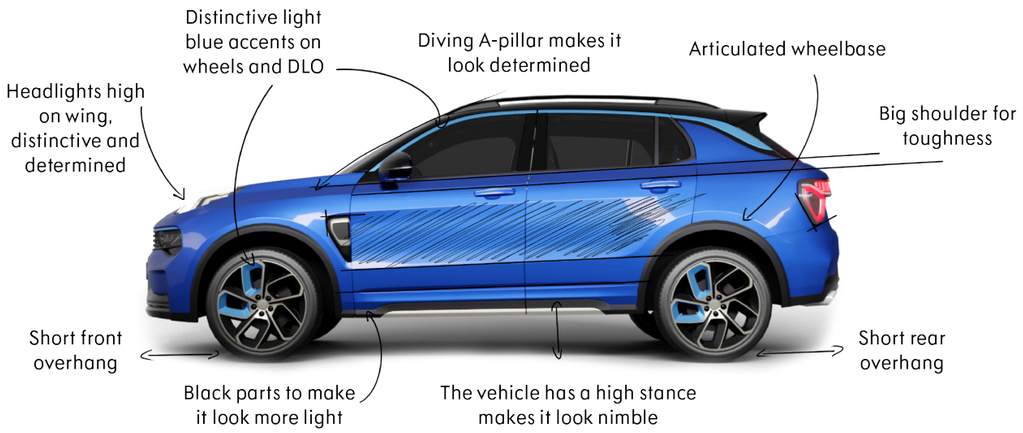


Figure 5: The character of the Lynk & Co 01 explained.

This exhibiting of human touches, facial features and characteristics makes owners of their car feel connected to them (Schroll et al., 2018); (Sano, 2010). People can feel a strong sense of connection with a product that exhibits a human touch. This implies that a product can serve as a replacement for a human relationship (Wan & Chen, 2021). Indeed, a car can show this human touch or human characteristics via the design. For example, the headlights that blink when you approach your vehicle, like a human saying 'hi'. But a car can even show a human touch via the flaws it has. Such as not driving that well in the morning, makes people relate to it as someone who is not a morning person. These flaws are seen as human traits.

This human touch is very evident in the front of a car (Figure 6). People compare the front to the human or animal face. For this reason, car designers attempt to leverage facial feature comparisons in order to create an emotional attachment to their automobiles. The headlights as "eyes" and the grille is a "mouth" (Toshinobu & Norihiko, n.d.).

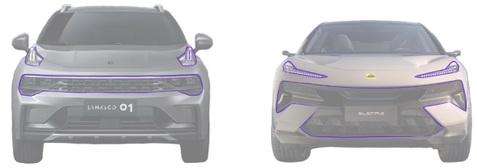


Figure 6: Different car facial expressions. The Lynk & Co 01 on the left and the Lotus Eletre on the right.

Lastly, cars provide experiences. People create memories with cars, the car makes it able to be physically present in special moments. It is there after a long day of work, but also with major milestones, such as a graduation or a wedding (AutoTrader, 2013).

In conclusion, this emotional connection between the owner and their car makes them hesitant about lending it, especially to strangers. This makes it one of the reasons, if not the strongest one, why potential peer providers do not want to participate in car-sharing.

Acknowledging the fact that a car is more than just a means of transport, is important. In current strategies to influence car driving decisions, this is often not taken into account. Especially when these decisions relate to asking owners of a private car to share it with others. This person acquired this car and consciously or unconsciously chose that one because it is an extension of themselves, and it reflects them which creates an emotional connection with it. Not everyone has this high-level emotional connection with a car. But even these people do refer to cars as humans due to anthropomorphism. Which suggests that they also feel some sort of emotional connection.

Availability

Availability
This car culture also reflects on the dependency of this type of transport. Another concern is that their car is not always available when provided for car-sharing. Research shows that owners of private products are unwilling to let them because they want to use them themselves. Letting it go, makes it less available for your own use (Bieger et al., 2007).
In a study among peer-to-peer car-sharing providers by Shaheen et al. (2018), hosts mentioned that they found themselves in (emergency) situations in which they needed the car. This idea of them being less mobile and flexible keeps them from lending their car.

Financial risk

Financial risk
The questionnaire showed that most people who own a 01, are afraid that the car interior or exterior will be damaged when shared. This concern is in line with research from Shaheen et al. (2018), in which peer providers expressed their concerns about possible damages.
Tangible goods can be damaged by those who use them, which leads to the risk of substantial financial loss, this makes owners insecure, making them less likely to share their car (Bossauer et al., 2020); (Ballús-Armet et al., 2014). It remains a risk for owners to find out who made a certain scratch or dent, recover the costs from that person and then also get their reimbursement. This is especially the case with small damages, these are often only noticed after a long time. This concern is less evident with providers who share their cars with friends and family.

Trust

Trust
63% of the questionnaire respondents indicated that they do not want to share their 01, because they do not know who is going to drive it. They are more willing to lend their car to people they know, friends and family. Even people who did provide their car via the sharing platform indicated that it is a major drawback to not be sure who is going to borrow their car. But, after several times of lending their car, they gained trust and were more open to share their car. The trust issue that occurs when sharing with strangers holds back people from providing their car, a motive in line with findings from KiM (2015) where this was found as one of the main reasons. The trust issue also relates to the fact that car interiors are seen as second homes. People live in them and keep personal things in them.

In a study conducted by Stanford, in collaboration with Airbnb, they researched the willingness to trust someone, based on how similar they are. It proved that we trust people who are the same more and that people are not that willing to share with people they do not know or are different (TED, 2016).

Usage behaviour

Usage behaviour
The trust concern relates to user and usage behaviour. People act aggressively and impolite in traffic. Seeing this current user behaviour on the streets logically holds back people from sharing. Why would you share something expensive with people who do not care about that?
How people treat products that they do not own is different from products they do own. Bardhi & Eckhardt (2012) studied how people treat their shared car and showed that people have the sense of "It is not mine". They treat products that do not belong to them differently from products that belong to them, often in a negative way. The same can be concluded via observations. How people use another sharing service, such as moped sharing, shows the bad treatment.

This also relates to how people behave in traffic: speeding, double parking and running red lights. This was also one of the aspects that held back owners because they did not know how people behave in their cars and in traffic. Speeding, fast accelerating and thus driving fast also relates to the financial risk, because having a 'sporty' driving style influences the wear and tear of the car more than driving less sporty (Renault Group, 2019).

Hygiene

Hygiene
Another concern among car owners with joining the sharing platform is the cleanliness of their car Shaheen et al. (2018). Something that was also found via the questionnaire, participants do not want their cars to get dirty. Especially the parts of the interior that someone touches: seats and screens. This refers to contagion, the disgust that people feel when they are aware that an object has been physically touched by someone else (Argo, Dahl, and Morales 2006; Rozin and Fallon 1987).

Other cleanliness concerns were about the smell and littering inside the car, such as smoking. Some hosts even cleaned the car more frequently and as a result, became more familiar with the vehicle. Owners also cleaned the cars more, to know all the details of the car in the event of damages (Shaheen et al., 2018).

IT & Design

IT & Design
Another reason why car owners do not provide their cars for sharing is the fact that the technology behind the platform does not always work (App Store, 2023).

In the conducted questionnaire there were no questions about the IT platform because it is already a known issue. Peer-to-peer sharing platforms are highly reliable on the connectivity, when they do not work as intended it causes frustrations to the users and can result in not using these platforms at all.

2.2.3 Insights

In conclusion, there are several connected drivers and concerns about sharing a private car. These are summarised in Figure 7.
On the right side, coloured in blue. There are different intertwined reasons why people want to provide their car on the car-sharing platform: to enhance their own quality of life by having more money to spend on other things, to reduce the costs of having a car, to help others, to feel a sense of community and to contribute to a sustainable lifestyle.
However, these reasons do not outweigh the reasons for not providing the 01. These reasons are shown on the left, coloured in purple. Because most of these reasons are deeply rooted in users' behaviour and their attitudes.

There is a bond with cars due to the emotional connection and the financial investment of it. Besides that, people are highly dependable on the car and expect it to be always available. However, the biggest concerns can be generalised in trust. Trust in other people's behaviour in driving the car, the hygiene and trust in the system. Trust is one of the most, if not the most, important drivers for the success of sharing platforms in general, but especially peer-to-peer car sharing (Botsman, 2013); (Gebbia, 2016); (Hawlitschek et al., 2016). Trusting other users is intertwined and influenced by the trust in the system and the feeling of control over the owned property. How people interact with these systems in the machines, such as cars, is related to ergonomics. Specifically cognitive ergonomics.

Figure 7: Reasons of (potential) lenders to participate in car-sharing or not.

2.3 Ergonomics in Car-sharing

2.3.1 Ergonomics definition

As discussed, car-sharing services are provided via digital systems, and how the user interacts with these systems is related to cognitive ergonomics. First, it is important to know all ergonomic domains. According to the International Ergonomics Association (IEA, n.d.), ergonomics is the understanding of interactions among humans and other elements of a system. It can be divided into 5 domains: physical, behavioural, organisational, sensorial and cognitive ergonomics (IDE TU Delft, 2021). Together with a brief explanation, these are shown in Figure 8.
In this report, the focus lies on the last two: cognitive and sensorial ergonomics.

Figure 8: The five different ergonomics domains (IDE TU Delft, 2021).

2.3.2 Ergonomics and touchpoints

The peer-to-peer car-sharing service of Lynk & Co can be accessed via various (digital) touchpoints. Touchpoints are points in the journey, in which the user encounters the brand and their service. Besides this definition, a touchpoint is a stimulus fulfilling a specific role within the customer journey (Barann et al., 2022).

Construction of touchpoints
The same study also set up a framework, on how a touchpoint is constructed, it identifies three parts: 'Stimulus', 'Interface' and the 'Encounter'. The framework is used as a tool to show how touchpoints influence the journey and what can be used for designing. A visual representation can be seen in Figure 9 on the next page.

The stimulus can be considered as a sensible element designed to guide the interaction between the user and the service provider (Kronqvist & Leinonen, 2019). Thus, it can be described as a potential interaction element (Heuchert et al., 2018; Richardson, 2010; Stein and Ramaseshan, 2016). It describes the planned encounter by the organisation and therefore, the controlled stimuli are the enduring parts that can be designed and managed. An example related to car sharing is the mobile app for sharing. There are also out-of-control stimuli, such as customer reviews.

The interface simply conveys the stimuli and therefore facilitates the encounters. An example is the infotainment screen inside the car on which the sharing app is displayed.

At last, there is the encounter, which is the actual moment of contact of a user with a touchpoint at a point in time. It is therefore characterized by a transient point of view. When a user of the car enters it and the infotainment screen starts, this is when the encounter happens. The encounters can be monitored, to apply improvements and adaptations.

Touchpoints in relation to car-sharing
Access to car-sharing for both the lender and borrower is through these digital touchpoints. They indirectly interact with each other through these machines and the associated sensors. Examples include: a mobile app, the infotainment screen but also the charging station can be influential.

The question that arises is, can cars that are not built for car-sharing only, which is the case with the Lynk & Co 01, influence both lender and borrower via the digital touchpoints? The interfaces in a car are relatively easy to change and connect with other actuators and sensors in the car.

Ergonomics in cars
Cars are one of the, if not, the most complex products that exist. How they are built but also in relation to the user due to the number of touchpoints and the enormous number of reactions that happen when someone interacts with it. Nowadays, most of these are digital and thus include interfaces, which are designed with cognitive ergonomics in mind.

An important part of the sharing experience is the car itself. It is the main product and influences the experience for the borrower. But the car is also the main product of peer-to-peer car-sharing that keeps potential lenders from sharing their cars.
The 01 already has some features that were designed with car-sharing in mind, but they are not optimally used. There is a 'car-sharing' application in the car, from which the owner can turn sharing on or off and set some settings. Other digital touchpoints that provide information and can control the user in the car are the interfaces: the driver's display (DIM) and the infotainment screen (AVN screen).

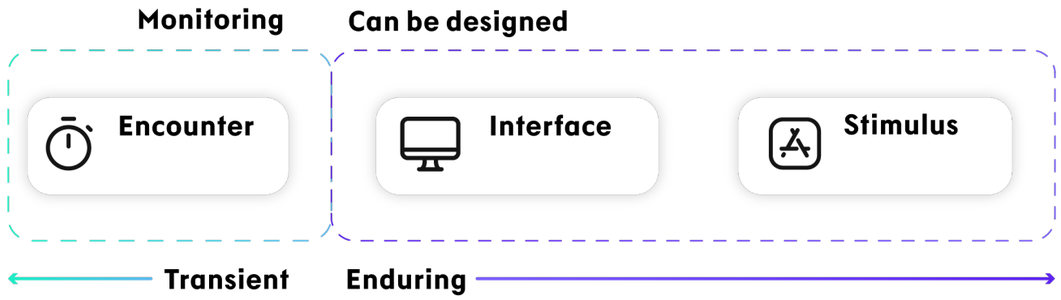


Figure 9: Abstract construction of a touchpoint, based on research from Barann et al. (2022).

Touchpoints along the journey
There are other digital touchpoints in the journey in which the lender and borrower interact: the charging station and the mobile app. These are further explained in Chapter 4: Interaction.

The interaction that a person has with these machines forms the complete experience for the user. The user experience (UX) is an extension of the traditional usability approach to human–technology interaction research that includes the user's psychological, sociological, and cultural experiences with technology (Lai-Chong Law, 2011). The interaction and the user experience are connected with each other. Individuals will experience a positive psychological state (flow) as long as the challenge an activity poses is met by the individuals' skills (Novak et al, 2000; Huang, 2003). This implies that the user experience can be influenced by the underlying cognitive ergonomics.

2.3.3 Cognitive ergonomics

Cognitive ergonomics is about mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system (IEA, n.d.). Relevant topics include decision-making, skilled performance and human-computer interaction as these may relate to human-system design. The reasoning of humans in cars has to do with where everything is located on the screen and how the menu is structured in order to reach all functions. But also, when the driver presses a button to perform an action, the haptic or acoustic feedback that emerges from this is also cognitive ergonomics. More pictures of relevant ergonomics and car-sharing features within the interior of the 01 can be found in Appendix C.

Ergonomics and anthropomorphism

Cognitive ergonomics can also be related to anthropomorphism. With interactive technologies, there is substantial evidence that people think of and treat interactive technology as if it is their friend (Nass & Moon, 2000); (Fogg & Nass, 1997). They ascribe a broad range of human attributes including personality to interactive technology (Desmet et al., 2008).
This perception of objects as human beings (anthropomorphism) also relates to psychological processes, such as the human-machine interaction. The attributing of human characteristics to non-human objects increases people's ability to understand the objects, reduces the uncertainty associated with them, and increases confidence in prediction about the objects (Epley et al., 2007).

A touchpoint has an interface (Barann et al., 2022), which can have different forms (physical or digital). This interface grants access to the digital features (mobile apps) and is mediated by a human. This human-machine interaction plays a big role in cars and car-sharing because it gives the user access to all car functions. There is evidence to suggest that the full potential of these already existing interfaces is not (yet) used. Especially when it comes to car-sharing because every user is different but gets to see the same interface. However, as proved by Dong & Liu (2016) the final user experience is influenced by individual cognitive differences.

2.3.4 Sensorial ergonomics

Sensorial ergonomics focuses on the capacities and limitations of the human sensory system and studies how people hear, see, smell and feel their environment (IDE TU Delft, 2021). Sensorial ergonomics can relate to tactile aspects, such as the structure and feel of materials (material on the seats). However, in this project, the focus of sensorial ergonomics is on how the environment can change due to visual and acoustic aspects and how different users adjust their behaviour to this.

Sensorial ergonomics in the interior

The environment, the car interior is the space that both the owner and the borrower make use of and it is a complex environment with a lot of features to offer. Which can be perceived differently according to different users. This means it is the most interesting touchpoint in the journey to design. Can the same space change according to the user and the purpose of the trip? And can the user behaviour be influenced this way?

Lenders indicated that they had concerns about how the interior of their car would look after it had been shared. This space is very wear and tear sensitive, due to the fact that people live in it. Next to that, it is perceived as a private space, and with car sharing it will be shared with others. Besides the concerns, this is also the space in which the borrower can be guided via these sensorial ergonomics.

2.3.5 Multi-sensory design

Multi-sensory design considers not just the shape of things but how things shape us, our behaviour and our emotions (Gibson, 2012). This ability to change human behaviour can have a huge influence on the user experience. Different people can perceive the same space in different ways (Altmann & Chemers, 1984).

This multi-sensory design is closely related to ambient computing. A type of computing in which smart devices use data and human activity to produce a result without the need for a command. It is a 'smart' way of providing a human-machine interaction, that reacts to the cognitive ergonomics as well.

In summary, cognitive ergonomics has to do with human-machine interaction and can influence the way people use products, by the things that are displayed and the sounds and light effects it produces. In potential, the machine can create a direct connection between the lender and borrower. Whereas sensorial ergonomics can interact with the senses of humans and can have a huge influence on how spaces are perceived pee different users.
Both domains are therefore capable of interacting and influencing people which can create trust and control for the owner of the private vehicle. How both types of ergonomics in the 01 are evident, is shown in Figure 10 and illustrated in Figure 11.

Figure 10: Picture of the 01 that shows which of the digital systems and other features are present.

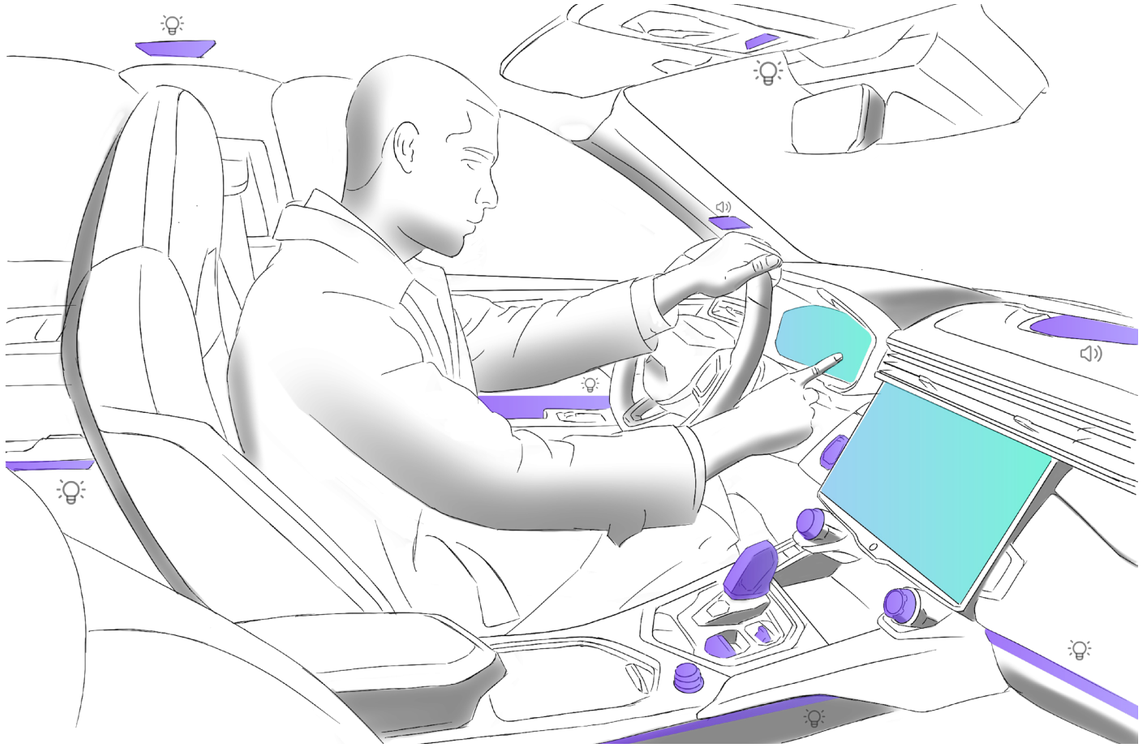


Figure 11: Illustration of difference between cognitive (blue) and sensory (purple) ergonomics in a current car interior.

Chapter 03

Context

This chapter is about the context of peer-to-peer car-sharing. It gives an insight into the brand Lynk & Co and it provides a reflection of the company in relation to other car-sharing providers. Besides the business and market aspects, benchmarking with other peer-to-peer sharing services is conducted.

3.1 Brand Analysis

To find out how Lynk & Co differs from other car-sharing organisations, the brand identity is researched and a SWOT analysis is performed. Both are used in the design process to create a unique brand focused solution.

3.1.1 Brand identity

The brand identity is the outward expression of a brand, including its name, trademark, communications, and visual appearance. Assembled by the brand owner, it reflects how the owner wants the consumer to perceive the brand and by extension the branded company, organisation, product or service (van Grondelle, 2022).

The identity of Lynk & Co was found by looking at brand values, the mission statement and objectives, the brand proposition, the portfolio (range of cars), the ads and the location and looks of the dealerships. For this project, Lynk & Co Europe is chosen to research, as this aligns with the car-sharing scope. Lynk & Co is also active in China, with a more diverse portfolio and a different market approach.

The brand identity is summarised in three words: Bold, Different and Simple and is shown in Figure 12. The research that led to these words can be found in Appendix D.

3.1.2 SWOT analysis

In this analysis the internal factors (strengths and weaknesses) are shown next to the external factors (opportunities and threats). The scope of the competitive business environment is limited to car-sharing services in the Netherlands. All points from the SWOT analysis are discussed and visualised concisely in Figure 13 on the next page. A more comprehensive explanation can be found in Appendix E.

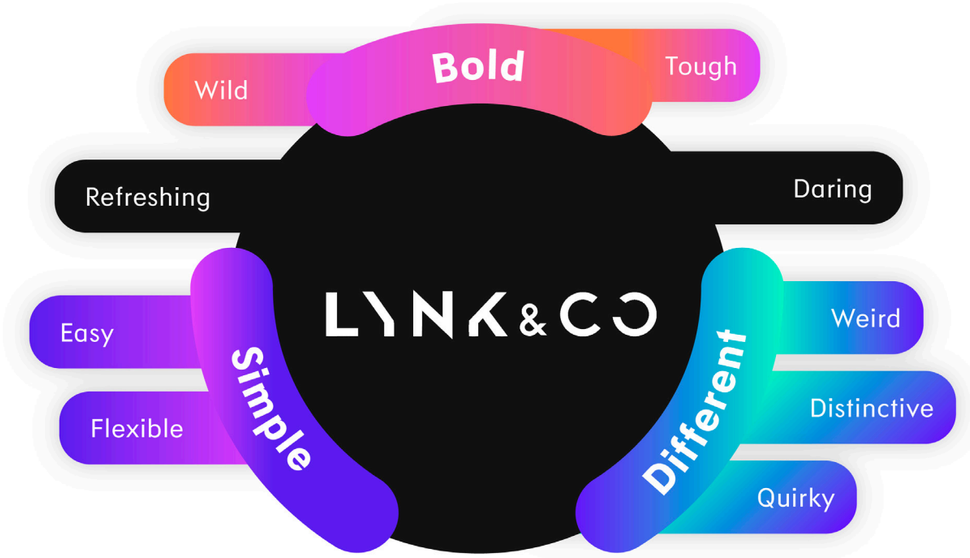


Figure 12: Brand identity and associated words of Lynk & Co in Europe.

Strengths
The current strengths of Lynk & Co mainly relate to the car itself, the existing sharing platform and the uniqueness of the brand.
The car itself is possibly the biggest strength, it is a luxurious car and equipped with all the latest features. Besides the car, there is the already existing sharing platform, consisting of the (in-car) app and the backend connectivity. Next to that, there are the clubs, unique styled locations with the car inside the city centres. And at last, the flexibility, which refers to the monthly subscription.

Weaknesses
The weaknesses of the company and especially the car-sharing service can be divided into three parts.
The first one is the fact that although the car can also be acquired via a subscription, the car is still privately owned and people feel responsible if something goes wrong with the car. As discussed in Chapter 2.2.2, this creates concerns about sharing the car. The other one is the fact that Lynk & Co in Europe shares parts and software with Lynk & Co in China. So, not everything is specifically designed and made for the same purpose and user.
Then there is the fact that the car-sharing service and the car itself are highly dependable on connectivity. Connectivity issues can influence the whole experience of the service for both lender and borrower negatively.
At last, the customer service is considered as a weakness (TrustPilot, 2023). This also creates troubles with car-sharing.
Both external parts are connected to the trends and developments research that can be found in Appendix G.

Threats
One of the threats is that the market is very dense, which will be further discussed in Chapter 3.2. Another threat is user behaviour, a threat in general with car-sharing, especially the P2P car-sharing from Lynk & Co. The other threat is diversification, people perceive the same experience differently. It could be challenging to provide a suitable sharing service for every user. The fact that people need to provide information in order to use the service in the best way (e.g. profile picture, full name and living address) creates a threat as well, because not everyone is that open to providing this.

Opportunities
The main opportunities lie within the car itself. Within the car, the 01, there are already a lot of digital features. However, these features are not optimally used, which creates the opportunity to make them more focused on car-sharing.
People in neighbourhoods asked if they could get access to a shared car (Appendix F), they were interested from an economic and sustainable point of view. Lynk & Co can play a role in these highly populated areas by focusing on these people. Besides that, there are emerging technologies that could be used to enhance car-sharing.

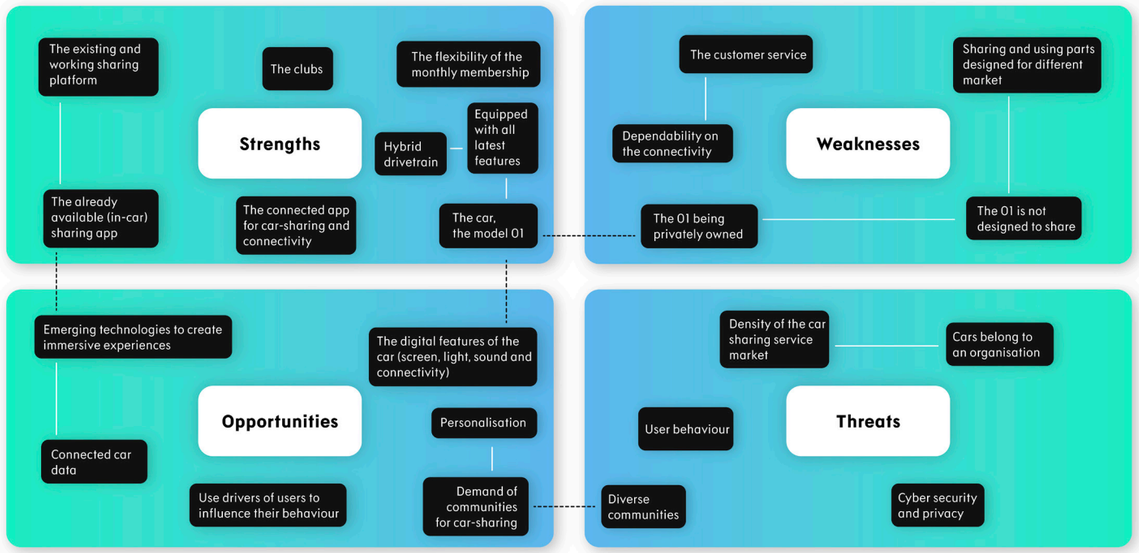


Figure 13: SWOT analysis within the scope: Car-sharing services in the Netherlands.

3.2 Market Analysis

To make car-sharing a sustainable business it is important to know what competitors approach the market, therefore a market analysis is performed. Due to the increasing supply of shared cars and therefore different types of shared services, it is difficult to keep track of local and private initiatives. The statistics in this report, are based on data from CROW-KpVV that are provided by suppliers of the sharing services (e.g. Greenwheels). The KpVV programme develops collective knowledge for decentralised authorities in the field of mobility.

3.2.1 Car sharing users (borrowers)

For this analysis, the most recent known amount is used. By 2021, there was a total of 970,000 car-sharing users in the Netherlands, this measurement is based on the number of people who have a membership or subscription to a car-sharing provider. When looking at people who actually use car-sharing, from 2018 to 2021 this is around 200,000 over these past 3 years. This number is built up from users of business-to-consumer (B2C) and peer-to-peer (P2P) services and accounts for 0.02% of the total number of car trips in the Netherlands (Jorritsma et al., 2021).

In a study, amongst 12.500 participants (above 18), by the Ministerie van Infrastructuur en Waterstaat (2023) on travel behaviour in 2022 in the Netherlands, it was found that 19% have used one or all the forms of car sharing (as discussed in section 2.1.3). Of the individual forms of car sharing, borrowing a car is mentioned most often (7%), followed by a commercial shared car, through a rental company or an online platform (3% each). A shared car through the employer and shared ownership were mentioned by 2% each. Thus, only a small proportion mentioned they used multiple forms of car-sharing.

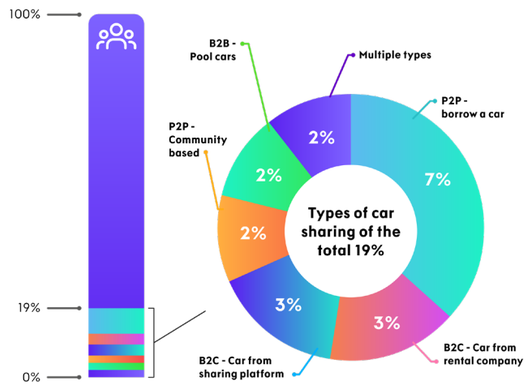


Figure 14: Percentage of different car sharing users (Ministerie van Infrastructuur en Waterstaat, 2023).

3.2.2 Amount of shared cars

There is a total of 100,000 shared cars (CROW-KpVV, 2023). Interesting is that 75.000 of these 100.000 shared cars being available are P2P car-sharing cars (Figure 15).

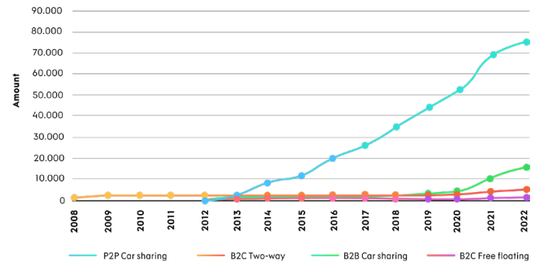


Figure 15: Amount of car sharing vehicles per type of sharing (CROW-KpVV, 2023).

Another interesting division can be made in the type of car offered. If the distribution of car classes is compared with the entire private car fleet in the Netherlands, the mini-class is well represented among shared cars.
This indicates two things, more luxurious and (often) bigger cars are not provided via car-sharing services. And that more people buy relatively bigger cars: C, D and E class cars. This implies that the demand for these cars is bigger.

Of these shared cars, 37.9% are electric (fully electric or plug-in hybrid). When the number is compared to private cars, the amount of electric cars is only 5.3%. Over the years, the number of shared cars being electric has increased: in 2021, the amount of electric shared cars was 13% of all shared cars.

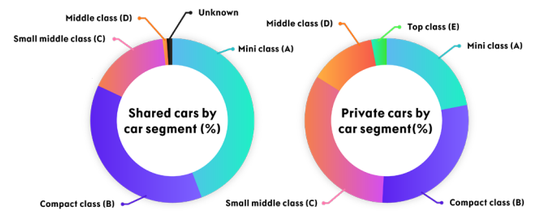


Figure 16: Difference in car segments between shared and private cars (CROW-KpVV, 2023).

3.2.3 Shared cars locations

The shared car supply is concentrated in highly urbanised areas in the Netherlands. That is also where the largest increase is taking place. In general, the stronger the urbanisation, the more shared cars (Figure 17).

The measurement used 24/7 shared cars, which are accessible day and night without the intervention of a person. There are also shared cars that no longer require a key, which starts at the press of an app button (such as Lynk & Co).

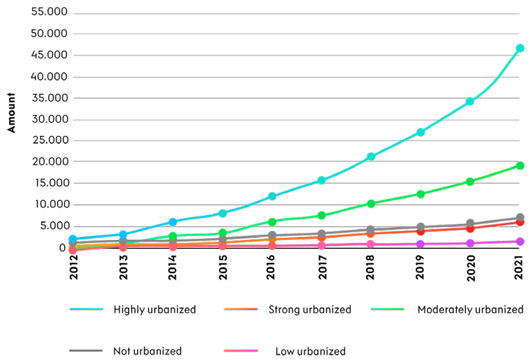


Figure 17: Amount of shared cars to urbanisation rate (CROW-KpVV, 2022).

Large cities also offer the greatest variety of car-sharing services, as shown in Figure 18. This also shows that the peer-to-peer car-sharing type in local communities, is the highest in highly urbanized areas.

Users like the fact that there are various forms of car sharing and providers with their P2P services. This leads to more choices and a suitable solution for different target groups. However, the B2C providers all target a bigger audience, with a on its own working service which creates difficulty for people to choose.

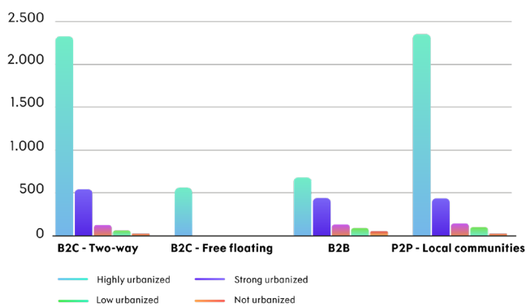


Figure 18: Amount of different types of shared cars to urbanisation rate (CROW-KpVV, 2021).

3.2.4 Car sharing providers

The Netherlands is attractive for car-sharing, because of the developed road infrastructure, relatively many charging stations and the short distances. The amount of shared cars is divided in the Netherlands, among more than 10 relatively large providers. The 5 largest and their share are shown in Figure 19.

In Figure 20, an overview of the car-sharing provider market is shown. This overview includes the company structure (B2C, B2B or P2P), and the type of trips the company offers (Two-way, One-way) combined with how vehicles can be parked (parking spots, home area or free-floating). The type of cars according to the UNECE standard (European Commission, 2013) and the drivetrain (electric, hybrid, gas).

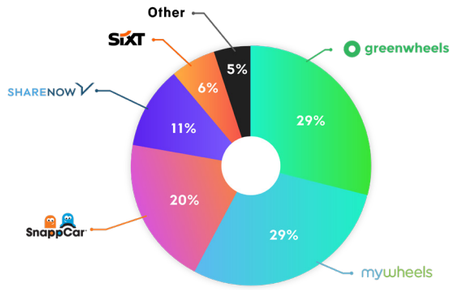


Figure 19: Key players in the car-sharing economy in the Netherlands (Statista 2023).

3.2.5 Insights

From the market analysis, several conclusions can be drawn. First, the car-sharing market is dense, for both B2C and P2P sharing. The B2C organisations target a wider audience. The fact that these services do not target a specific user ensures that they are design-for-all which is also reflected in their cars. The cars from these B2C services are also standard, i.e. basic models with little to no options. Lynk & Co is unique in this area, offering a car with all the latest features.

There is a high P2P car-sharing demand, but there is only 1 provider in the Netherlands, Snappcar. An advantage over Lynk & Co on this provider (and other P2P providers in Europe) is that the car is already able to be shared and there is not something needed to be built into the car. Besides that, private sharing or collectively buying a car already happens in neighbourhoods (Gemeente Rotterdam, 2020). These developments present opportunities for Lynk & Co, since they already have their own platform.

At last, other P2P car-sharing services show interesting approaches. Peer providers of Turo can link cars to an experience to attract similar people. Getaround, lets borrowers book cars without approval. Hiyacar focuses on how the car is returned and especially on hygiene in the interior.

	Structure	Type of trips		Active	Cars	Others		
mywheels (Amber is the B2B car sharing part of MyWheels)	Business-to-Consumer Business-to-Business	One-way Two-way	Home areas & Pre-defined parking spots	Midsized and big cities	**Amount:** 2.900 **Segment:** A, B, C, D, J **Drivetrain:**	People can get discount if they clean the cars in their neighboorhoud (sleutelfiguur)	No max. amount of days	Travel through Europe
greenwheels	Business-to-Consumer	Two-way	Pre-defined parking spots	Whole of the Netherlands	**Amount:** 2.600 **Segment:** A, B, D, M **Drivetrain:**	Partnership with NS (Dutch railway), to combine sharing car with public transport	Max. 7 days	Also focuses on business customers
SIXT	Business-to-Consumer	One-way Two-way	Home areas	Big cities (Amsterdam, Rotterdam, Den Haag & Utrecht)	**Segment:** B, C, D, J **Drivetrain:**	Also able to bring car to Sixt locations	Max. 7 days	
SHARENOW	Business-to-Consumer	One-way Two-way	Home areas & Free floating	Big cities (Amsterdam & Rotterdam)	**Amount:** 350 **Segment:** A, B, C, D, J **Drivetrain:**	Charges extra fee for one-way trips outside the free floaitng service area	Max. 30 days	Uses hubs in parking garages
GreenMobility	Business-to-Consumer	One-way Two-way	Free floating	Big cities (Amsterdam)	**Amount:** 260 **Segment:** B **Drivetrain:**	User can get discounts when he/she charges the car after using	Uses the Renault Zoë	Travel through Benelux and Germany
hely	Business-to-Consumer	Two-way	Pre-defined parking spots	Big cities	**Segment:** A, B, D, M **Drivetrain:**	Uses hubs on crowded places (office buildings and residential area)	Car sharing combined with mopeds and bikes sharing	
GO sharing	Business-to-Consumer	Two-way	Home areas	Big cities (Den Haag, Eindhoven & Rotterdam)	**Segment:** A, B, C, D **Drivetrain:**	Car sharing is combined with mopeds and bikes sharing	QR code with explanation how car works in the interior	Uses only Mini's
SnappCar	Peer-to-peer	Two-way	Defined parking spots by owner	Whole of the Netherlands	**Amount:** 9.000 **Segment:** All **Drivetrain:**	Travel through Europe with booked car	Owner can set 'restrictions' on their car	Box need to be installed for this service

	Structure	Type of trips		Active	Cars	Others	
TURO	Peer-to-peer	One-way Two-way	Defined parking spots by owner	UK, USA & Australia	**Segment:** All **Drivetrain:**	Book car per experience	Owner can choose for which experience car is suitable
GoMore	Peer-to-peer	Two-way	Defined parking spots by owner	Spain, Austria, Switzerland, Sweden, Denmark, & Finland	**Segment:** All **Drivetrain:**	Owner can decide if they want keyless or with key	If keyless is decided a device needs to be installed in the car to make sharing work (like all other companies)
getaround	Peer-to-peer	Two-way	Defined parking spots by owner	France, Germany, Spain, Belgium, UK, Norway & USA	**Segment:** All **Drivetrain:**	Book car without approval from owner	Owner can choose multiple locations (brings car their)
hiyacar	Peer-to-peer	Two-way	Defined parking spots by owner	UK	**Segment:** All **Drivetrain:**	Fee can be charged when car is returned very dirty	

Figure 20: Market analysis of the biggest car-sharing companies in the Netherlands, and biggest peer-to-peer car-sharing companies from the world.

3.3 Stakeholder Analysis

The number of providers makes car-sharing complex for both users and companies. For the user, it is difficult to choose between all the providers. And for the company, it is difficult to create a competitive advantage with their service. But what makes it even more complex are all involved stakeholders. With different actors, such as residents, other road users, local authorities, municipalities and organisations within and even outside the company itself. All these stakeholders have different interests. The stakeholder map on how Lynk & Co is connected to all these players is shown in Figure 21 on the next page.

3.3.1 Business perspective

Geely Holding
The Zhejiang Geely Holding Group (Geely Holding) was founded in 1986 in China, this is the group to which Lynk & Co belongs. This automotive enterprise has a big portfolio containing several brands, such as Lotus, Volvo, Polestar, Smart and Lynk & Co. The cars from these brands share the platforms with each other. This group provides financial assets, and Lynk & Co also has to report to them (Geely, 2023).

Lynk & Co
Lynk & Co is the automotive brand formed as a joint venture between Geely Holding and Volvo Car. They launched in 2016 with their car, the 01, designed and engineered in Sweden and provide them for their users. Currently, other models are only present in China, where they range from the 01 to the 09. Cars can be seen in experience stores, called 'clubs' and they are sold in a digital way (Zhejiang Geely Holding Group, 2023).

CEVT
China Euro Vehicle Technology AB (CEVT) is the provider of product development support within Geely Holding. They provide software for the cars, such as in-car apps, which will be used by the user (Zhejiang Geely Holding Group, 2023a). The software that is used for the app, that connects the user to the car, is developed in-house at Lynk & Co.

3.3.2 Government perspective

The government perspective can be divided into three parts: European Union (EU), the Dutch government (Rijksoverheid) and the municipalities of cities.

European Union
The regulations that are set up by the EU influence the acting of the national government, such as the Dutch government. Regulations about emissions, cybersecurity, privacy and connectivity are most influential to car sharing.

Dutch government
The part of the Dutch government that decides on the infrastructure and that is able to set regulations that influence travel behaviour, is Rijkswaterstaat Ministerie van Infrastructuur & Water. The Dutch government in general sets cooperative strategies for mobility between different parties and they therefore also influence the municipalities.

Municipalities
Municipalities have a big interest and influence in mobility, and also in shared mobility. They decide together with the national government, project developers and people how the cities will look like, where (shared) cars are parked, what people need to pay for this and if there is a difference between shared and conventional cars (Gemeente Rotterdam, 2020; Appendix H).
In this report, the municipality of Rotterdam is chosen to make the scope and therefore relevant stakeholders more tangible and get a better view of their role with the sharing services. Besides that, the TU Delft is partnered with Rotterdam as they are the frontrunner with future mobility in the Netherlands (Rotterdam Partners, 2023).

3.3.3 People perspective

Users of the sharing platform
The users consist of two types: the lender and the borrower. They have a big influence and high interest in car-sharing. During the sharing journey, they use all the touchpoints. Such as the same car, the sharing platform to interact with each other and the mobile app.

Cities (public spaces)
The cities, and public spaces in general, are the spaces in which car-sharing takes place. These spaces are linked to the municipalities and adapt to their regulations. Examples of points from these public spaces that influence the car-sharing of Lynk & Co, are the ability to park, the charging infrastructure and garages. Within these public spaces, the use of these types of cars influences the way people live in their neighbourhoods.

Other road users
Within these neighbourhoods and thus public spaces, car-sharing has an influence on other road users. Such as other vehicles, pedestrians and bicycles are actors that also participate in traffic, just as the users of car sharing. They want to know what the shared cars are up to. The other road users have an interest in car sharing, as it influences the way their street will look.

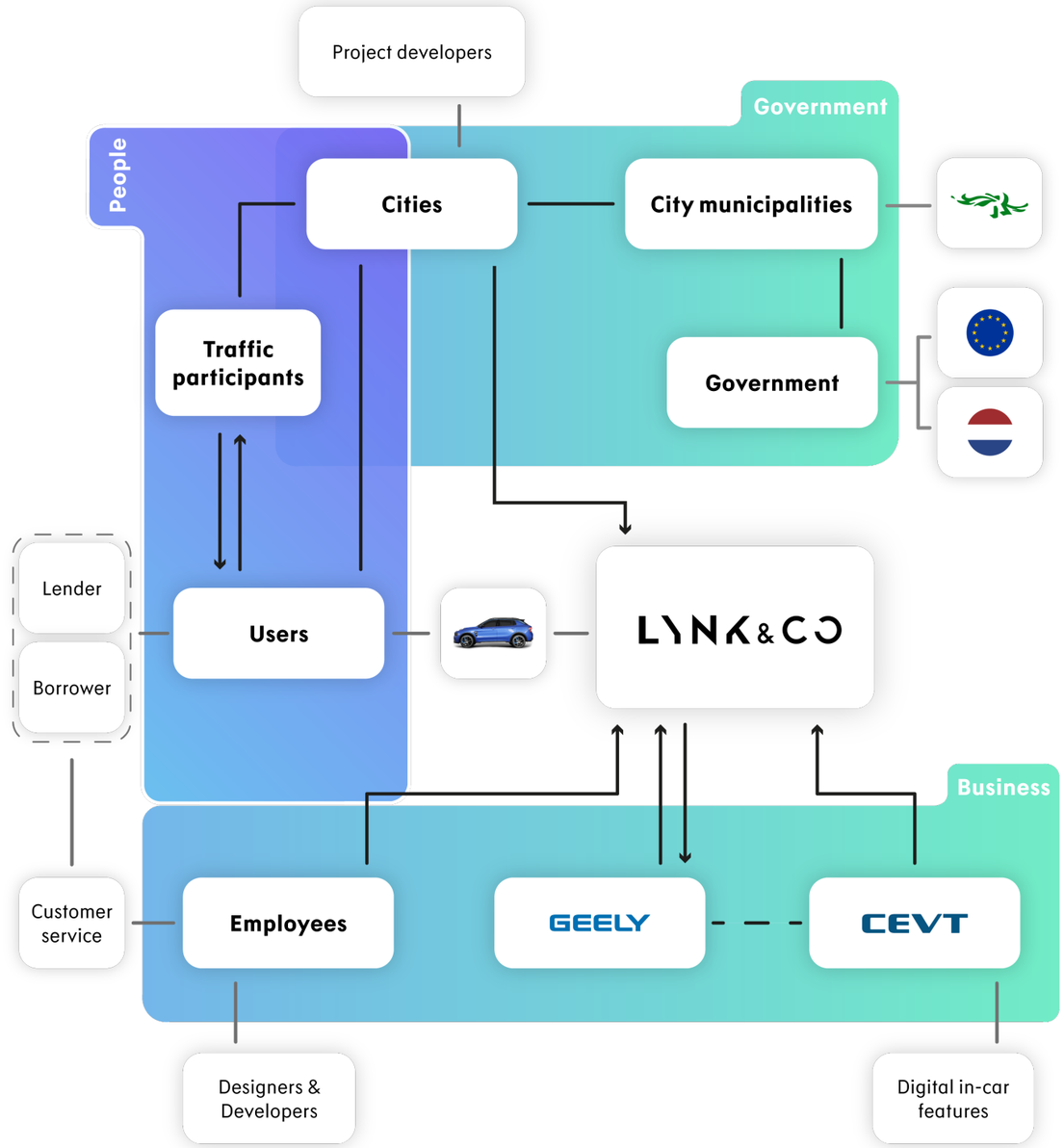


Figure 21: Stakeholder map with relevant players and how they are connected.

3.4 Benchmarking

Benchmarking is done with peer-to-peer sharing services in which trust plays a role and secondly, a benchmark is done with interactive spaces, where cognitive and sensorial ergonomics influence user behaviour. The services that were benchmarked all had some aspects that touch upon the trust and control issue and therefore relate to the topic of P2P car-sharing.

3.4.1 Design for trust

Airbnb is a company that took an interesting approach to sharing highly valuable personal spaces. Airbnb is a platform where people can rent out or share their home or room with someone else. The service can be accessed via digital interfaces: the mobile app or the website, which are fully designed on trust between the host, the one who owns the place and the guest, the one who wants to stay in this place.

An important aspect of this service is the trust and control of the host over the guest. They use different approaches to build trust and tackle the concerns of the owner, the stranger-danger bias. This implies that people trust people they know more (Airbnb, 2023; Auffman, n.d.).

Rating and reviewing
As discussed in Chapter 2.2.2, research was performed on the willingness to trust strangers. This trust issue is approached by Airbnb via a rating and review system. In which the host and the guest have to leave a review after the stay is over. When reviews were added, and people had a high reputation, it became clear that it did not matter if people were different. There is also a difference in the reviews, there are reviews about the person, the staying and how the house is handed over again to the host.

Introduction to increase trust
Before the stay, guests must introduce themselves and explain why they want to book the place. This makes people have more trust and confidence in defining if people are suited to stay. Airbnb uses the design of its digital touchpoints and interfaces to give hints to its users on what to provide and which actions to take.

Personal information
All hosts and guests have a profile in which personal information is stored. The host can state personal information, give interests and provide preferences. It turns the trust issue around, not only hosts can check guests but guests can already see what type the host is and if it will match. It is an interesting approach from another point of view. The host also feels more in control due to the personal information that is provided, as the guests will only try to book when they are more alike or have things in common (Airbnb, 2023; Auffman, n.d.).

Other important aspects when designing for trust are transparency, instructions, reminders, personalisation and grouping. Transparency focuses on the fact that for both host and guest, all the information is shown all the time. Including the price built up and the defined rules for staying. At the end of a booking, there is no doubt and discussion about important things such as costs and regulations.

Personalisation
As a base, there are different types of travel trips: vacation, city trip, beach, adventure or business. Airbnb groups accommodations based on these trips (experiences). The hosts can mention what kind of trips they are open for and will mainly attract these types of guests. Guests can search for specific trips and experiences; this way booking will be more alike and therefore match (Abrahao et al., 2017).

The host can give instructions and provide reminders to the guests. Instructions on what needs to be cleaned and time-related reminders on things they might have forgotten.

All these minor design aspects create a bigger feeling of control along the complete journey. This approach shows that small tweaks can influence the whole experience.

3.4.2 Community

Another comparison is made with Peerby, this is a platform where people can share all kinds of products with others within communities and neighbourhoods.

The interesting part is that the service works in two ways. People can offer their product, a party tent for example. And others can react to this advert if they have a birthday in their garden and want to borrow it for the weekend. However, Peerby also enables people who want to use/rent something to place requests for a certain product at a specific time. They can for example ask in their community, 'I have some shelves to put on the wall, does anybody have a drill that I can borrow?'. This way people actively participate in the sharing and connect more with people in their community (Peerby, 2023).

3.4.3 Interior

An example where the interior is used as a tool to influence the behaviour of different users and is fully connected with sensors and actuators in the interior is the new Mini Cooper Electric in 2025.

Digital interventions
This interior uses the AVN screen together with lights and sounds that are embedded inside the car, to create all kinds of different experiences. These modes can be changed but come with preselected features that are enabled and some of them are disabled and therefore less prominent or not shown, depending on the relevance and need of the task (BMW Group, 2023).

The screen plays a big role for the user of the car, it adapts to the user. Visualises different predefined experiences and shows relevant information. The lights can change colour, but they can also display patterns and shapes to enhance and guide the user even more. Next to that, new sounds are developed that correspond to the driving, the actions that someone takes and the specific experiences. Besides this, a personal assistant is used in the system to guide the user when questions are asked but also out on its own. At last, the phone, just like Lynk & Co, is used as a digital key.

Such an approach to enhancing the in-car experience and influencing the user is interesting to use as a starting point to influence car-sharing users.

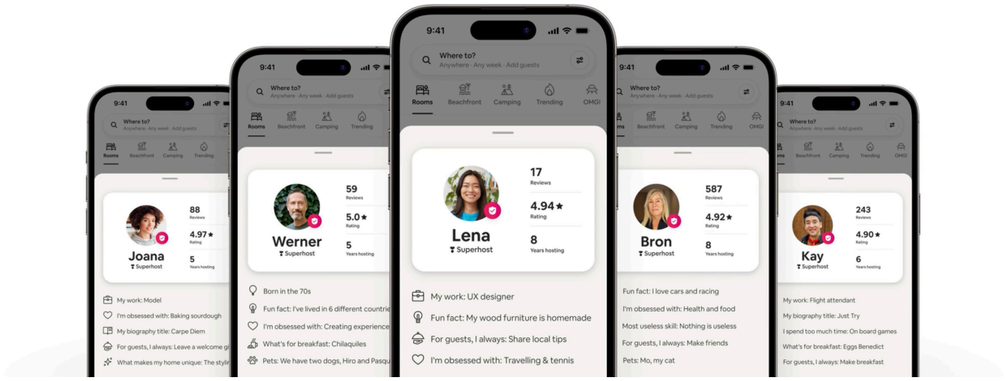


Figure 22: The hostpass to show how Airbnb makes sharing valuable properties and providing trust and control (Airbnb, 2023).


Figure 23: The new Mini Cooper Electric 2025 interior (BMW Group, 2023).

Chapter 04

Interaction

This chapter is about the interactions the user has with the current car-sharing service. It shows a structured overview of the performed tests. And explains the performed interaction with relevant actions, insights and touchpoints.

4.1 Construction of Research

It is important to fully understand the current experience of the lender and borrower. This way it can be seen where the concerns and pain points are, but also what goes well during the experience.

The research on this experience is split up into a questionnaire, experiencing the car, experiencing the service, and interviews (in this order). Insights about why people want to share or not are also researched via this questionnaire and are shown in Chapter 2.2. This chapter discusses insights related to the journey as a borrower and lender.

4.1.1 Questionnaire

At the start of the project, a questionnaire was done amongst owners of the 01, users of the sharing platform of Lynk & Co and people that never used car-sharing services. This was done to get a first idea of the problems and concerns related to car-sharing.
Questions were based on previous research performed by Lynk & Co (Lynk & Co, 2023a) and first ideas about possible concerns present with car-sharing, based on literature research and initial thoughts.
The survey was distributed through social channels, flyers (Figure 24) and via employees of Lynk & Co who know people who own a 01. The questions and results can be seen in Appendix B.

4.1.2 Borrower experience

After the questionnaire, the service was experienced as a borrower, to mimic the interaction of a real borrower, who was new to the car. The interaction as a borrower of the 01 was performed by two people (including myself), to see which parts of the journey are most relevant and what to ask the owners of a 01 at a later stage during the interviews. First, the journey was tried out by myself. After that, the journey was performed by someone else, to provide the opportunity to make notes, take pictures and gain more insights.

The service scope that was tested went from setting up an account on the Lynk & Co app to receiving the final email with the amount that will be charged to the borrower, so the complete journey for someone who knows that the 01 can be used as a sharing car.
During testing, photos were taken from the interaction and screenshots of the digital touchpoints were used (Figure 25).

4.1.3 Experience the 01

Before testing the experience as a lender, it was important to know all the current features of the car. Just as a real lender, you have to know the car and how everything works. This way it became clear what potential borrowers could touch, access and change.

4.1.4 Lender experience

After getting to know the car. The service from a lender's point of view was performed. Again, with two persons, this way one could perform actions and the other could take photos and take notes. Next to that, this experience is tested in two environments. One outside at a charging station and one inside a parking garage. This was done to not only identify current problems but also problems that might occur when sharing is used in the future portfolio.

4.1.5 Interviews and questionnaire

The interviews targeted 01 owners. They were performed after the complete service was experienced. This way it was possible to know what owners had to perform when sharing their car. And if concerns are the same and if they were experienced among more. During the interviews, questions were asked, based on observations during the experience of the service. Besides pre-structured interviews, there were also spontaneous conversations with 01 owners on the streets. More information about the interviews can be found in Appendix H.

Figure 24: Flyers on windscreen to gather input from 01 owners.

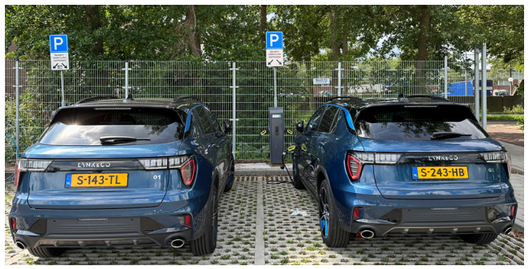


Figure 25: Test setup of experiencing the car as borrower and lender.

4.2 Current Interaction

4.2.1 Borrower interaction

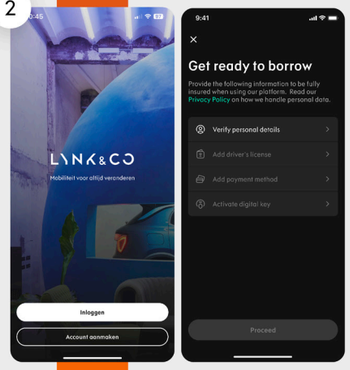
In this part, the tested borrower experience is shown. A chronological step-by-step overview of the most important parts of the current car-sharing experience as a borrower. Including images of the performed actions, related screens and relevant insights supplemented by existing research of Lynk & Co.

1

Download mobile app

"Reviews do not look promising..."

2

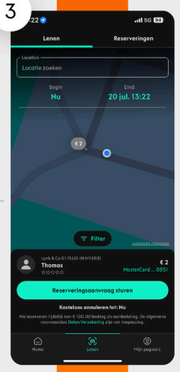


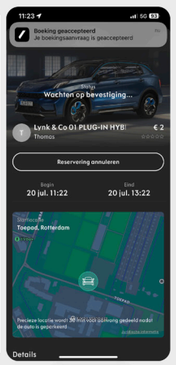
Open app

First create an account.

After that, setup sharing with a license check, personal details, payment method and activation of digital key.

3





Send request

Wait to be accepted. When accepted there is a notification and the screen changes.

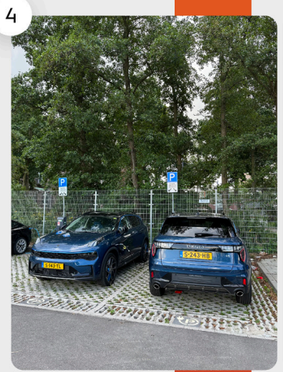
"Often I get rejected ..."

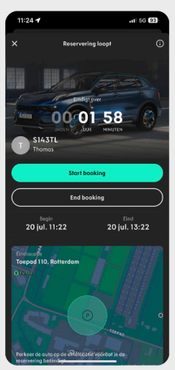
"I'm in!"

Accepted

Rejected

4



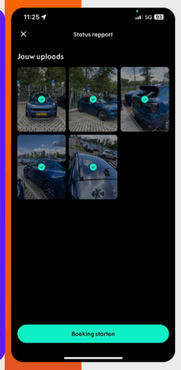


Start booking

Start the booking when near the car.

"Think I can start the booking, not sure what to do else..."

5

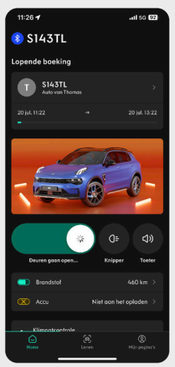


Condition report

Borrower needs to take pictures of car to indicate damages.

"Like the rental cars on vacation"

6

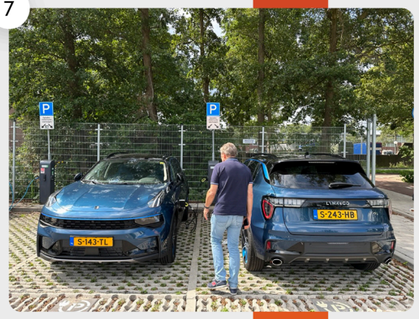


Opening 01

[Participant unlocks the car with the digital key]
"Never used it, easy!"

01 not connected to charging station

7



Car is connected to charging station

Borrower needs to unplug cable.

[Participant stands still for a while] Indicates the he is not sure and in doubt.

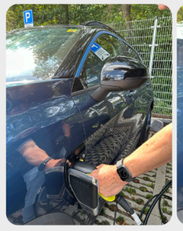
Getting card

"Have to check my Whatsapp, we discussed before."

"Must not forget to put this back"

Unplugging from charging station

[Participant first tries to pull out.. not working, tries with card and hears beep]

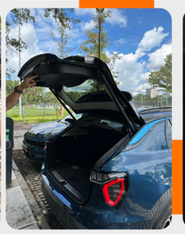


Unplugging from car and putting cable away.

[Participant just pulls charger (car is unlocked so it works)]

"How do I open the boot? Car looks fancy so must be electric"

[Participant first puts the cable on top, not knowing this hatch was there]



8

Entering the 01

Borrower enters the 01 for the first time.

"I have no idea where to begin and what I am allowed to touch since it is not my car"

"Looks really good!"

"Would be nice to have some type of guide for questions"

[Participant starts with touching screen via swiping and ticking]

9

Driving the 01

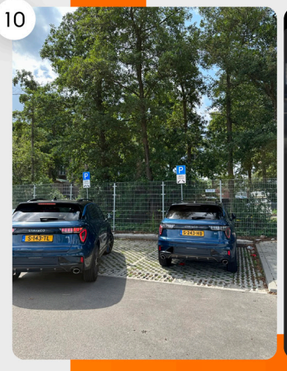
[Some struggle with how to operate the car]

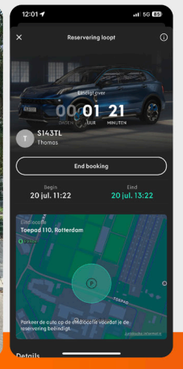
[Participant ask a lot about how things work and what is possible]

"Car drives great!"

[Hesitant to try out things]

10





Returning the 01

Borrower needs to return the car in time to a pre-defined spot buy the lender.

"Wait, I need to check the app to see where I have to park."

[Participant looks worried when asked to charge car again]

"Am I in time? What if I'm not?"

"I heard a click sound and the colour switched, which means something happened."

"Is this alright?"

[Participant unlocks petrol filler cap]

[Trouble finding button to open charging port]

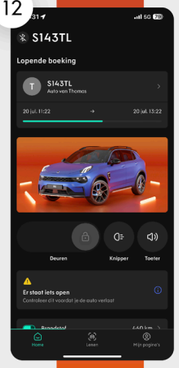
"Plugging in I now know."

11

Charge the 01

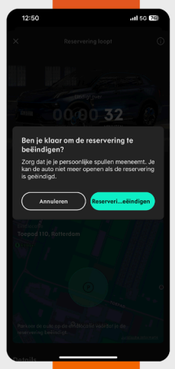
[Boot opened via button on tailgate, not in car]
Indicates that participant is not aware of all features.

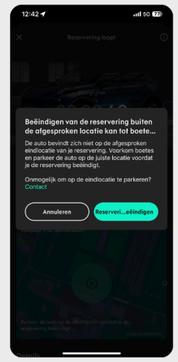
12



End booking

Borrower needs to close everything and get app to end booking.





"What now? What happens if I end my reservation?"

[Participant looks very stressed and unknown]

[First reaction was to click 'contact']

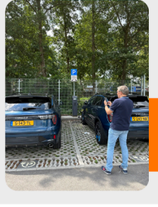
13

Condition report

Borrower needs to check again for damages.

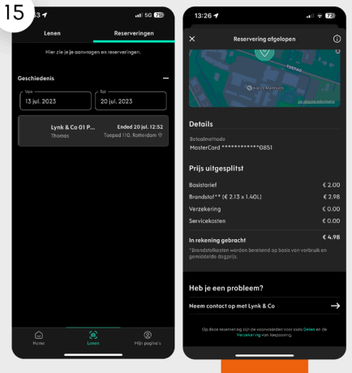
"What if my battery had died?"

"I did this before, I know how it works"



Review and receipts

15



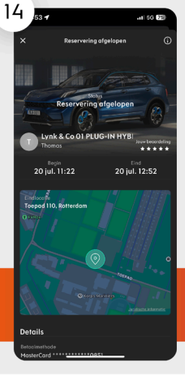
"Ah this is handy"

"Was this price before?"

"Not sure if I used it to the max and best way possible"

Leaving car

14



Borrower can walk away from the car and the booking is ended.

[Participant forgot to put charging card back]

"Would like to thank the person that I borrowed from."

"Can I just walk away?"

4.2.2 Borrower interaction insights

From the performed service interaction several insights emerged. These are discussed below.

Confirmation
The first one is that first-time users, ask a lot of questions during the journey and ask for guidance. They want to get a lot of confirmation of what they are doing. Because the service and the car are new.

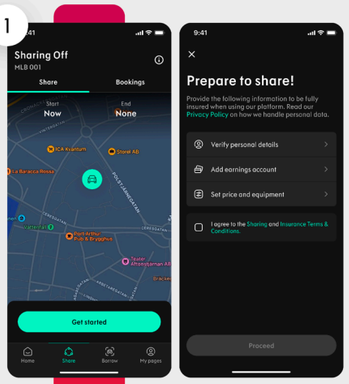
Unclear exploration
Secondly, people are afraid to use things. It was found that the borrower does not try everything for fear of doing something wrong. They are not familiar with the car and therefore hesitant to use them to their full potential. This unfamiliarity with the car also sometimes causes the user to use the car incorrectly.

Carefulness
At last, the borrower was very careful with the car. Partially because the actions were not performed alone and thus the participant knew that he was being watched. But also because he did not want to do anything wrong, which could influence the car in a bad way. This personal and close interaction brings a certain carefulness with it.

4.2.3 Lender interaction

In this part, the lender experience is shown. Again a chronological step-by-step view of the most important parts of the current car-sharing service from a lender point of view. The experience is supplemented with images of the performed actions, related screens and relevant insights.

1

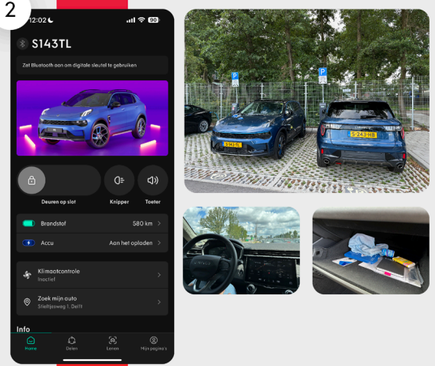


Setup car-sharing

The lender can set up car sharing. This is done in two parts:

The first part can be accessed via 'get started'. It starts with setting up your personal details, adding an earnings account, adding insurance details (if car is bought by cash) and last set price and equipment.

2



Lender parks 01

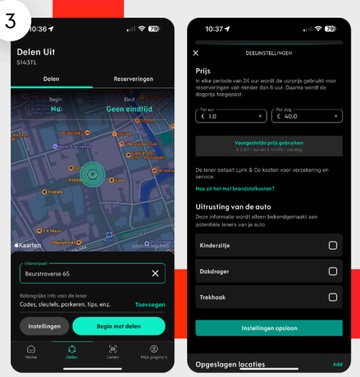
Lenders parks the 01 and views information in the mobile app.

"Hope this will be returned in the same way."

"Hope this will stay here."

"I can just leave, my settings will stay."

3



Start car-sharing

The second part consits of starting the sharing and thus making the car available. Additional information can be provided such as what is available in the car and the price.

This can be done via the mobile or in-car app.

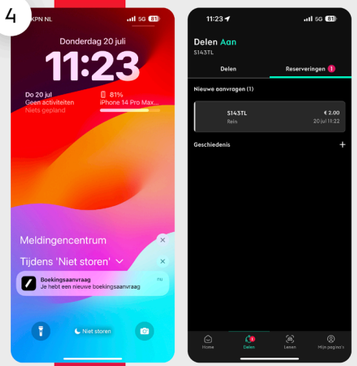
"Would like to give more information."

"In-car app does not do much."

"Will it even be used?"

"Nice that I can give some explanation."

4



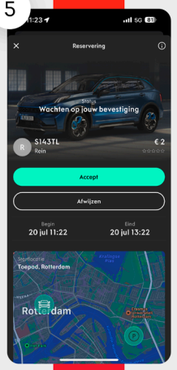
Request notification

User gets notified in app. In the sharing section, user can see new requests.

"Who is this? Is there a picture or info?"

"A request!"

5

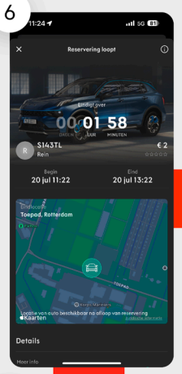


Confirm booking

User can confirm the booking by accepting it. Next to that, this page shows all the important details.

"Will it really be back at this time?"

6

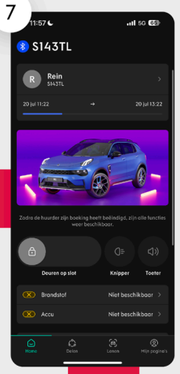


Before booking

User gets updates about the booking on the application screen.

"Can I still change some things?"

7



Ongoing booking

User can see limited information about the ongoing booking.

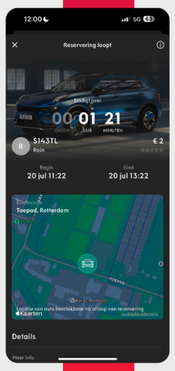
"I have no information at all."

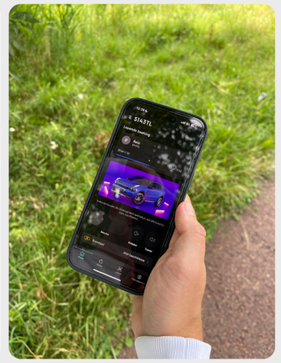
"Can I contact the borrower if needed?"

"Progress bar is clear"

[Keeps checking phone] Indicates curiousity and control

[Keeps refreshing the application]





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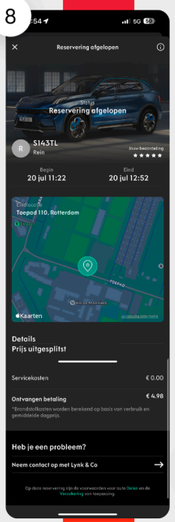
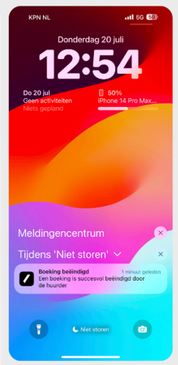
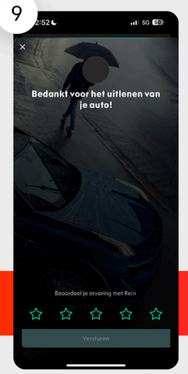




Booking ended

User gets a notification about the ending of the trip by the borrower.

9



Review

User can leave a review based on how the car is returned and the condition of it.

"I still have no idea who borrowed it."

"Not sure what I can rate."

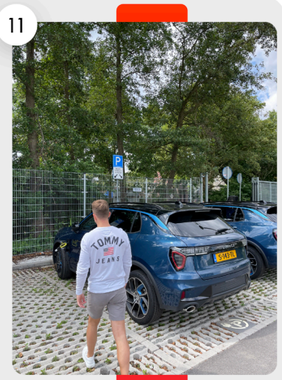
4.2.4 Lender interaction insights

From experiencing the service as a lender relevant insights that are present with lenders became clear. In general the car-sharing system works well (when the connectivity works), such as the information shown and the different in-car user accounts but the full potential of the present systems is not yet used.

Control
Similar to the literature found, the lender has no sense of control. A related example was the fact of constant checking of the phone. There is little to no information about the user, nor is there any data about the car in the mobile app during the booking.

Interaction
Besides that, it became clear that the lender wants to be able to interact with the borrower. Both for the booking to give information but also to be able to answer questions about uncertainties.

11



Return to car

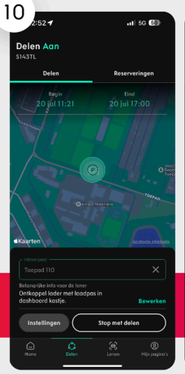
User returns to the car and starts to check how it looks.

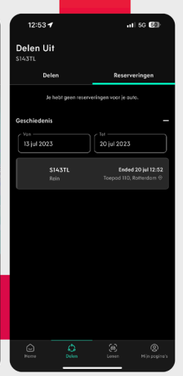
"I have my own settings again."

[Looks around and checks the car interior]

"See some finger prints."

10





Stop sharing

User can stop sharing and see history of car lending sessions.

"Clear overview."

Chapter 05

Journey

This chapter converges all previous research, observations, and interview insights into a persona and a lender journey. The persona consists of the lender and borrower and shows a representative version of a potential Lynk & Co lender and borrower. In the journey map, the most important aspects of the journey are shown with the related emotions, touchpoints and activities.

5.1 Persona

5.1.1 Research

Before the journey map is created, a persona has been made. This persona reflects a two-way interaction between the lender and the borrower and is based on user research and observations. In addition, it will be used to design for the target audience as it mimics the most common use case of car-sharing.

Location
The persona is representative of highly urbanized areas, city centres and medium-sized cities such as suburbs. It takes place in the city centre because this is where Lynk & Co is highly represented.
An interview is conducted with a consultant shared mobility and mobility hubs within the municipality of Rotterdam (Appendix F). From this interview, it was made clear that in cities, the car is part of a transition in the coming years. From being prominently parked on the streets to being subjected to designing liveable areas where the car plays a secondary role and is parked in garages (Gemeente Rotterdam, 2022). Besides that, the charger is included as this is in line with the future portfolio.

This combination of most Lynk & Co cars in the city and the interesting transition the car will undergo in the coming years was chosen as the default for the persona. Which is visualised in Figure 26 on the next page.

5.1.2 Borrower persona

Since this is a two-way interaction between lender and borrower. The borrower is included in the persona. He is needed to use the car, and if no one borrows the car there is no reason for the lender to offer it.

Living situation
He lives in a city and is at the start of his career. Acquiring a private car is therefore too expensive and he does not have the space to keep it.

Personality
Personality traits of him are that he loves cars and the newest innovative tech products. He is an extrovert and very active in his community. At last, he is determined and serious, due to a lot of things that keep him busy he can be chaotic and tend to forget things. This makes car-sharing interesting but overwhelming.

Car usage motivation
He loves going on road trips during the weekend with friends. And sometimes he needs a car to visit cities for business trips or prefers to use the car instead of the train for longer journeys outside the city.

5.1.3 Lender persona

The lender part consists of a family of two people. They decided to get a car because from experience they know they cannot get everywhere with public transport only.

Motivations for the 01
They have a subscription to Lynk & Co 01 because it is a flexible way to have a private car, as they can cancel it whenever they want without any extra costs. Besides this benefit, the car has a lot of features included as standard at this price (e.g. panoramic sunroof, 360° camera and automatic tailgate). They are no true petrolheads, they see the car more as a means of transport and choose it due to the interior and experience.

Personality
The personalities of both are quite similar. They are acquainted with digital tech and know how everything works in their car, they know all the ins and outs.

Their life is well organized in terms of planning their weeks. They want to have control over everything, their daily life but also bigger things such as their financial life. With their stuff they are organized as well, they know where everything is and are therefore very neat. Inside their house, but also in the car interior, which they want to keep clean.

Both of them are quite introverted, during their hectic lives they love some time for their own. However, they also like to spend time with family and friends from when they were younger and new friends from their neighbourhood. In contradiction to her, he likes cars. He likes the looks of them and is very careful with the 01, loves to keep it clean and good-looking. But in general, they relate more to the car in terms of experiences.

Car-sharing
She shares the car sometimes with friends, but he is a bit hesitant about that. He does not want the car to have any damages or a badly-treated interior.

During sharing they cannot see any information about their car, this is not a big problem as they know how their friends are and behave. But it holds them back from sharing the car with more people.

When they offer the 01 on the sharing platform they get requests from a lot of people, that they reject because they do not know who these people are. When lending the 01 they always give some basic instructions.

Lender Subscribed to a 01

- Family of two
- Middle aged
- City centre
- Office jobs (hybrid)

Motivations

Subscribed to a 01 because they want a **flexible** way of having a car. Also chose for the 01 because of all the **features that it has as standard** and they **identify** with the **brand** and the perceived **lifestyle**.

Goals

- They make **environmentally aware decisions.**
- Plan and track their **time** to make it **efficient.**
- Want their **costs** as low as **possible.**
- Actively **participate in the community.**

Car usage

The car is occasionally used during the week for work. In general, during the week the car is only used some evenings for sports or visiting family. On the weekend days, they sometimes go out on a road trip or go to visit friends/family. At last, they use the car for their vacation. Due to hybrid working, the car is by default at home several days a week. The car is also not used every weekend. Besides that, when on vacation the car stands still for multiple weeks. When the car is not used it is parked inside a private garage plugged in the charger.

Personality

Technophile	Tech-savy
Disorderly	Organized
Untidy	Neat
Obeyer	Control freak
Unbothered	Car geek
Introvert	Extrovert

Car-sharing motivation

- When I share my car I have **no information**.
- Car sharing does **not feel personal**, I have no idea **who** will borrow it and how this person behaves.
- I hope the **car will be returned as I left it**.
- I hope they do **not misuse my car**.

- I am **currently sharing** the car with some **friends** and **people in my neighbourhood**.
- I might want to share with others if I have more information about them and the **sense of control**.

Borrower

- Living alone
- Young adult
- City centre
- Office job

Personality

Owning	Using
Unmotivated	Determined
Untidy	Neat
Obeyer	Control freak
Introvert	Extrovert

Car-sharing motivation

- Getting a private car is **too expensive**, therefore I want to use car sharing.
- I am **not familiar** with the **car and the service**, which holds me back.

- I frequently ask in the community chat if I can **borrow things**, for me a car seems a bit too much.
- I would **love access** to a car for **certain trips**.

Figure 26: Lender and borrower persona.

5.2 Journey Map

In this journey map, the focus is on the lender. The journey map is combined by insights from people who did offer their 01 and people who have doubts about offering their car on the sharing platform. It is used to find important moments throughout the journey and to identify opportunity gaps.

The service has been divided into different stages. It consists of the activities the lender undertakes and the needs they have in doing so. Furthermore, the journey includes touchpoints to show how users interact with the service and with each other. Also included in the journey is an emotional line, which shows how the lender feels over time. And where the pains and gains are.

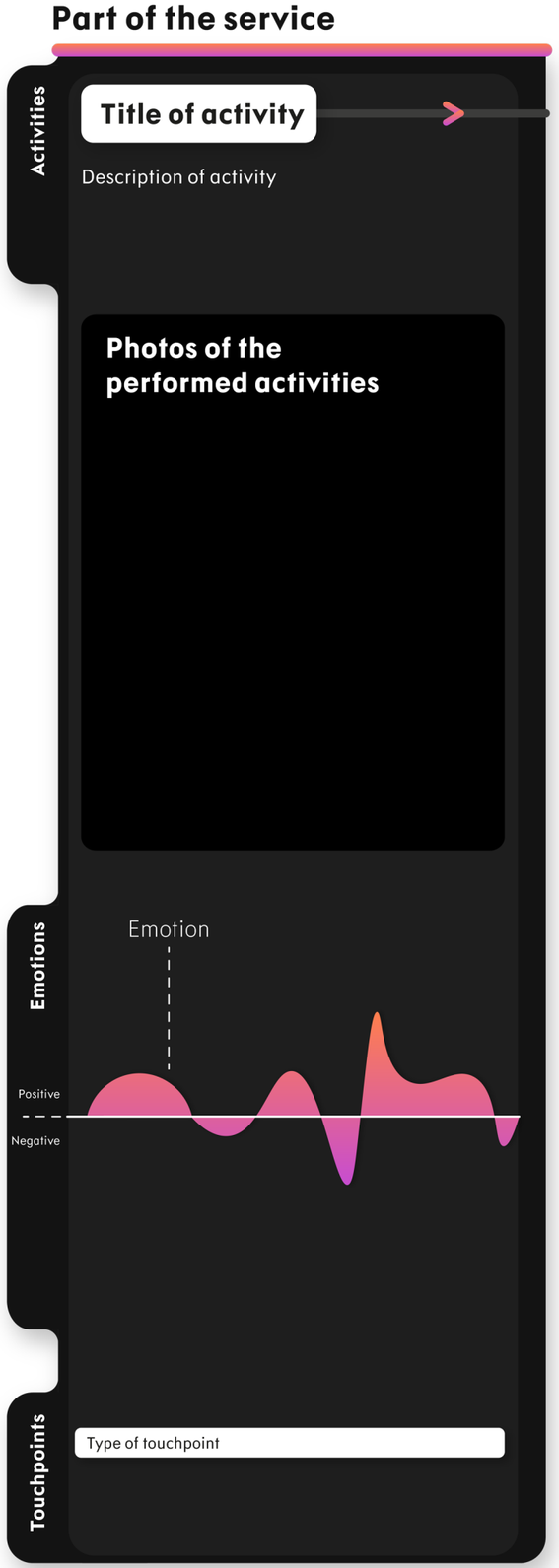
5.2.1 Explanation of journey map

On top of the journey map the part of the service is described.
Then there are three main parts, which can be divided into: the activities, the emotions and the touchpoints.

Activities
A title gives a brief description of the activity, which is further elaborated below with some text. Besides the text, there are drawings in which the activities are visualised.

Emotion
The emotion section focuses on the emotions of the lender throughout the journey. Above the middle line, the positive emotions are shown and below, the negative ones. Emotions are combined and represent the most common ones based on user research via the questionnaire from Appendix A, interviews from Appendix H and own observations. They are structured via the Product Emotion Measurement Instrument (PreMo) from the Delft Design Guide (Van Boeijen et al., 2020).

Touchpoints
The touchpoints section shows what the lender uses in order to be connected to the service, or related parts of the service. The touchpoints can be the mobile app, the HMI in the interior, the charging station and the exterior of the car (lights and sounds).



Consuming: Lender uses own 01

Initiating: Thinking about and setting up car-sharing

Activities

Driving the car

The lender drives the 01 to a destination. While using and enjoying all features in the car.

Parking the car

Lender parks the car in the streets or inside a garage.

Plugging the car in

Lender gets the charging card, plugs the charger in the car and in the charging station.

Car is idle

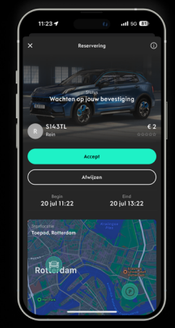
Lender does not use the car for a day or even multiple days.

Setting up car-sharing

Lender can set up car-sharing via the phone or in-car mobile app.

Decide on requests

Lender receives request from borrowers and can decide to share the car, thus accept or decline.



Emotions

Positive

Negative

Relaxed and joyfull

Relieved

Satisfied

Unbothered

Annoyed

Cautious

Touchpoints

Car HMI (interior)

Car exterior

Charging station

Application

Car HMI (interior)

Lending: Ongoing booking

Closing: Booking is ended

Before booking

Lender looks at the phone to view information about the booking.

Ongoing booking: Borrower uses the car

Lender is occupied with other tasks, but starts to worry and get stressed about the car. There is no sense of control, because there is no information in the app, except the booking progress bar.

Booking ended

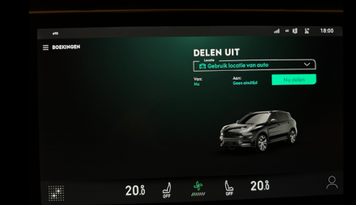
Lender receives a notification that the booking has been ended and thus the car returned.

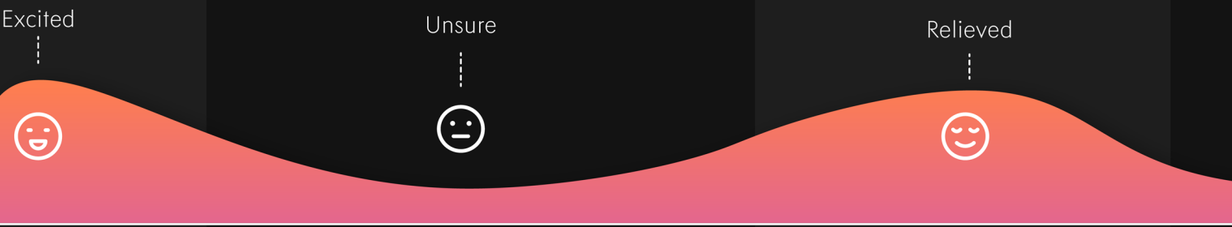
Review and payments

In the app the lender sees what will be paid by the borrower. Besides that, a rating can be given.

Turn car-sharing off

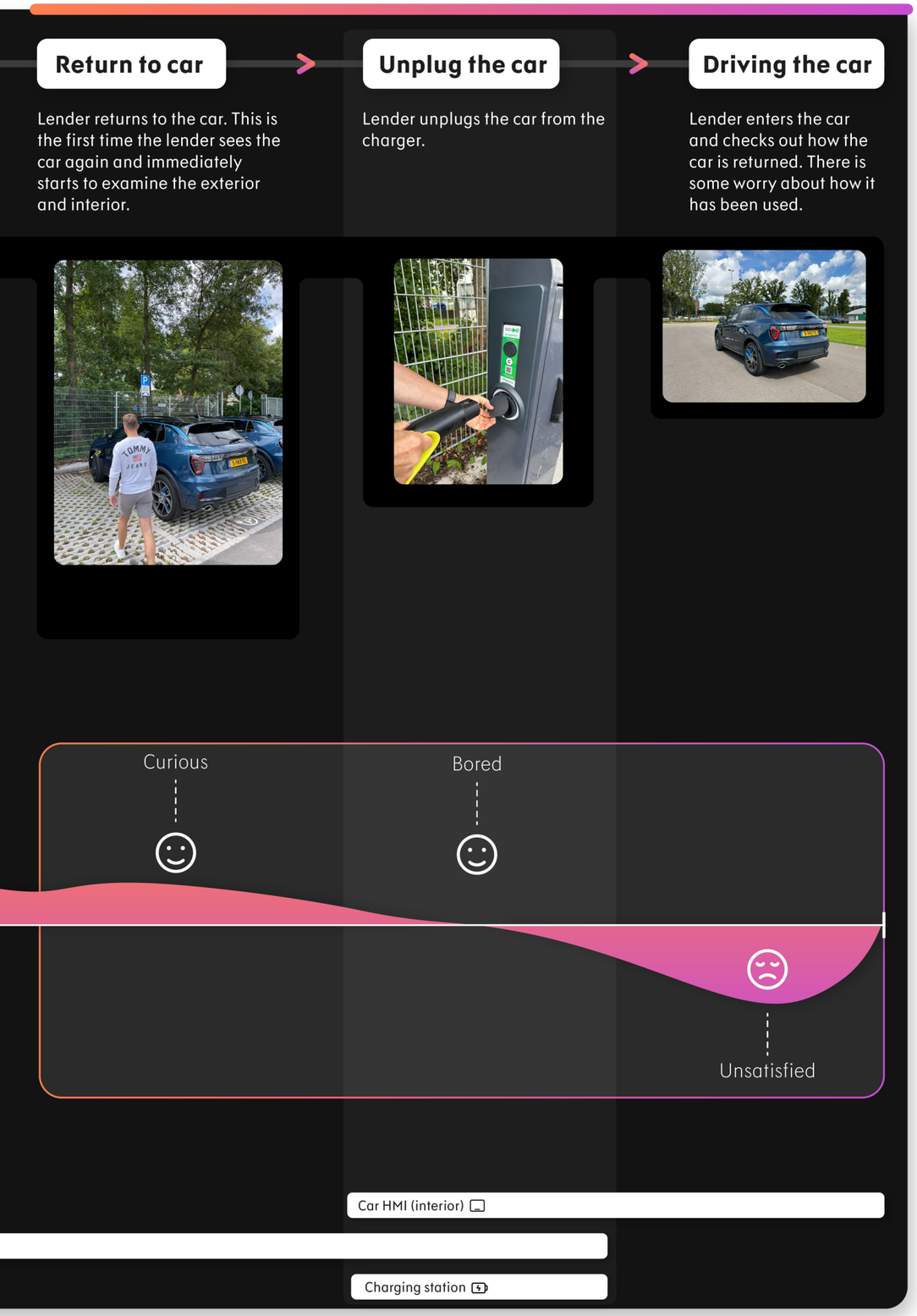
Lender can decide to turn off car-sharing. This can be done via the (in-car) application.





Car HMI (interior)

Car exterior



5.2.3 Insights

According to the peak-end rule, people judge an experience based on its most intense points and how it ended (Frederickson & Kahneman, 1993). The same goes for this journey map and related experience. It has some high points, with positive emotions but also some deep lows and not an ending with a positive feeling. In conclusion, the lender does not experience the complete service as good and therefore not beneficial.

The most influential points present in the journey map can be categorised into three sections: Stimulation, information and closing.

Stimulation
The first section and intense negative emotion happens at the point where the car is idle. The car is parked, being charged, and available for the lender whenever needed. There is no stimulation for the lender to provide their car on the sharing platform. This possibly leads to the fact that the lender does not share the car on a regular basis. And if the car is provided, the lender rejects a lot of people, which makes the acceptance rate low (Lynk & Co, 2023c). Most of the time they only share with people they know (e.g. family and friends). Rejecting a lot of requests brings frustration to the borrower. Which will eventually lead to less demand on the sharing platform.

Information
Secondly, there is the fact that people have no control or even the feeling of control during the booking. Control about the user, their behaviour and the car itself during the booking. Participants indicated that they do not want to have the exact locations of the car, but the fact that everything disappears makes them stressed.
This also relates to the fact that people cannot interact with each other. This is not only for the lender difficult, but also for the borrower who does not know the car. They cannot ask questions about the booking and the car.

Closing
At last, at the end of the journey, the lender gets back to and into the car and has doubts about its usage of it and how it is returned. Therefore, the experience does not end with a positive emotion. The only indication, that the booking is ended, is the notification when the borrower ended the booking. The money that the lender earns with sharing comes several days after the booking. Besides that, the lender has to take care of the car again, by refuelling, charging or cleaning. Therefore, there are no clear benefits shown and thus sharing feels more like a hassle.

5.2.4 Desired interaction

With these critical journey points in mind, the desired interaction for the lender can be described. This is done via the emotion line from the journey map, which is shown in Figure 27.

The three main differences take place in the earlier mentioned sections that came from the insights.
The first one is where the car is idle. At this moment the lender feels unbothered and is not thinking about sharing. In the desired interaction the emotion should be more neutral and the lender should be stimulated to actively participate in car-sharing.
The second moment is where the lender feels the lowest emotions, in the current interaction, this is during the booking. In the new version, the lender should feel calm and relaxed.
At last, there is the end of the interaction, where the lender should have a high positive emotion by making them excited to perform the same interaction again.

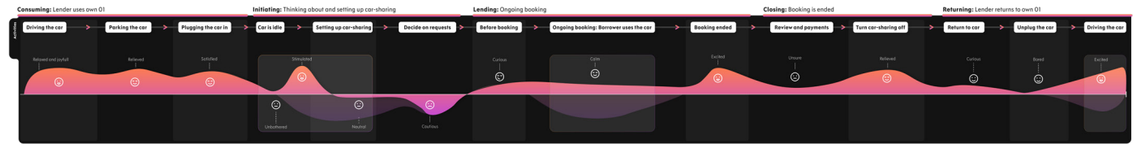


Figure 27: Desired interaction moments for the lender in the car-sharing journey.

Chapter 06

Design Brief

This chapter provides a revised design brief. The design brief consists of the design direction, that shows the more specific problem statement and related design statement. The scope gives insight into which part of the journey will be focused on, what the time frame is and what the opportunity gap is. At last, there is a vision with related concept drivers.

6.1 Summarizing

In this chapter, all insights that came from different research methods are mapped out. This is done to see how all relevant insights that were found are connected and what the underlying topic is.

6.1.1 Explanation mind map

Mind mapping is a method to create an overview (Van Boeijen et al., 2020). The mind map is built upon different aspects, reasons against providing the car and the concerns that come with this, reasons why people provide their car, and insights from field and literature research that influence the lender's willingness for P2P car-sharing.

The original mapping can be found in Appendix I. For this report, a digital version is made. The light blue 'sticky notes' are reasons why people provide their cars for P2P car-sharing. The dark blue ones are reasons against providing the car. The dark green ones are opportunities or needs. Besides this, the part of the research where the insights came from is shown.

The mind map is shown on the next page in Figure 28, and conclusions are discussed in the next section: 6.1.2.

6.1.2 Key drivers

From mapping all the insights and connecting them, different themes emerged. These themes are used as key drivers for the ideation.

Trust and guidance

Trust and indication
All lender concerns about providing their car can be generalized into one theme, which is trust. Trust in the user, the usage behaviour and in the system itself. The lender feels responsible for their car and therefore wants to have an increased feeling of control. This control does relate to control during the booking, but also before and even in the end. And in order to gain trust, a better indication of the borrower is needed.

Stimulation

Stimulation
Supply and demand on the sharing platform are closely linked. More borrowers create more car-sharing opportunities for lenders, and when more lenders accept booking requests from borrowers, it makes them return. It is therefore important that the lender has a stimulus and guidance to share the car on a regular basis and thus keeps coming back and being active on the sharing platform.

Critical journey points

Influence critical points
Lynk & Co creates its solutions based on the complete user experience. The car-sharing experience for the lender currently has some points in the journey that negatively influence the overall experience. The ignition of the service, the control during sharing and the ending without a high positive emotion. Therefore, one of the key drivers for the to-be-designed solution is the focus on specific points in this journey.

Product service interaction

Product service interaction
The last important driver is the complete product service interaction and especially the Human-Machine Interaction, which is about how information from the system is perceived in a visual, haptic or auditory way. This key driver is derived from research but also personal ambitions.
The interior is the space that is shared and thus in which both users, borrower and lender, take place. Besides the fact that in this area the biggest concerns arise, the HMI in the interior also has the highest potential, it can influence both borrower and lender within the same system. Next to that, it is important to include how these interactions are visualised towards the lender.

6.1.3 Mind map

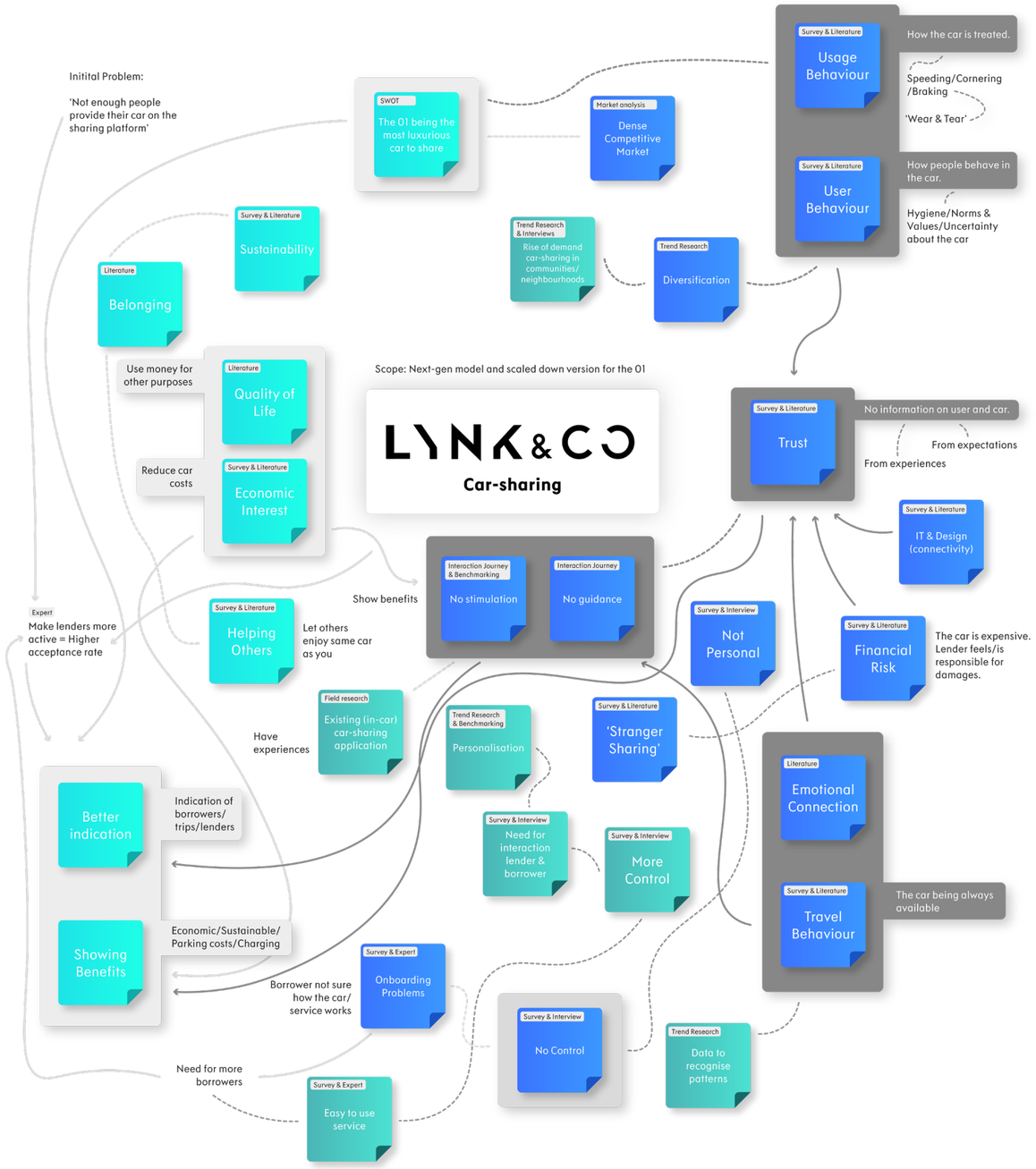


Figure 28: Mind map with most relevant insights from the research phase.

6.2 Envisioning

In this chapter, the vision and the analogy are shown. Both are used to continue with the next phase and start ideation. The analogy helps in communicating the vision to others.

6.2.1 Vision

A vision is an expression of the desired future. Besides giving a future direction, it also functions as a starting point from which will be designed (Hekkert & van Dijk, 2014).

In the vision, the focus is on the lender, as this is the actor present with peer-to-peer car-sharing that decides to take part in car-sharing or not. From the research came that car-sharing at the moment is a hassle, instead of a benefit. The car-sharing experience should therefore be enjoyable, it should not feel like an obligation or extra hassle of things the owner has to worry about and take care of. Providing the car must be something that lenders do not think about and must give satisfaction during and after the booking is ended.

Statement
The following vision statement is therefore conceived:

> " Make sharing a privately owned car beneficial, instead of a hassle. "

6.2.2 Analogy

An analogy is used to convey the underlying message of the vision towards stakeholders. It can be found in another domain and is a strong way to clarify the desired interaction (Hekkert & van Dijk, 2014).

The underlying message is described via an analogy. The desired interaction should feel like:

> " Bringing your children to their grandparents for a day. "

Doing this is beneficial due to the fact that people feel a certain certainty and safety which makes it worry-free but still controllable. People feel secure as they know how they will take care, they know and trust that everything will be alright or even do a better job. It feels worry-free, which means they do not have to think about it. However, people still remain on stand-by if things go wrong or if help is needed. This can be via direct interaction or via instructions that were provided beforehand. And at the end of the day, after the 'experience' it feels relieving and relaxing.

Product qualities
From this analogy, the product qualities emerge. These are qualities to elicit the interaction, by using these product characteristics the user will experience the use of the product in the way as been defined and envisioned by the designer. The qualities do not describe what kind of product will be designed, but they do develop an understanding of the to-be-designed product at a qualitative level (Hekkert & van Dijk, 2014). The product qualities that come from the analogy are human touch, secure, worry-free, relieved and enjoyable.

6.3 Scope

6.3.1 Place and time

At the start of the project, the scope for the research was already limited to Europe and for the stakeholder, market and user research even to the Dutch market. This was done to be able to include relevant stakeholders and make them tangible in the research phase, while still being representative of car-sharing in Europe.

Place
The scope continued to focus on highly urbanized areas (large and medium-sized cities). This is where most of the Lynk & Co 01 owners live and where the biggest changes in terms of car usage take place. At last, there will be looked at car-sharing from someone's home location. This is due to the fact that the car stands still most of the time at home.

Time frame
For the time frame, it was decided to design the next-generation car. But the current design is used to test and prototype the working principle. By designing for the near future, approximately 3 years, emerging trends and developments, which will influence car-sharing in the future, can be taken into account. This design can be used as a strategy to work towards and adapt the current cars accordingly.
In addition, this coincides with Lynk & Co's future portfolio plans and their shift of focus area. Which is currently only flexibility and will be more on car-sharing.

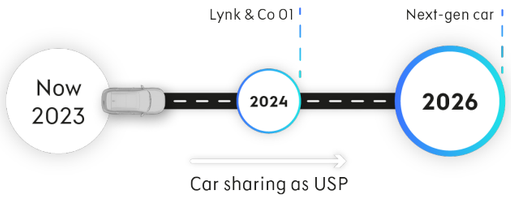


Figure 29: Timeline from now to 2026.

6.3.2 Opportunity gap

To recap, the opportunity gaps that came from the journey map are the stimulation for offering the car, the information during and how the experience is concluded. During the research phase, it was also found that the main part of the opportunity is located in the interior of the car. This is the place where both users take place and where the systems and their connected sensors can potentially use data to influence the user, track behaviour and give feedback. More specifically, the focus is on the (digital) systems in the interior (AVN screen and providing feedback) and the connected touchpoints for the user in the form of the mobile app.

6.3.3 Focus area

Lender
The lender sees the interior as a personal space. They keep personal belongings in it and adjust the settings to their preferences. In this place, all features can be accessed and settings changed. It is the last touchpoint before the lender leaves the car idle for a certain time. Therefore, it has a high potential to influence the lender to provide their car on the car-sharing platform. Not only before car-sharing, the interior and related systems can play an important role but also after the car is returned at the end of a booking. The lender returns to the interior and has doubts about its usage and hygiene. It is the space that brings the negative or neutral emotion when a booking is ended and has the potential to change this into a positive feeling that persuades the user to share again.

Borrower
Focusing on the lender, the borrower cannot be neglected. The earlier-mentioned need for a higher acceptance rate is not only related to the lender but also to the borrower. More returning borrowers on the platform who know how the service works will persuade more lenders to provide their cars more often.
At the start of a booking, borrowers want to get into the interior and drive off. However, in the current situation, people are overwhelmed with all the information and possibilities. Lynk & Co is a unique sharing car due to the level of equipment. The systems and sensors in the interior could potentially influence the borrower during the booking but also at the end of it when the interior is 'handed over' towards the lender again.

Figure 30: Top view of opportunity gap: interior.

6.4 Design Direction

The design direction gives an insight into what will be designed, it is more specified than the initial design statement and therefore provides guidance for the next phases of the project.

6.4.1 Problem statement

This project started with the initial problem statement: "Not enough people provide their car on the sharing platform".
During the research phase, via literature, user and market research and by negotiating with different disciplines the initial problem was specified. The key drivers reflect the biggest concerns of P2P car-sharing amongst lenders and borrowers and led to the new problem statement. From these first two phases, discover and define, emerged a new statement which consolidates into:

> " How to get a higher acceptance rate on the sharing platform, by creating a stimulus, trust and benefit, in order to make lenders provide their car on a regular basis? "

6.4.2 Design statement

The design statement is derived from the problem statement. On the basis it is the same, however, it shows actionable points of the to-be-designed solution. This statement includes and reacts to the What, When, How, Who, Where and Why questions and is based on the WWWWWH Method (van Boeijen et al., 2020).

> " Make the service persuasive for the lender and guiding for the borrower (**Who**) by designing a car-sharing focused concept (**What**) inside the car (**Where**) for current generation cars with the future portfolio in mind (**When**) in order to make the acceptance rate higher (**Why**) by using digital systems and sensors to provide more trust, better user indication and stimulation (**How**). "

This statement is the basis for the next phases, develop and deliver. How stages from the previous phases are connected are visualized in Figure 31.

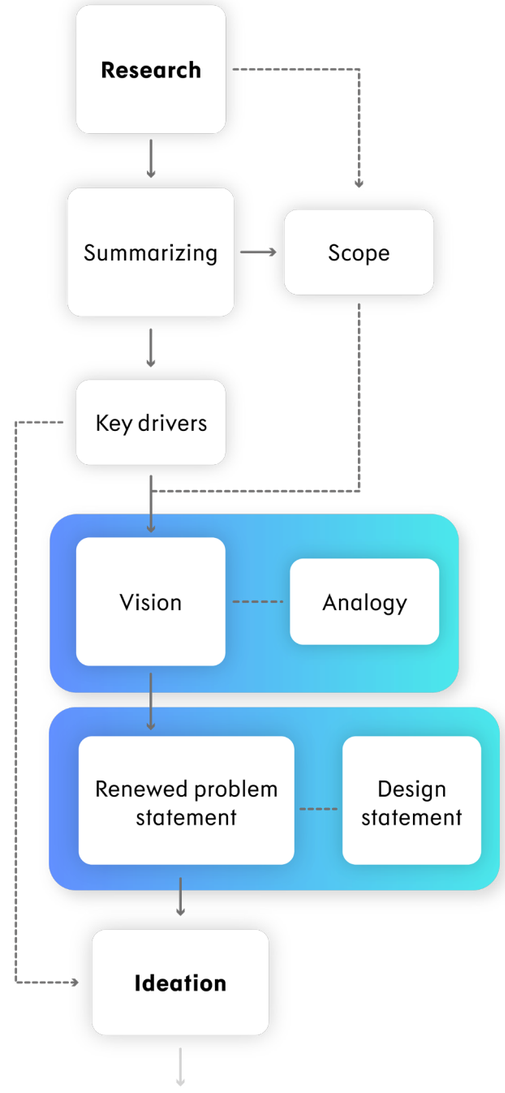


Figure 31: Visual representation of the steps in the redefined design brief.

Chapter 07

Exploration

In this chapter, the idea exploration and related topics are shown and discussed. The methods used for idea generation are elaborated on and the most important insights which developed the concepts are stated. The reasoning behind the chosen concept is also shown.

7.1 Ideation

After the design statement, the ideation phase began. From day one of the project, ideas started to emerge, but this phase explicitly used different methods to generate ideas. The Delft Design Guide (Van Boeijen et al., 2020) was used to find suitable methods: How-Tos, Mind Mapping, Brainstorming, Braindrawing and SCAMPER. During the ideation, the opportunity gaps and user journey are kept in mind, in order to gain valuable ideas. All ideas can be seen in Appendix J.

7.1.1 Methods

How-Tos
The key drivers were used as a starting point for the ideation. Once ideation started, questions arose and How-Tos were used to answer them. How-Tos are problem statements written in the form of questions in order to support idea generation (Van Boeijen et al., 2020). All the How-Tos can be found in Appendix J.

Technology exploration
Another method used during ideation is a technology exploration. This method was chosen to map the relevant technology in the car, in order to know what can be used or not. This whole exploration can be found in Appendix J.

Brainstorming and braindrawing
Along the ideation process, brainstorming is done in order to generate a great number of 'simple' ideas. It is done together with braindrawing, where ideas are drawn instead of written down in text (Van Boeijen et al., 2020).

SCAMPER
At last, SCAMPER is used for ideas that have a high potential. It is a creativity method used in a later stage of the ideation phase, to improve ideas and concepts. It is used via the application of seven heuristics: Substitute, Combine, Adapt, Modify, Put to another use, Eliminate and Reverse (Van Boeijen et al., 2020).

7.1.2 Structure

As discussed in Chapter 6.4 the acceptance rate of bookings needed to be higher, this rate can be higher due to the stimulation of the lender, the trust in the borrower and guidance through the system. Ideas were generated based on these topics, this ideation is an iterative process and therefore difficult to clearly show. The general structure of how the ideation happened is shown in Figure 32. The most promising ideas, which eventually led to the concept directions are shown in the explanations of the concept directions in Chapters 7.2, 7.3 and 7.4.

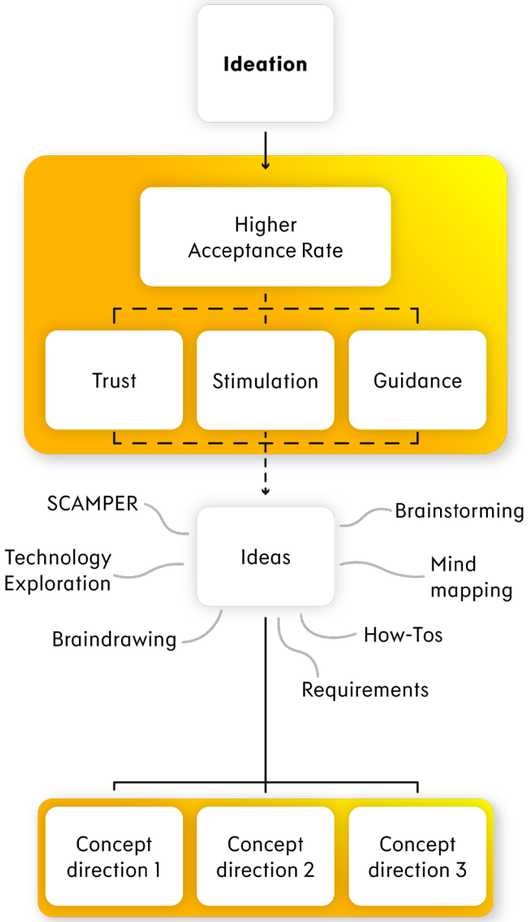


Figure 32: Abstract structure overview of ideation process.

7.2 Sparke

The first concept direction is called 'Sparke'. It focuses on the ability to initiate and stimulate car-sharing from a lender's point of view. This direction responds to two moments in the entire user journey: 'Initiating', the moment when the car is made available, and 'Closing', the moment when the journey is concluded.

7.2.1 Approach

The first important part in the journey, is the part of convincing the lender to make their car available for sharing, how people can be stimulated to do so is discovered via a How-To (Figure 33).

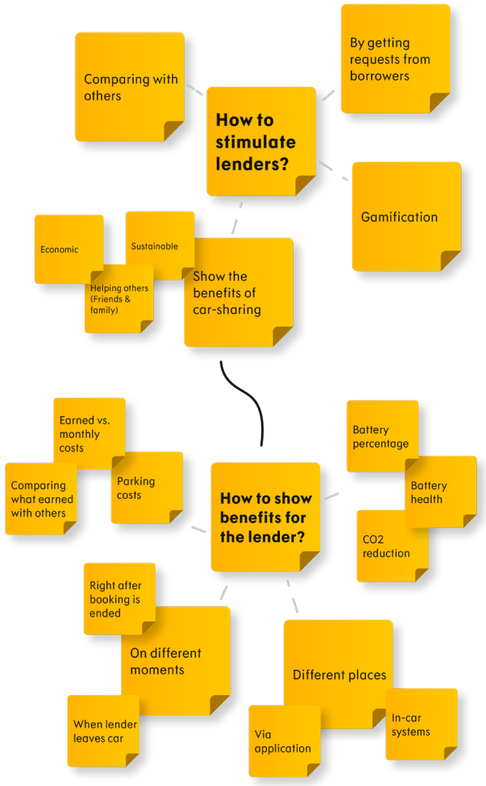


Figure 33: Stimulation How-Tos.

In general, the answers related to different types of benefits and when and where they occur. Based on these answers, several ideas emerged. One of them was to show people what they are able to earn via potential borrower data.

7.2.2 Type of benefits

However, lenders share for different purposes: economic, sustainable or to help others. These reasons were further narrowed down into what they consist of and how that can be turned into stimulations.

Economic reasoning
Lenders with economic purposes can be stimulated by emphasizing what they earn and how this influences their monthly car price, by showing which costs can be reduced or by comparing what they earn with others.
The principle of gamification has been used, using game thinking in a non-game environment in order to create a reward structure that encourages desired behaviour (Winkler & Gomes, 2017). A ranking can be displayed in which lenders can compare themselves to other sharers in the same city/group/neighbourhood.
The gamification is also reflected by showing the total monthly subscription amount (for subscribers) and progression since the last booking.

Sustainable reasoning
For people who share for sustainable reasons, the amount of CO2 reduced can be shown or how much the battery will be charged when the car is returned. It can take the hassle of a low battery percentage to the benefit of it being full by someone else charging it.

Helping others
Helping others can be stimulated by getting requests from people. Borrowers can create requests, consisting of a brief introduction of themselves, why they want to borrow a car and indicate when they need it. These requests create a marketplace, with people asking for a car.

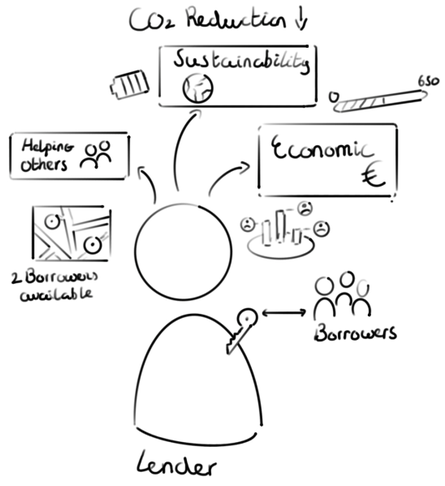


Figure 34: Different types of stimulations.

7.2.3 Stimulation variables

Besides the types of stimulations, it is also important when they are shown. During the field research, it was found that the stimulation can take place on two systems, in-car and on the mobile app.

In-car
The lender can be stimulated when about to leave the car, via the AVN Screen and with audio, visual and haptic feedback on systems present in the car.
With the systems in the car, the ideal moment to stimulate the lender is right before the journey ends or when the lender is about to leave the car. This is the moment when the lender does a final check of the car and is able to take a deeper look at the AVN screen to consider sharing. Audio, visual or haptic feedback can be used to gain attention. The steering wheel could provide vibrations when entering a high-potential sharing area. Lights in the side panel can flicker in order to create awareness.

Figure 35: Haptic and visual feedback about car-sharing opportunities.

Mobile app
The other system able to provide the stimulation is the mobile app. When the car is idle for a longer period or by predicting the car usage behaviour based on the past, lenders can be stimulated. People have a living pattern, going to work during the week. The system sees when the car is used and thus patterns are recognised. A suggestion can then be provided to share the car via the mobile app.

7.2.4 Returning

The stimulation influences if people participate in the service but that is no guarantee that people use it again. Therefore, the benefits are also shown at the first touchpoint for the lender at the end of the car-sharing journey. This way, there is a bigger emphasis on the good parts by reminding them.

When the journey ends, the lender can either return to the car or look at their phone. On the phone, the benefits specific to this person are shown by mapping and keeping track of them (e.g. a progress bar that shows the total amount earned).

However, in the car, there is currently no beneficial indication that someone participated in car-sharing. On the AVN screen, extra emphasis can be placed on which benefits were achieved by showing them when the lender takes place in the interior again.

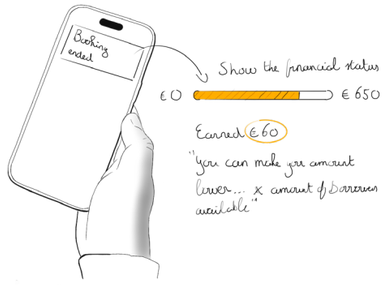


Figure 36: Showing of benefits from car-sharing.

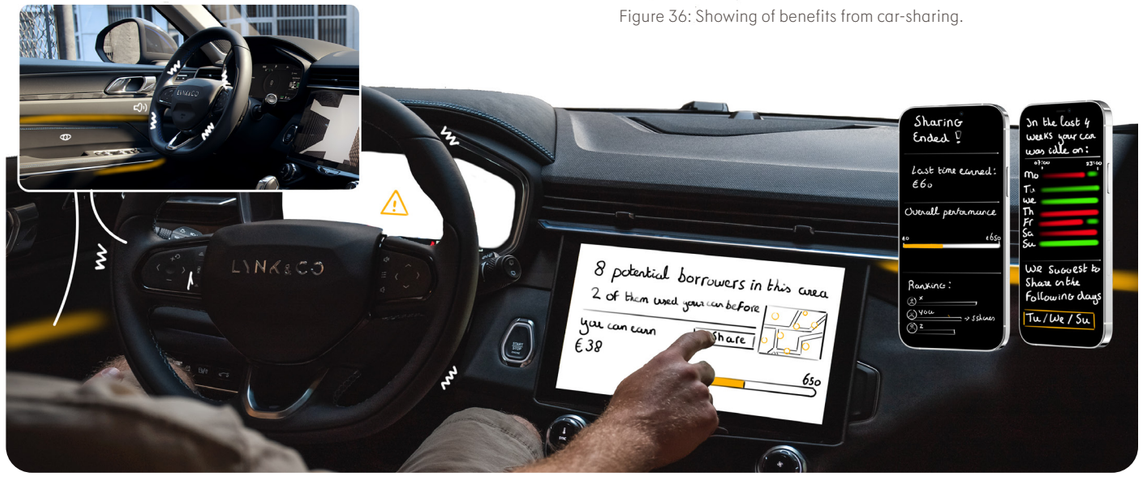


Figure 37: Visual explanation of concept direction 1.

7.3 Stimulus

The second concept direction is called 'Stimulus'. This direction focuses on trust via more advanced profiles and a more comprehensive reviewing system from the user and the system.

7.3.1 Approach

Another important part, connected to the first concept direction Sparke, is how people can be stimulated to accept the received bookings. It relates to the trust and the reward, which in most use cases is the financial benefit. However, there are different approaches on how to increase trust, for this a How-To was used (Figure 38).

Figure 38: Trust How-Tos.

It was concluded that more specific car-sharing information is needed from borrowers in order to create a better indication.

7.3.2 Reviews

A better indication can be created via information about the person and experiences with them. These experiences can be divided into two parts: Personal opinions about the borrower from the lender and how the borrower behaves in the car. The last one is something that the lender has no insights about.

In-car technology
The technology exploration (Appendix J) resulted in different systems and sensors that could potentially be useful for car-sharing. However, the general conclusion was that more driving data can be used for this and even the most simple one will be beneficial.

It was found that the behaviour of the borrower with the car can be tracked by using data about as speeding, braking, accelerating and cornering. Borrowers get a score based on how they behave in the car and can be rewarded for good behaviour.
During the booking, the systems could also provide feedback about the trip score. Which adds to the sense of control over the use of the car for both borrowers and lenders.
The steering wheel was chosen to provide feedback via vibrations. This way, the borrower can focus on the road with the hands on the wheel and there is no confusion with already existing sounds from the safety systems in the car.

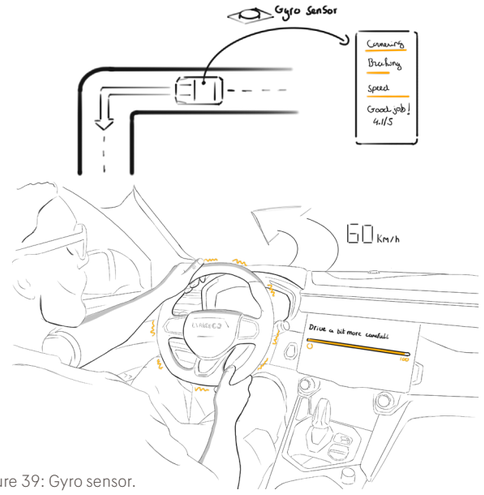


Figure 39: Gyro sensor.

The parts where the lender does have insights into, are how the car looks after it has been returned, the hygiene and how people act before the booking. However, at the moment there is no possibility to review borrowers on these aspects. Lenders can only give a ranking on a scale from 1-5. In order to encourage people, suggestions are given for categories to review (Norman, 2013).

7.3.3 Profiles

These reviews give insight into people who borrow on a regular basis. In order to also get a better indication of first-time users, more comprehensive profiles are made.

Borrower
First, the borrower provides personal information when creating an account. Examples of this type of information are age, location, studies or work and languages. Suggestions will be provided to fill in this information. With all this information, the lender should be able to make a better assessment of this (first-time) borrower. Besides that, it will allow lenders to find people who are similar and thus show similar behaviour (TED, 2016).

The borrower profiles consist of three parts: personal information, lender reviews and trip scores (Figure 40).

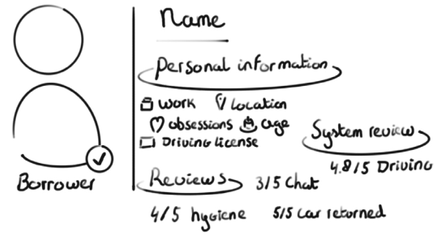


Figure 40: Borrower profile.

Lender
Not only does the borrower have an enhanced profile but also the lender. In order to provide trust for both parties and to facilitate the right match. Besides that, the lender is also able to borrow another car when needed and thus becomes a borrower.

The lender must provide relevant personal information for the borrower (e.g., location) so that profiles are easier to match when searching for bookings, to eventually increase the acceptance rate. To exploit this principle even more, the lender has an introduction about himself.

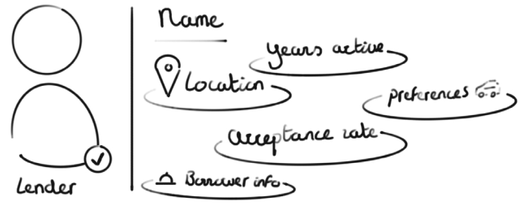


Figure 41: Lender profile.

Figure 42: Visual explanation of concept direction 2.

7.4 Groop

'Groop' is the third concept direction, it builds upon one of the already strong features of Lynk & Co, sharing within communities.

This concept is approached from another point of view, the borrower. It was indicated that borrowers had difficulty understanding the service and thus participated. Guidance is needed in order to attract them, to get more bookings which eventually increases the acceptance rate.

7.4.1 Group focus

This guidance was combined with the borrower indication from the previous concept.
Borrowers could be grouped, based on different trips, experiences and relation to the lender.

Currently, Lynk & Co lenders tend to share more with people close to them: friends, family, neighbours and colleagues.

The first iteration enhances this strong point by giving the lender the opportunity to create their own group on their sharing profile (Figure 43). The group can consist of people who always have access to the car when it has been made available by the lender to share. So, friends, family, neighbours and colleagues can use the car, without having to send a booking request. Instead, the lender gets a confirmation, on which no reply is needed. Because sharing with people close to you is often without economic interest. The price is automatically based on the current fuel/electricity price.

7.4.2 Experience focus

The second part of this concept is based on the fact that if people want to borrow a car there is always a reason for this. Borrowers know beforehand where the car will be used for and where they are going, such as on a weekend trip or transporting large items.

Therefore, sharing with strangers is still possible. The car can be offered to the public by making it available for specific trips.
The borrower can search for a car based on the trip and related experience they want to make. Knowing for what the car will be used, gives the lender a sense of control. The price is also self-calculated by getting data about the duration of the booking, prices of other sharing companies in the area and fuel/electricity prices.

When the booking is successful and the lender is satisfied. The lender could add the borrower to their group, to give the borrower easier and more frequent access to the car.

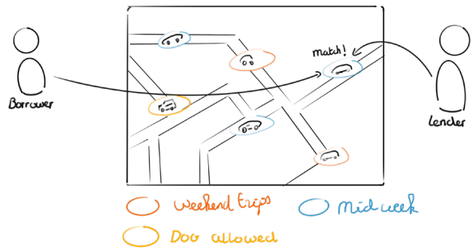


Figure 44: Different trip experiences.

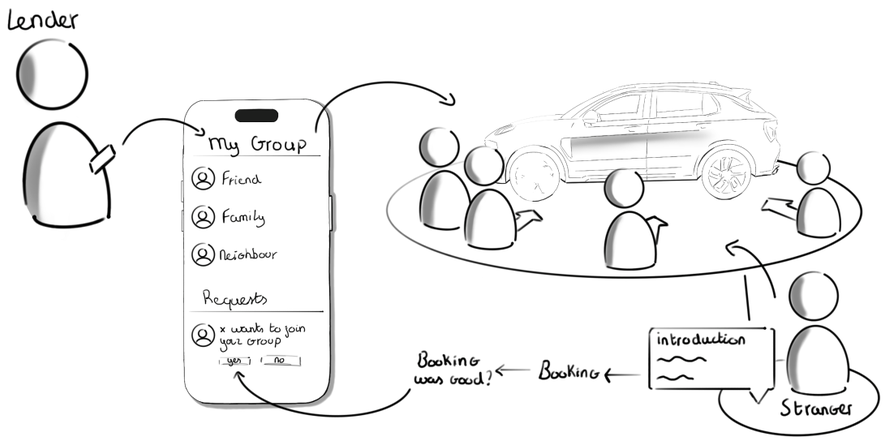


Figure 43: Lender can make own group.

7.4.3 Technology

From the technology exploration other technologies emerged that influenced these ideas and the ability to guide the borrower.

B-Pillar
One of them is the small screen in the B-Pillar, this screen could communicate in different ways with (potential) borrowers in order to persuade and guide them to use the service.

It can see who is near the car and communicate to the borrower concise information about that specific car for car-sharing. Times until when the car is available that day but also which days it can be booked in the near future can be shown.

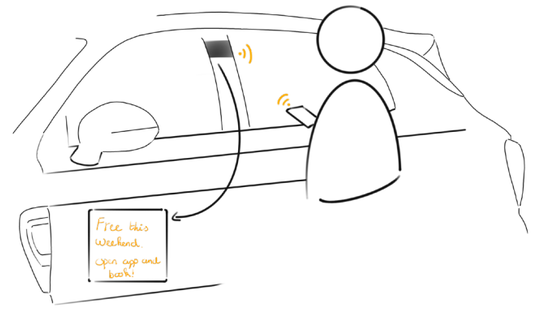


Figure 45: Different communication states of B-Pillar.

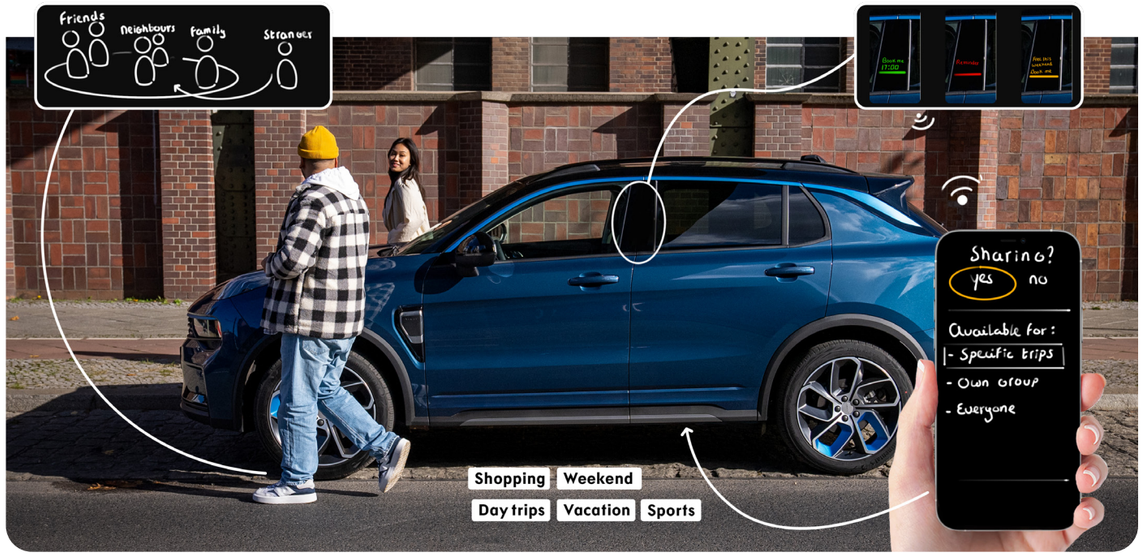


Figure 46: Visual explanation of concept direction 3.

7.5 Chosen Concept

With three different concept directions a decision needed to be made about further devlopment. In this chapter, an explanation of this decision is shown.

7.3.1 Weighted Objectives

The Weighted Objectives method is used in order to decide which concept to further develop. With this method, the three design concepts are compared based on their overall value (Van Boeijen et al., 2020). The method is visualised in Figure 48 on the next page.

Requirements explanation
It was decided to use six different values: Brand Identity, Personal Ambition, Novelty, Stimulus, Trust and End Journey Focus.

The brand identity was chosen because Lynk & Co is very brand-focused. The solution therefore needs to be in line with their values and design.
The personal ambition is about my ambition on what to design. What I find interesting and what is most relevant for my future career.
Then there is Novelty, which was chosen to verify the uniqueness of the solution.
Stimulus is about how the solution stimulates the lender to share their car. It came from the opportunity gap within the user journey map.
Trust also came from this journey map, it has to do with how the solution provides (perceived) trust in the system and borrower.
At last, there is the Focus on how the car-sharing journey ends for the lender. It was concluded that this is a vital point in the whole experience and has a high influence on how lenders experience the service.
The weights were estimated on what is most important for Lynk & Co and for this project.

7.3.2 Discussion

Besides this structured method, the three concepts were also reflected towards the view of experts at Lynk & Co and the supervisors.

General
Concept Stimulus was seen as most general and thus able to help most users. Whereas, Sparke had high potential but many things to work out as it targets different user personas. Groop had some concerns on how to approach it from a legal point of view.

7.3.3 Conclusion

After the scores were analysed. It became clear that the concepts had different strong features, but were all intertwined. The decision was made to continue with a combination of 'Stimulus' and 'Sparke'.

Stimulus has the highest total score, highest potential, and preference from Lynk & Co and myself and is therefore used as the leading direction. It provides more trust for the lender by using a more extensive review and profile system. This complete system is based on reviews from humans and the system. These scores relate to the HMI interaction, as they provide feedback and guide the borrower. However, this direction will be supplemented with Sparke. Because it scored very high on the stimulus and end-of-journey values, something where Stimulus scored less. The digital touchpoints and cognitive ergonomics are used to provide a stimulus for the lender. Besides that, this showing of benefits can also be used to influence the ending of the car-sharing journey.

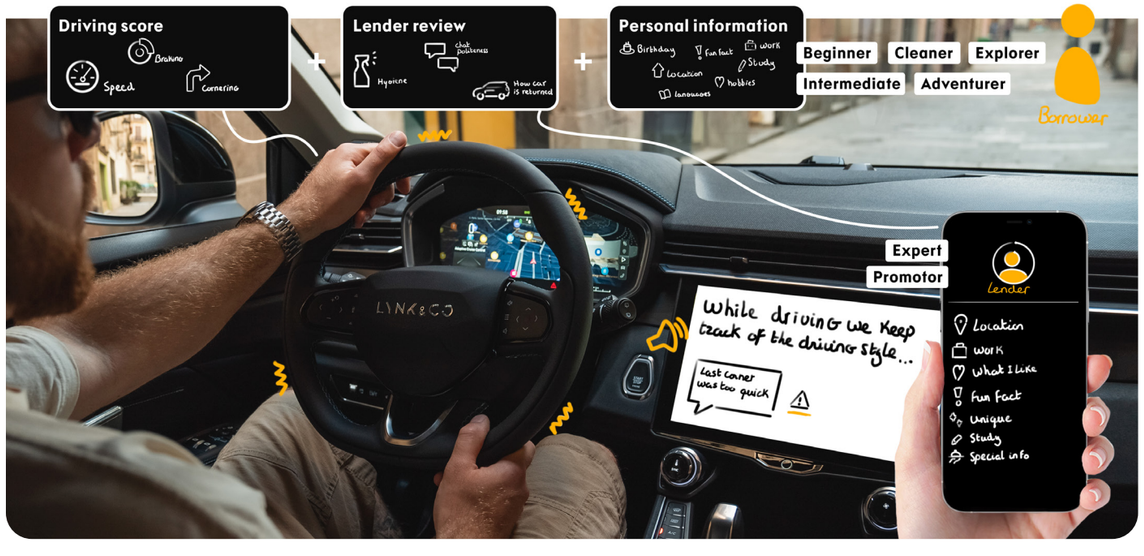


Figure 47: Chosen concept direction.

		Sparke		Stimulus		Groop	
Weight		**Score**	**Total**	**Score**	**Total**	**Score**	**Total**
HMI Focus	15	7	105	8	120	7	105
Novelty	10	6	60	4	40	5	50
Brand Identity	15	5	75	7	105	8	120
Stimu-lation	20	8	160	5	100	4	80
Trust	20	4	80	9	180	6	120
End of Journey	20	9	180	6	120	3	60
Total Score	100		660		665		535

Figure 48: Results of the Weighted Objectives method.

Chapter 08

Conceptualising

This chapter explains the different parts of the chosen concept: Stimulus. A distinction is made between ergonomics and mobile app design. For both, the previous research is shown, the method of testing with the corresponding results and insights.

8.1 Structure

Stimulus further development is divided into two parts: the cognitive ergonomics and the mobile app design, both of which can be summarised in one service where everything comes together. How this is constructed is shown in Figure 49.

8.1.1 Cognitive ergonomics sprint

The cognitive ergonomics at Stimulus is about the feedback the borrower receives while borrowing a car. This feedback consists of visual feedback complemented by haptic feedback. Haptic feedback should serve as complementary, not primary, feedback (Apple, 2023), therefore the visual feedback via the AVN and DIM in the car is also taken into account.

There are two questions that need to be answered. The first is about communication of feedback to the borrower and secondly, there is the question if tracking driving is seen as a hassle or benefit in relation to the complete service. Respectively the questions are:

“ How should the feedback be delivered? “

“ Does the trip score make it easier and more beneficial for borrowers to use the service? “

8.1.2 Mobile app design sprint

The mobile app sprint considers the design of the associated screens, that provide information to both borrowers and lenders throughout the car-sharing journey.
The to-be-designed screens can be divided into categories: new profiles, new review system, marketplace and onboarding.

The design and information should contribute to the sense of trust by providing a better indication of potential borrowers.
The final question associated with this section focuses on the lender and is therefore:

“ Does the new more detailed system increase the acceptance rate of booking requests? “

Finally, how everything comes together in the new concept has also been designed.

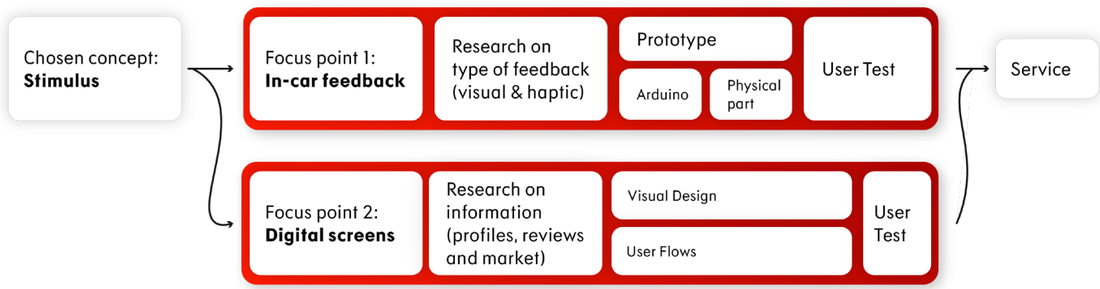


Figure 49: Structure of the focus points of the chosen concept.

8.2 Ergonomics Sprint

This chapter is about the development of in-car cognitive ergonomics. Because a part of Stimulus is the haptic feedback to inform the borrower about their driving behaviour.

8.2.1 Haptic feedback

Haptic feedback uses touch (vibrations) to communicate with the user (Ultraleap, 2019). In Stimulus, the borrower is informed about their driving behaviour via this form of feedback.

Haptic feedback explorations
First, different forms of haptic feedback are explored. In general, they could be divided into success, neutral, ongoing, failure and warning. It was decided to take two different types to reflect on the driving behaviour: 'success' and 'warning'.
Haptics are physical metaphors. A physical metaphor is essentially how a person interprets the semantic meaning of a physical interaction (Baker, 2019). This shows that both vibrations must have a distinct shape. The 'warning' is a staggered vibration with high intensity and the 'success' is an ascending vibration where the intensity varies. Thus these vibrations are different in frequency and amplitude, visualised in Figure 50.

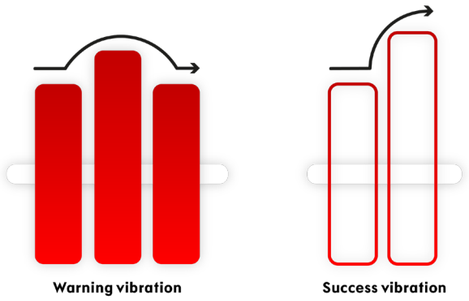


Figure 50: 'Success' (right) and 'warning' (left) patterns (Baker, 2019).

Feedback timing
Besides the type of vibration, it has been considered when the feedback should take place. Four elements were chosen for the test: hard braking, sharp cornering, quick acceleration and speeding (Figure 51). This is because these actions increase the wear and tear of the car and can be dangerous.

Figure 51: Actions that will be taken into account in calculating the trip score of the borrower.

Mapping
After deciding the types of feedback and their timing. It was found that the vibrations could be even more useful. This was done via mapping, which is having a clear relationship between controls and the effect they have on the world (Norman, 2013).

The 'warning' vibration is located on the left of the steering wheel. This way the visual feedback will be shown on the left of the screen. The 'success' vibration is located on the right side of the steering wheel as this corresponds with the location of the feedback on the screen. The screen that shows the corresponding information is the AVN screen, how everything is located inside the car interior is shown in Figure 52.

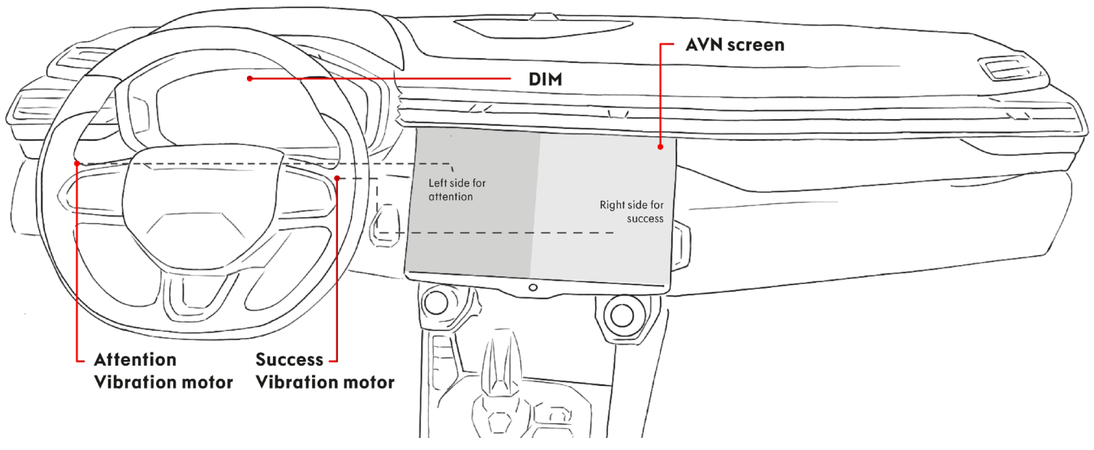


Figure 52: Location of vibration motors on the steering wheel and how they are reflected on the AVN screen.

Steering wheel prototype
For the test, a prototype was composed of two separate prototypes.
One prototype is the steering wheel with integrated vibration motors, as shown in Figure 53. This prototype needs to communicate the haptic feedback towards the driver.
The motors are placed in a way that the participant does not feel them, in addition, they are hidden behind fabric (Figure 54). The wiring is concealed behind the dashboard, as shown in Figure 55.

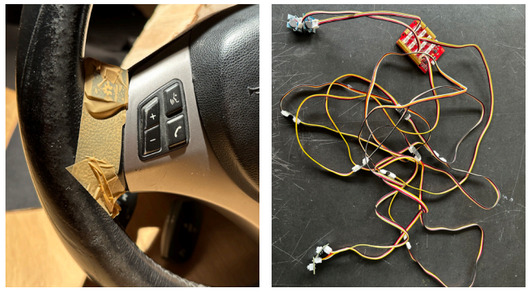


Figure 53: Steering wheel prototype with the location of the vibration motors and wiring.

Figure 54: Steering wheel prototype with the covered vibration motors.

Figure 55: Wiring behind the dashboard to make the steering wheel prototype work.

These motors are controlled via buttons by the researcher from the rear of the car. The controlling works via a code that was programmed in Arduino (Appendix K).

In-car
The prototype was built into a car, as shown in Figure 56. Furthermore, a video screen (Figure 57) was used with a video made by IPG Carmaker of a driving car through a neighbourhood, showing situations that potentially could influence the driving score: cornering, braking, acceleration and speed.

Figure 56: Steering wheel prototype embedded in the car with the Arduino code.

Figure 57: Picture of steering wheel built in the car with the test setup on test days.

8.2.2 Visual feedback

Besides the vibrations, the borrower also receives more comprehensive information about driving behaviour while driving via the AVN screen.

Design
For the test, the existing widgets were used and two different designs were created for these to show on the screen (Figure 58). These designs build on the current design where the 'driving score' is added as a widget. The first design corresponds to the idea that feedback is given after each action. The second one only provides feedback when the score is influenced and thus works over time.

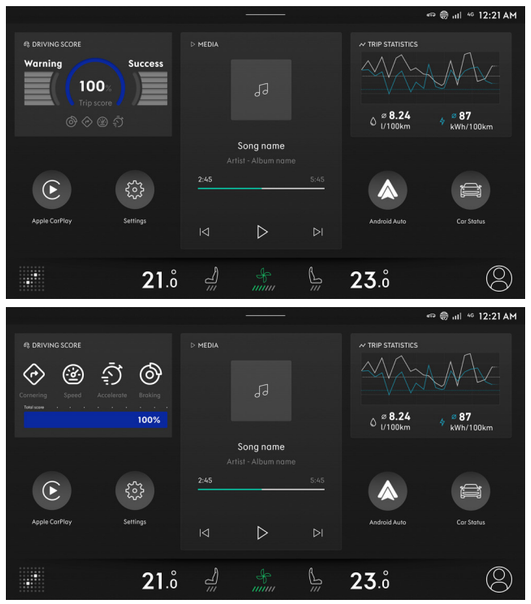


Figure 58: AVN screen prototype for scenario A (top) and B (bottom).

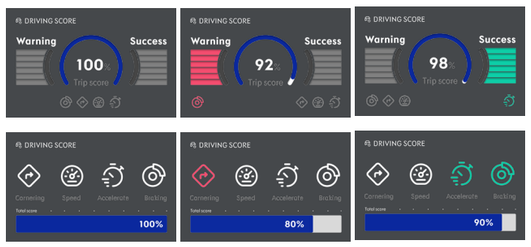


Figure 59: Animations in the Driving score widgets for scenario A (top) and scenario B (bottom).

Screen prototype
A digital screen in the form of an iPad has been used and built-in (Figure 60), like the Lynk & Co 01's AVN screen it is the same size. It is controlled from a distance by the researcher, to show the correct screens in relation to the driving action performed. These screens were created via Figma.

Figure 60: iPad screen with the digital prototypes from Figma.

8.2.3 User test

To investigate which way of providing feedback to the borrower is preferred, a test was set up.

Method
For this test, it was chosen to do an A/B test, a randomized controlled experiment to compare two versions of the haptic and visual feedback (Gallo, 2017).
One version is where the feedback is delivered after every action performed in the car. The other version is where feedback is given after a certain amount of time, with a big drop in the driving score, and reflects on what went wrong or good over that period. Each scenario took around 8 minutes. How this test procedure looks can be seen in Figure 61.

Besides this, the Wizard of Oz method was used to conduct this test. This is a method where participants interact with a system that they believe to be autonomous (Geison, 2019). The researcher was located behind the participant to steer the system.

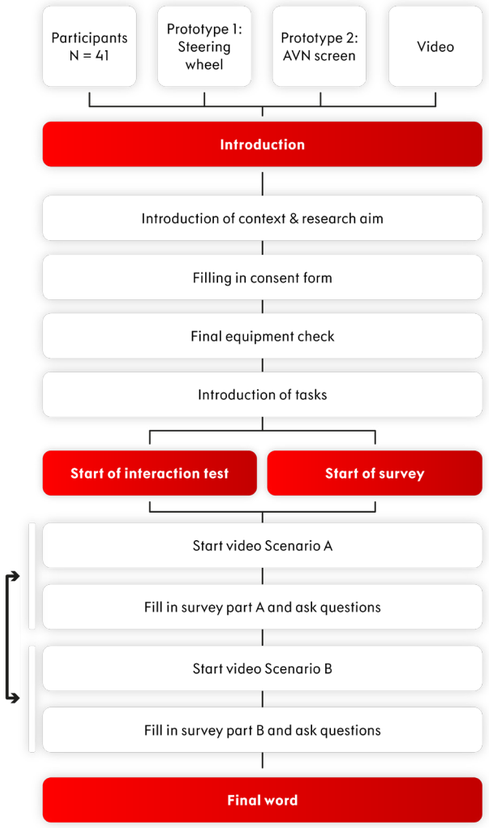


Figure 61: Diagram of test procedure.

Participants
The requirements for participants are that they were familiar with driving and fell within the target group of car-sharing (around 20-30 years). 41 participants took part in the test, of which 39 had a driving license. These were mainly students, with 25 men and 16 women participants, in the 18-30 age group. The group that is most open to car-sharing. To ensure that not all participants were from the same group, passers-by from a higher age group were also asked to participate. This allowed to see if there was no big difference in responses by age group.

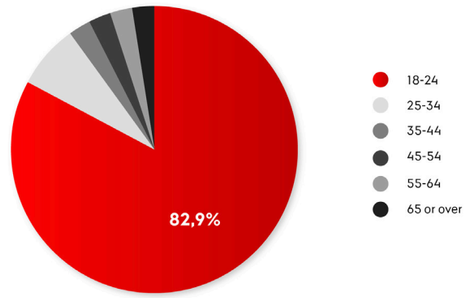


Figure 62: Division of participants.

Test setup
The test setup used beforehand is shown in Figure 63. In this top view, the location of equipment and people is shown. Besides that, it can be seen how the wiring goes.

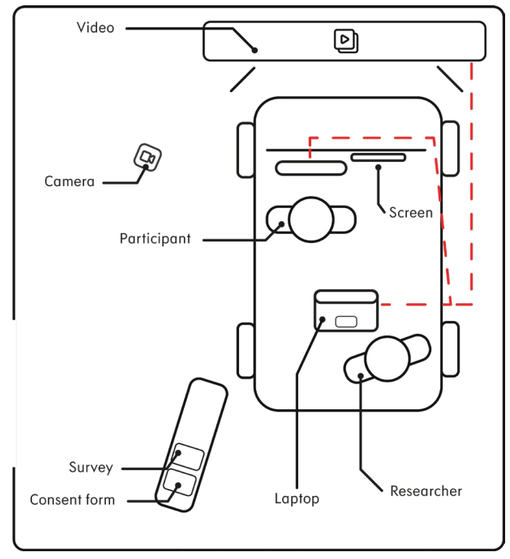


Figure 63: Test setup.

8.2.4 Insights & Conclusions

Several insights emerged during the test, this section explains the most interesting ones with the conclusions in relation to the design. The insights are divided into the vibrations, the visual part and the concept in general and the complete survey can be seen in Appendix L.

Haptic feedback

The vibrations while driving were generally not perceived as disturbing, for both scenarios A and B (see Figure 64). However, people did have to get used to it at first. It was also indicated that, as in scenario A, the vibrations will become annoying on longer journeys and could therefore become distracting and simultaneously feel patronizing.

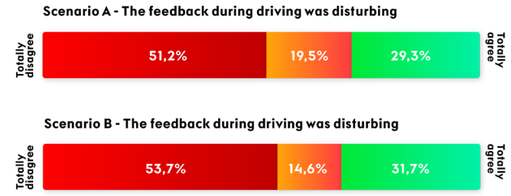


Figure 64: Results on the question if vibrations disturb while driving for both scenario A and B.

Figure 65: Participant reacts to 'warning' vibration.

It was also found that for most people the success vibration was not very easy to distinguish from the warning vibration (Figure 65). Some of the participants immediately linked the vibrations to already existing vibrations within other mobile apps and were therefore able to identify a clear difference.

Participants therefore indicated that they thought the two different vibrations were gradations in how wrong something was. And expected visual communication via the progress bar to become more red, when something worse happened.

The vibrations in scenario A were seen as more motivating than in scenario B (Figure 66). A frequently mentioned reason for this was that the vibration comes immediately after a driving action so it was more clear what needs to change.

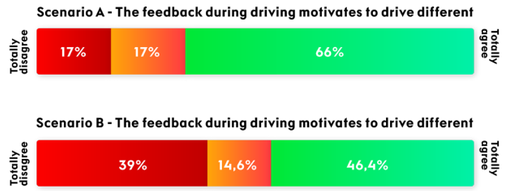


Figure 66: Results on the question which scenario motivates more to change driving behaviour.

Figure 67: Participant thinking out loud and indicating what he thought went wrong.

From these insights, a number of conclusions can be drawn in relation to the vibrations. That will be incorporated into the design.
It was found that the vibrations from scenario A, i.e. giving feedback with every action, were most clear and most motivating while least annoying. The vibration with each action when something goes well will be deleted, it was not that clear, not really needed and does increase the number of vibrations significantly. The timing and occurrence of the feedback will therefore be changed in the new design.

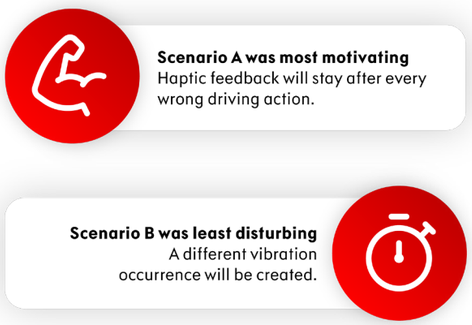


Figure 68: Points that will be taken into account in the design of the haptic feedback.

Screen time

During the tests, it became clear that in the first scenario of the two, which was A for some participants and B for others, people looked relatively long to the AVN screen (Figure 69).
They wanted to see what information was shown, which resulted in less focus on the road and thus less safety.

Figure 69: Participant looking at the AVN screen for a long time.

Visual part

Questions were also asked specifically about the visual feedback of both scenarios A and B. It was indicated that the feedback from scenario B was clearer than A, see Figure 70. Even after participants started with B and then did A, they still felt that A was not clear enough.

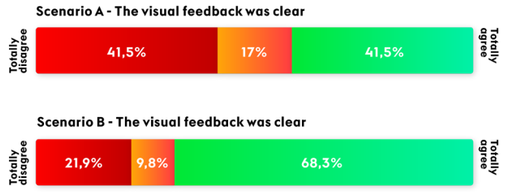


Figure 70: Results on the question on how clear the visual feedback was for both A (top) and B (bottom).

When asked why, several answers emerged which can be clustered into a number of themes, shown in Figure 71.

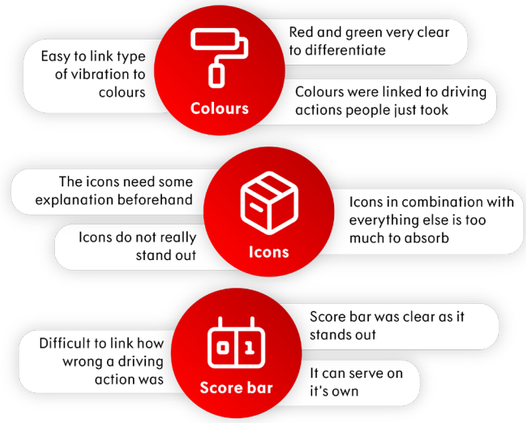


Figure 71: Clustered reasons about the visual feedback.

These insights result in changes in the design of the widgets on the screen. The AVN screen will still be a part of the solution but will contain more detailed information. The DIM will be added to the solution. This screen is easier to look at, while still looking in front of you. It can provide the simple information directly to the user.

With the addition of this screen the design changes as well. It was also found that all the information in one place and at the same time is a lot to absorb and process. Therefore, there will be a change in their location and timing. However, the colour scheme worked well and thus will be continued. The icons were clear after some time and will therefore be added as well. On the AVN screen users will still see how good they were performing. At last, the mapping will still be used but will shift to the DIM with a different working principle.

Figure 72: Points that will be taken into account in the design of the visual feedback.

Awareness

For the majority, the vibrations were a signal of feedback and helped to attract attention (Figure 73), but for some, the link was not made right away with the driving score.

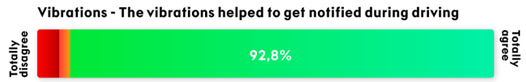


Figure 73: Results to the question if the vibration helped participants to get notified about their driving actions.

In almost every test, it became clear that people did not know right away how the vibration was connected to the whole concept and that it was linked to something happening on the AVN screen. To not surprise and scare people an explanation of the service is needed.
When people book a car and get into it, they just want to drive away so this is not the right time to explain it. For the design, this means that onboarding should take place before people get into the car, i.e. through the mobile app.

Service

Beyond the specific questions about the feedback, there were also questions about the service in general.

People were asked whether they see the tracking of driving behaviour as a benefit to them. After all, tracking driving behaviour is something new and also something that is not entirely seen as a benefit for the borrower at first sight. Because it can be associated with a declined feeling of privacy. Nevertheless, participants indicated that they believe it is beneficial (Figure 74).

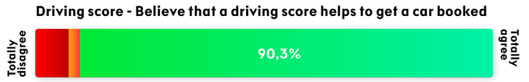


Figure 74: Results on the question if a driving score is seen as a benefit for borrowers.

Apart from the benefit people think they get out of it by getting a booking accepted more easily, another thing stood out. Most people saw the system as a game, they wanted to get the bar with the corresponding score as high as possible. It corresponds with the initial idea of Nissan, to use a progress bar that reacts on how sustainable someone drives. This way people tend to drive more economically in order to get the progress bar as full as possible (Nissan, 2020). This principle is also used by Lynk & Co in their 01. This idea of gamification will be developed further in the solution (Figure 75).

Gamification
The progress bar motivated people to improve and will therefore be continued on the DIM. Each icon gets an own progress bar on the AVN.

Onboarding
People need information about the driving score and working principle before the booking is started.

Figure 75: Points that will be taken into account in the design of the service.

General

When asked whether people are willing to have their driving behaviour tracked and shared with lenders and the company, there was a surprisingly large majority who said 'yes', this can be seen in Figure 76.

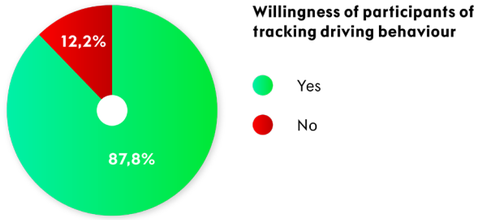


Figure 76: Results on the question if people are willing to let a compnay track and share their driving behaviour.

What is also interesting is to see that people with a higher age do not differ in their opinions. The opinions in favour and against are shown in Figure 77.

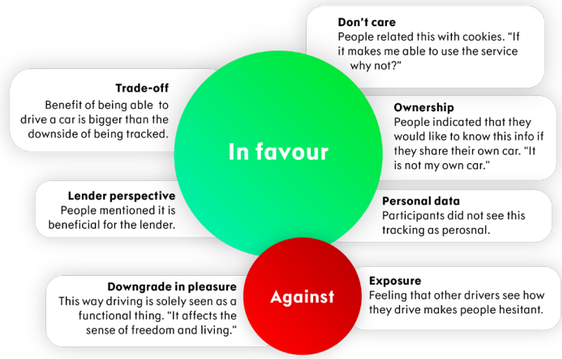


Figure 77: Clustered reasons about the willingness in tracking and sharing.

All these conclusions will be taken into account during the iteration of the concept. How these findings influenced the final design is shown in Chapter 9: Showcase.

8.3 Mobile App Sprint

The information obtained from tracking the borrower's driving behaviour will be communicated to the lender via the mobile app. This chapter therefore looks at the development of the screens in the mobile app.

8.3.1 Hierarchical Task Analysis

At the beginning of this sprint, the current app structure was explored through a Hierarchical Task Analysis (HTA). This made it easier to see how the app is currently structured and what logical places for Stimulus to build on further in the current mobile app. Figure 78 shows the HTA and where the new screens are added within this HTA.

The concept Stimulus has several topics that should recur within the mobile app.
A renewed more detailed profile for both lender and borrower is developed. In this profile the trip score is included. There is also a more detailed review system that follows after the booking and is also part of the new profiles. Next to that, there is an entirely new 'market' section, in which borrowers can place requests to borrow a car.

Some parts of this HTA will be discussed in Chapter 9: Showcase, including the onboarding.

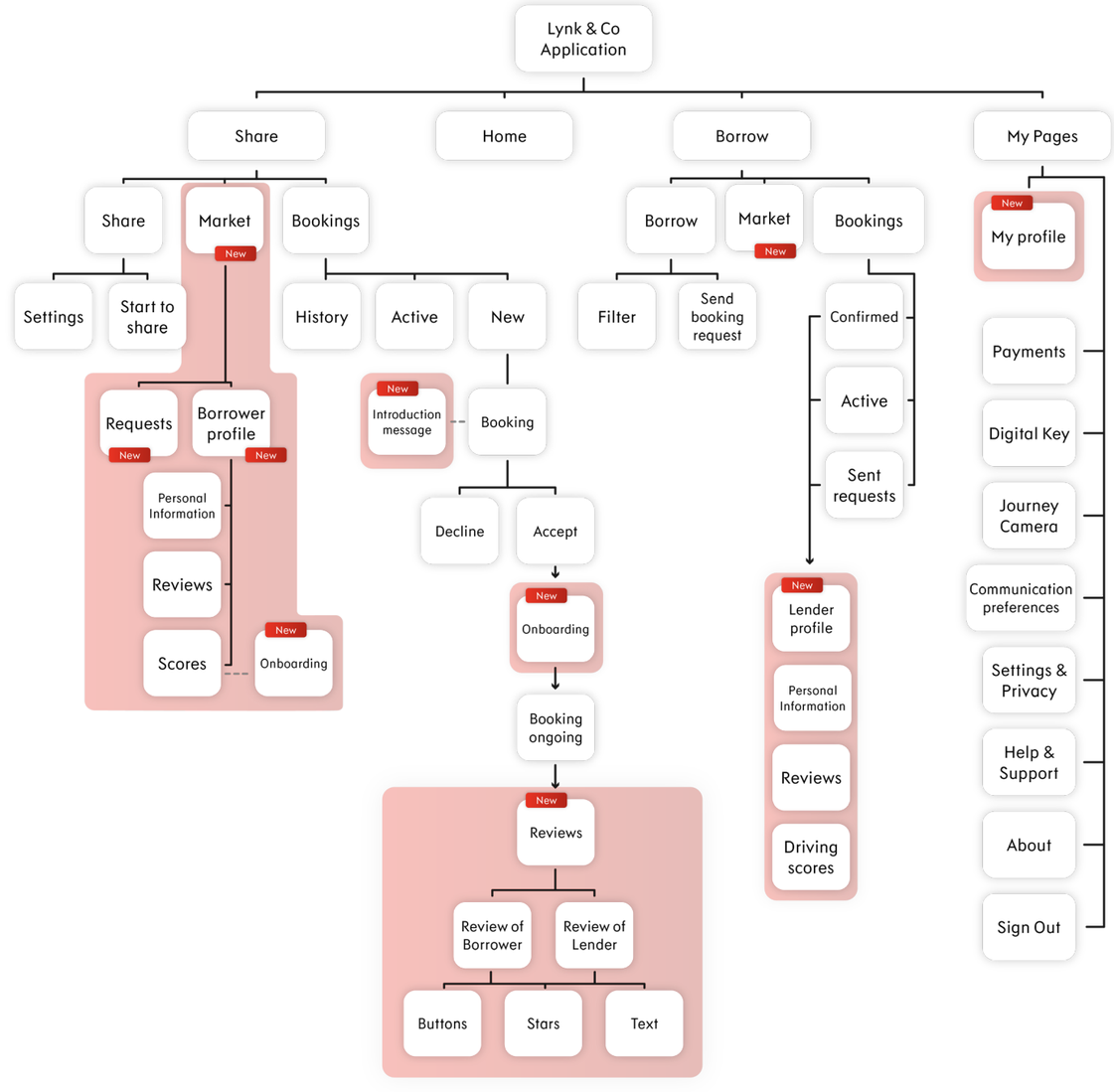


Figure 78: Hierarchical Task Analysis of the Lynk & Co mobile app.

8.3.2 Review system

Another part of the current service that changes with Stimulus is the review system. In the current system, a rating can only be given through a 5-star rating system, as shown in Figure 79. The rating is based on a person rating the experience on a scale of 1-5 (Scarbrough, 1975). Besides that, people can voluntary add some comments in the form of text.

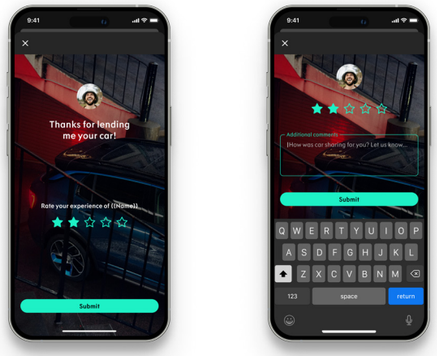


Figure 79: Current review system in the mobile app.

That is because most users only give the rating via the stars, and no additional specific information about the booking is provided. The current system does not give enough insight about the user and important parts related to sharing a car.

Test
A different, more comprehensive, system was designed for Stimulus. Mobile app screens and user flows were prototyped via Figma and discussed with an expert. The first user flow (Figure 80) is based on stacking information on top of each other. This way the review can be started with the easiest one built upon this. The second flow (Figure 81) focuses on limiting information overload and showing each review part separately. This way every step feels mandatory. The third flow (Figure 82) shows all the information simultaneously.

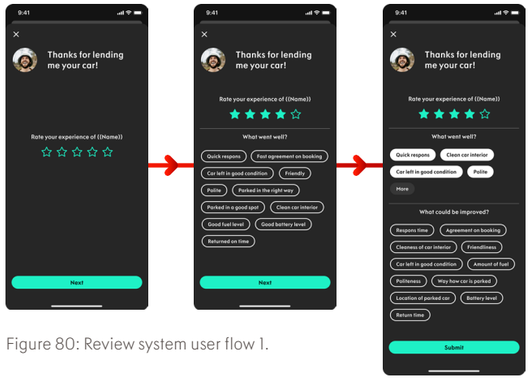


Figure 80: Review system user flow 1.

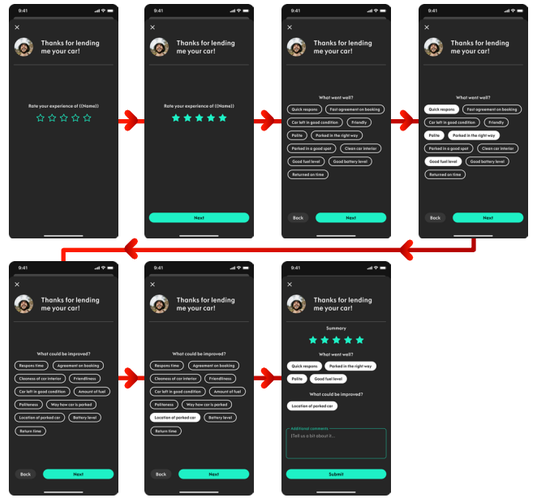


Figure 81: Review system user flow 2.

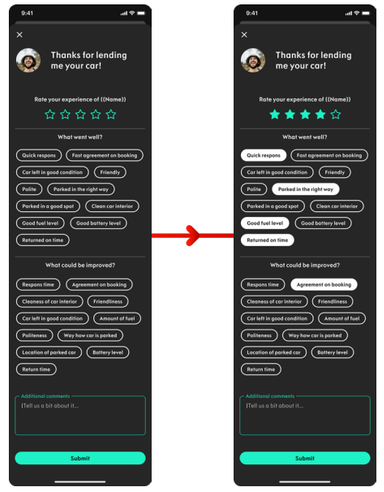


Figure 82: Review system user flow 3.

Insights
During the expert discussion, it was found that user flow 2 works best in order to get the more detailed review. Besides that, suggestions were provided for the 'chips', these are the words that can be selected to mention what went well or not. These findings will be used and showed in Chapter 9.

8.3.3 Profiles

The scores and reviews belong to a person and are therefore linked to their profile. But current borrower and lender profiles only consist of a name, photo and reviews in the form of stars (Figure 83). Next to that, the profiles cannot be clicked to access more information about the specific user. For this project, the borrower profile was designed.

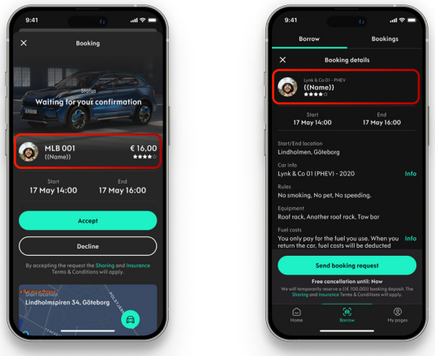


Figure 83: Current profile view in the mobile app before a booking (left: lender perspective. Right: borrower perspective).

Therefore, more detailed profiles are needed to better assess information on the potential users. And to make it easier to match people who are alike, might increase the trust for both users (Aufmann, n.d.; Airbnb, 2023).

Test

This borrower profile screen summarizes all newly designed aspects (review, trip score and requests) and is present for lenders at a new booking request. A test was conducted to see if this information made them more willing to accept a new booking request.

With this test it was important to make a comparison between the current and new design. But a comparison also needed to be made between different amounts of information.Because not all information is mandatory and it was found that not everyone is that willing to fill everything in. Therefore, the test was conducted with four printed screen variations (Figure 84).

The first screen (Figure 85) is the one currently live and it appears at a new booking request. The second screen (Figure 86) shows the design with only mandatory information. The third screen (Figure 87) shows half of the information and the fourth screen (Figure 88) shows the design with all information.

Ten participants were involved from which 2 are 01 owners and 8 are students.
With every participant there were four comparisons. Every time the old design was compared with one of the three new designs (differentiation in information), the variantions were shown in random order. Participants were asked to choose between the two variants. The decision needed to be made based on three things: trust, ability to indicate and willingness to share.

Besides testing the information to see if the new desings with different information could increase the acceptance rate. The design of the screens were also discussed with an expert from the mobile app design team.

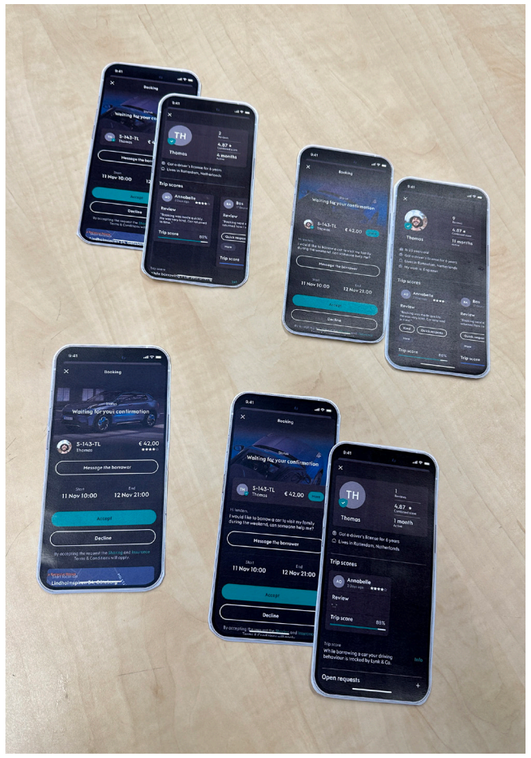


Figure 84: Printed and tested mobile app screens.

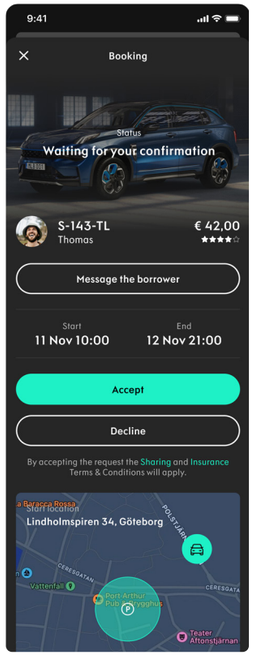


Figure 85: Currently live variant.

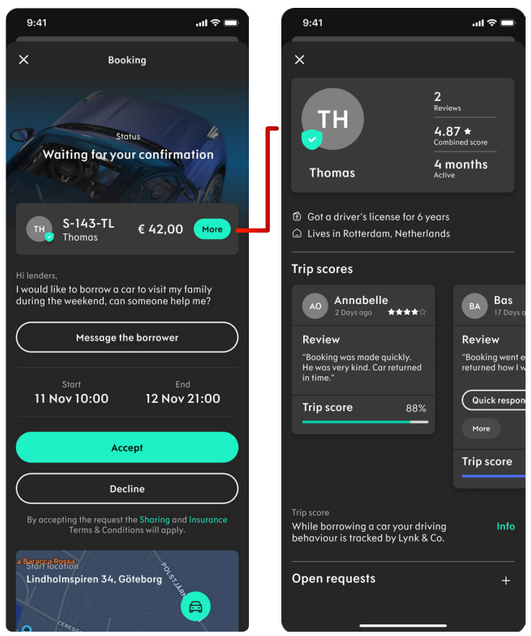


Figure 86: New version variant with half of the information.

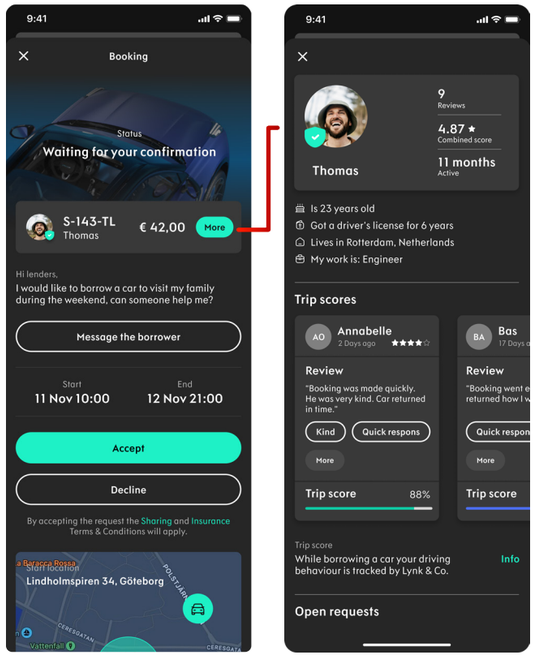


Figure 87: New version variant with all information.

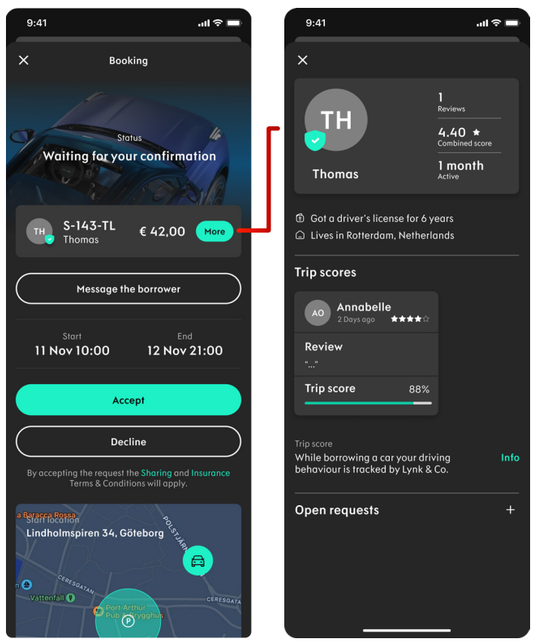


Figure 88: New version variant with only mandatory information.

Insights
The test showed that all the three newly designed screens (all, half and mandatory information) compared to the one that is live scored higher on trust, ability to make an indication and the willingness to share, as can be seen respectively in Figures 89, 90 and 91. The new design scores higher than the one currently live, also when only mandatory and half of the information is provided. All answers and results of the test are shown in Appendix M.

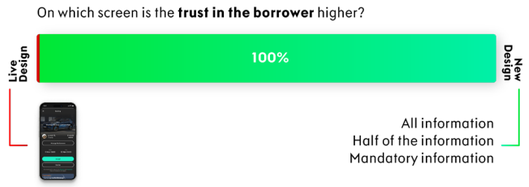


Figure 89: Results on the test where the 'Live Design' is compared to the 'New Design' based on trust.

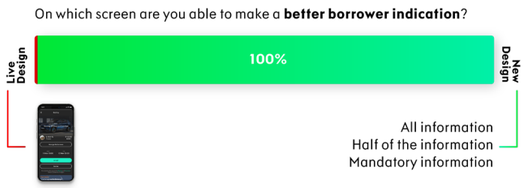


Figure 90: Results on the test where the 'Live Design' is compared to the 'New Design' based on borrower indication.

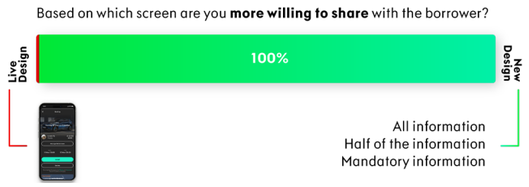
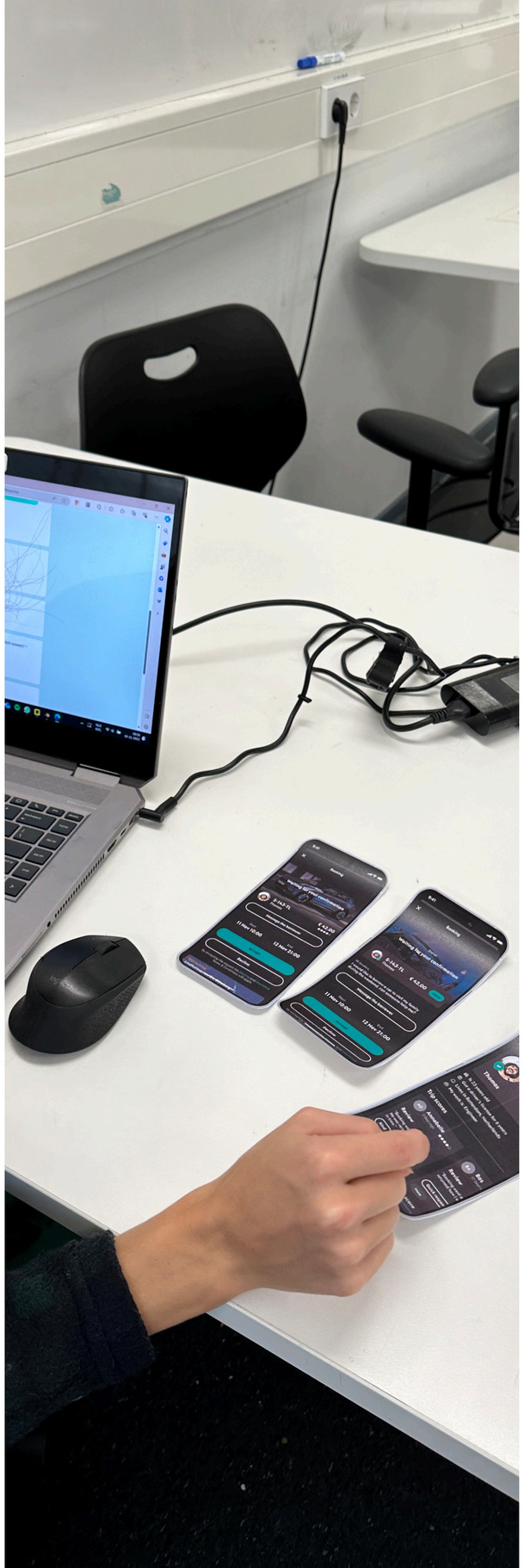


Figure 91: Results on the test where the 'Live Design' is compared to the 'New Design' based on the willingness to share.

From the discussion with the expert, other design and information related topics emerged. A breakdown is needed, which is a list that explains how the score was formed. This way, lenders get more insights than just a percentage. Next to that, a visualisation of a warning is needed for people with low trip scores. Lenders can be warned this way for people who misuse cars. At last, four types of information need to be prioritised: The amount of money, the time of the booking, the profile card and the accept button. This is needed because data analysis from the current app shows that this is seen as most important when considering a booking request. These insights are included in the final design, showcased in Chapter 9.



8.3.4 Market

Besides the new profiles and the components (scores, reviews and personal information) that come with them. The stimulation at the beginning of the service for the lender is also included in the product service. And to stimulate the lender a new section has emerged: Market. It shows requests to borrow a car for lenders.

For the lender, this tab will be located between 'Share' and 'Bookings'. For the borrower, it will be located on the Borrow page between 'Borrow' and 'Bookings' (Figure 92).

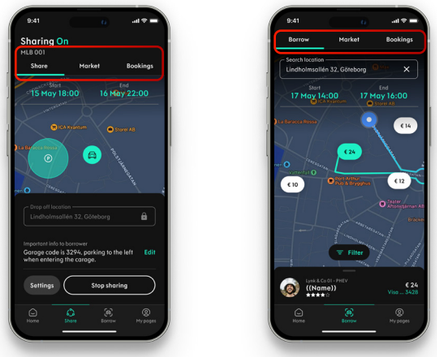


Figure 92: Proposed location of Market tab in the mobile (left: lender perspective. Right: borrower perspective).

In this section, the most important thing is to see as many requests as possible on one view of the screen, i.e. without scrolling. In doing so, it is important what information is displayed, how it is structured and how it looks.

Test
Three different designs were created (Figure 93) and again discussed with an expert from the mobile app team.
Variant 1 uses the principle of showing as many requests in one view. Because of this it only shows the most important information: the time and date. When a lender is not available at the requested time there is no need for other information.
Variant 2 shows some more information than this by showing the time and date but also the money that can be earned and the rating. By seeing the benefit, they might consider sharing.
Variant 3 shows all information available so lenders see all the information needed to make a decision to share or not.

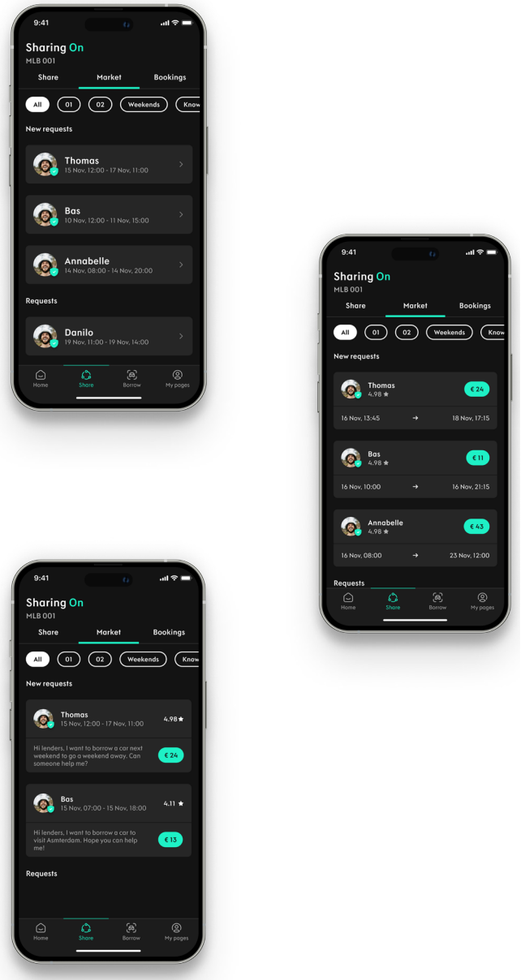


Figure 93: Three variations of the Market section design (top to bottom: Variant 1, Variant 2 and Variant 3).

Insights
Advised by the expert it was found that the most important information to show here is the time, date and the money that can be earned. Next to that, the requests for the lender should be able to be filtered and the lender should not have to think too much. Besides that, feedback was also provided on which screen will follow and what information should be included. All the feedback is included in the final design which is shown in Chapter 9. Some parts of the feedback are further discussed in Chapter 10.1: Recommendations.

Chapter 09

Showcase

This chapter shows Stimulus. The working principle of the concept and how it influences the current service. The product service journey summarizes the process and shows the in-car prototypes and mobile app.

9.1 Annotated Prototypes In-car

9.1.1 Digital screens

The final design of the digital in-car parts of Stimulus is divided into two: the DIM and the AVN. Both are shown below and explained with annotations on the next page.

The DIM is used to show essential information. To not distract the driver while driving. The trip score is integrated into the hub on the right side.
Gamification is used by showing the progress bar to stimulate the users to get it full.

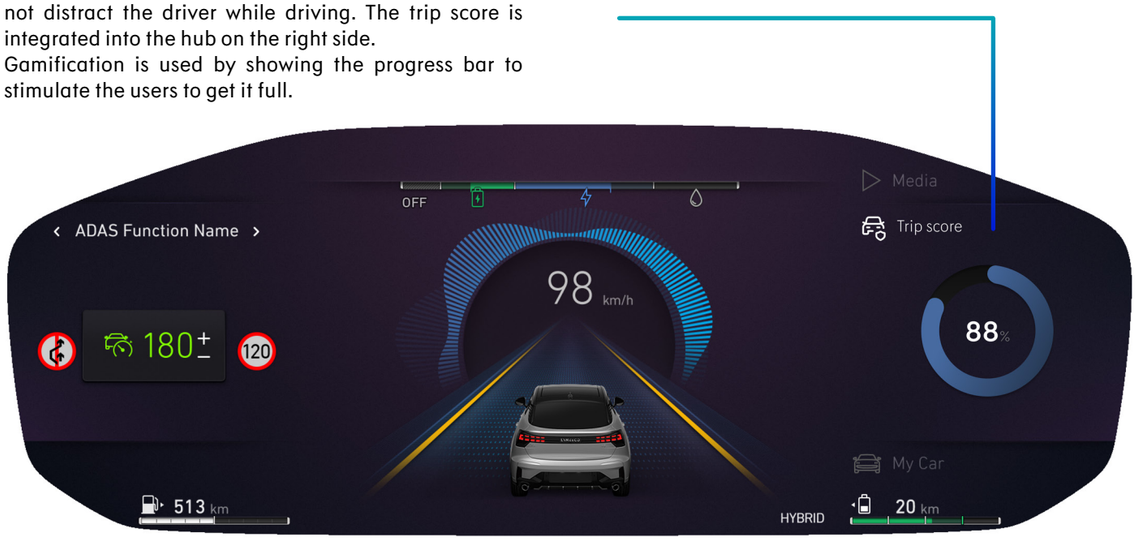


Figure 94: The DIM design of the Lynk & Co 01 with the integrated trip score hub on the right.

Progress bar behaviour
This blue circle progress bar shows the overall trip score based on each part scored. The brighter the blue and the more the circle is filled, the better the score. When a wrong driving action is performed the bar blinks. Blinking happens with the same frequency as vibrating—this way the user is attracted to the right part of the screen.

Figure 95: Different states of the progress bar.

Integration
The DIM is also used to show the circles when Apple CarPlay, Android Auto or the navigation is used on the AVN.

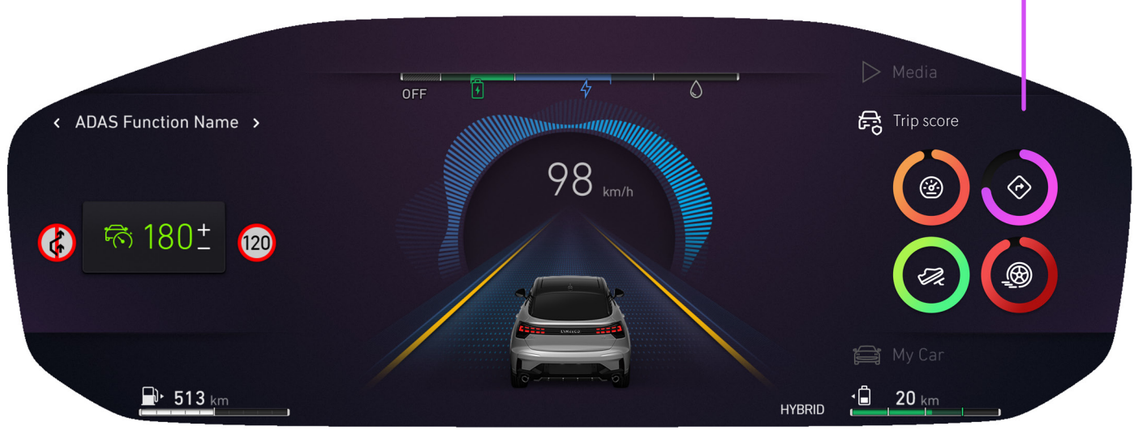


Figure 96: The DIM design of the Lynk & Co 01 with the integrated trip score hub when other applications are used on the AVN.

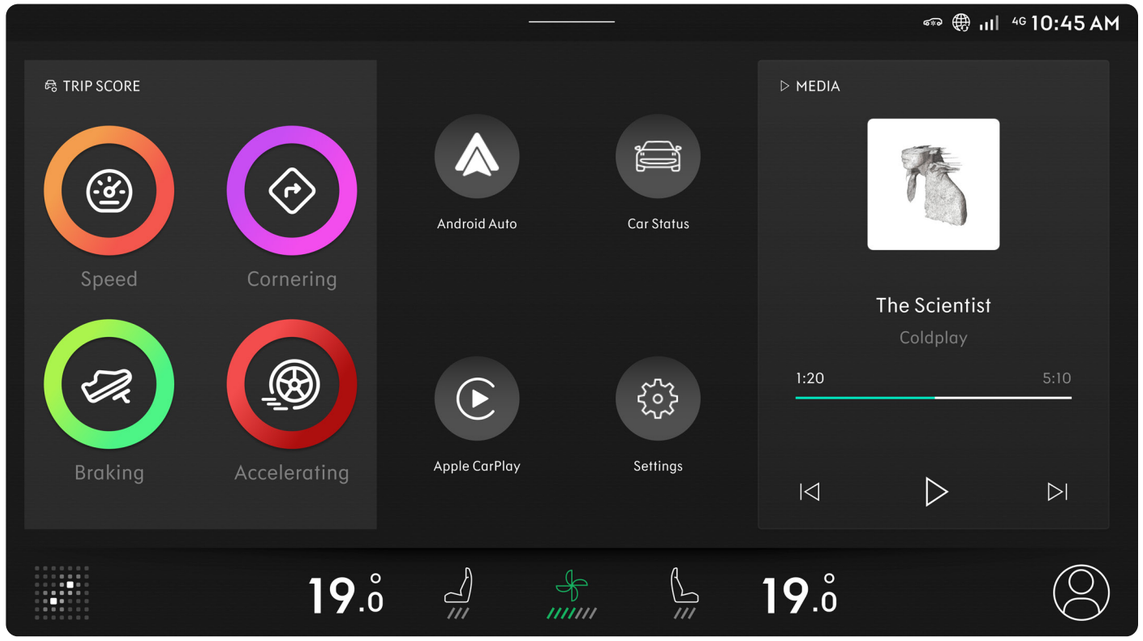


Figure 97: The AVN design of the Lynk & Co 01 with the integrated trip score widget on the left.

AVN design
The AVN provides more detailed information about the driving behaviour in a concise way. A widget is used to show information.

Breakdown
The principle of gamification is further exploited. Each part of driving that is scored is given a different colour. This way they are easier to distinguish from each other and easier to relate and link to the driving actions. To have coherency the colours on the AVN are the same as in the mobile app.

It was decided to use distinctive colours to make each aspect that is scored stand out and easy to remember. Speeding and accelerating are coloured in warm tones, orange and red. The braking is green and the cornering is purple on both to stand out, as shown in Figure 98.

The progress bars increase or decrease based on the driving. There is chosen to not let them blink in order to not attract too much attention. People already related the drop in score and the related vibration with the action they just performed.

Figure 98: The different colours for speeding, accelerating, braking and cornering.

9.1.2 Haptic feedback

The digital parts are connected to the haptic feedback that the borrower receives when driving the car. In this section both scenarios are shown with their vibration patterns and the related visuals.

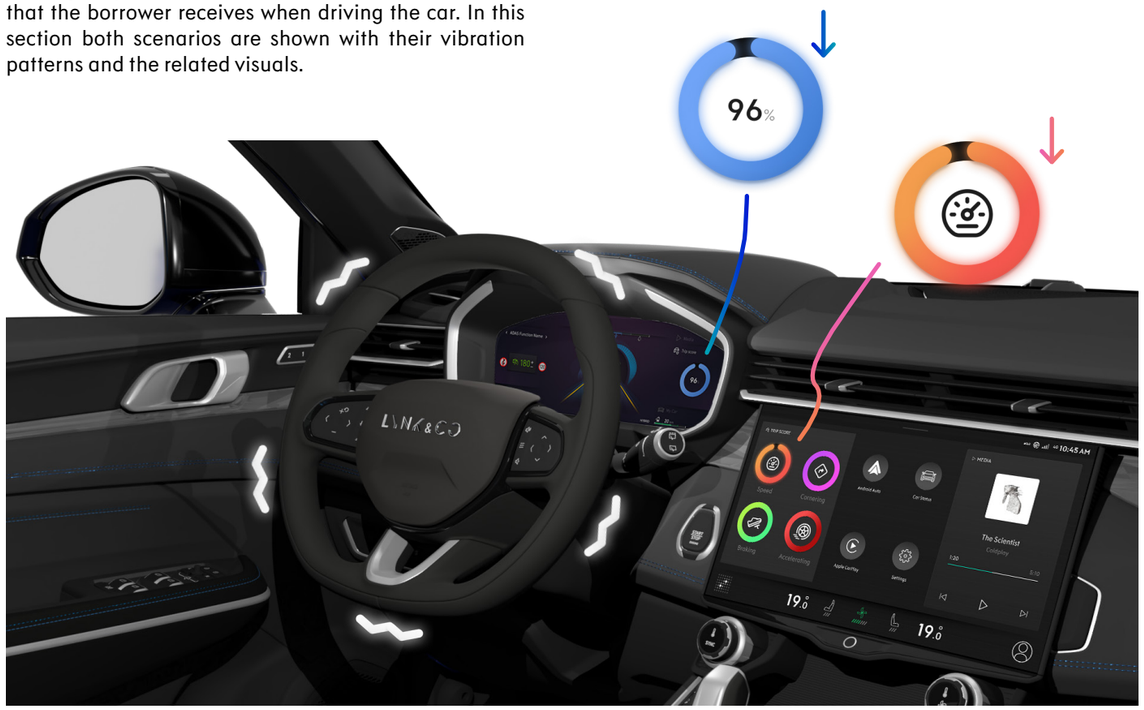


Figure 99: Haptic feedback when a wrong driving action is performed.

Wrong action
With hard braking, fast accelerating, speeding and sharp cornering the borrower gets a warning via haptic feedback. These vibrations relate to what happens on the screen, to have a clear relationship between controls and the effect, which makes it understandable to the user (Norman, 2013). In Figure 99 the scenario of a wrong action, in this case speeding, is shown.

Wrong action vibration pattern
The vibrations differ in their intensity and pattern. The more influential a driving action is on the score, the higher the intensity and the longer the vibration occurrence, creating a stronger and more attentive vibration. With less urgent driving actions a soft vibration is used, with a lower intensity and different pattern (Figure 100).

Figure 100: Strong (left) and soft (right) haptic feedback pattern.

Normal driving
When the borrower drives normally, the score is adjusted accordingly. At first, it stays the same and when driving well for a longer time the score increases, as can be seen in a visual representation of both screens in Figure 101.

Haptic feedback is only provided with a driving action that decreases the trip score and is therefore not provided to the driver when the score stays the same or increases.

Only visual feedback can be seen on both DIM and AVN, via the changing number and length of the progress bar. On the AVN the part that went well during driving is changed accordingly. In this example, the speed, cornering and braking went well so the bars are increased. Accelerating can be improved and thus stays the same.

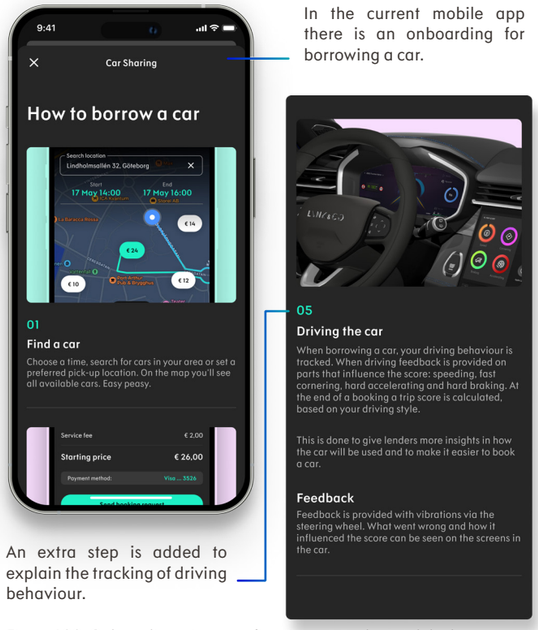
Figure 101: Feedback with normal driving.

9.2 Annotated Prototypes Mobile App

In this chapter, all new mobile app screens are shown and explained via annotations.

9.2.1 Mobile app screens: Onboarding

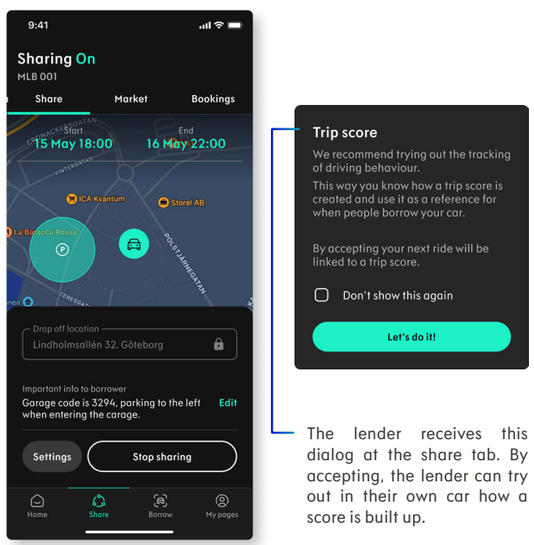
Before a borrower uses a car, onboarding takes place to inform the user about the tracking of driving behaviour. This happens on three points: when the borrower opens the share tab for the first time (Figure 102), before every booking and on the profile (Figure 104). The lender also needs a type of onboarding. By trying out how a trip score is made. This way they can relate scores from borrowers better (Figure 103).



In the current mobile app there is an onboarding for borrowing a car.

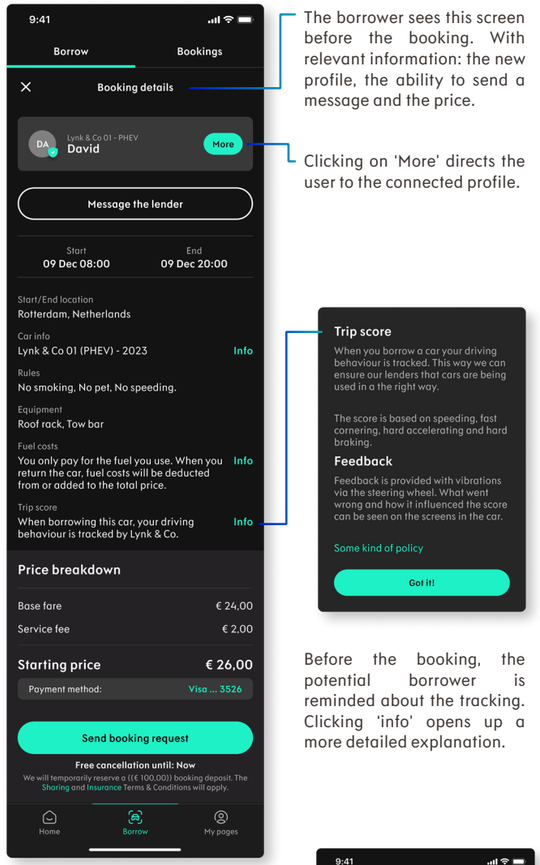
An extra step is added to explain the tracking of driving behaviour.

Figure 102: Onboarding trip score, first time open share tab by borrower.



The lender receives this dialog at the share tab. By accepting, the lender can try out in their own car how a score is built up.

Figure 103: Onboarding trip score for the lender.



The borrower sees this screen before the booking. With relevant information: the new profile, the ability to send a message and the price.

Clicking on 'More' directs the user to the connected profile.

Before the booking, the potential borrower is reminded about the tracking. Clicking 'info' opens up a more detailed explanation.

On the profiles both lender and borrower can see trip scores and click 'Info' to open up a more detailed explanation.

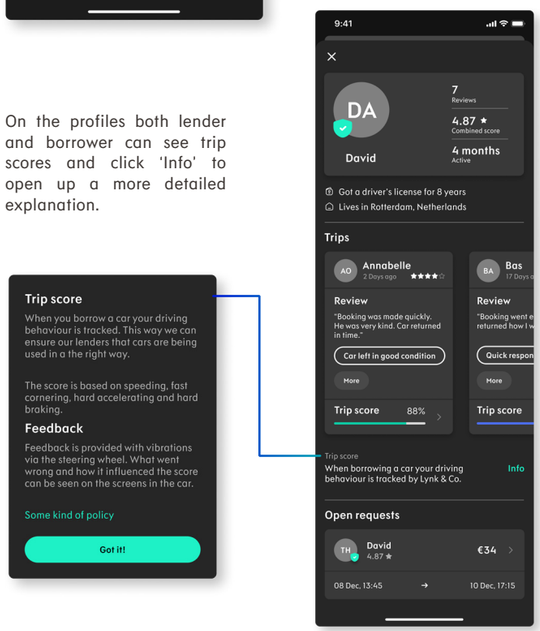
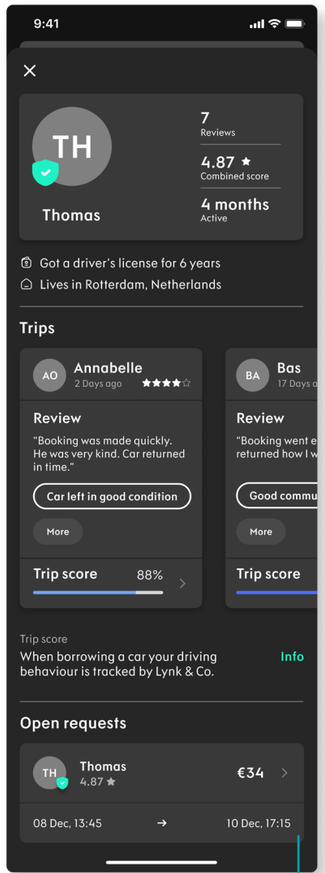


Figure 104: Onboarding tracking driving behaviour, before the booking is accepted and on profiles.

9.2.2 Mobile app screens: Profiles

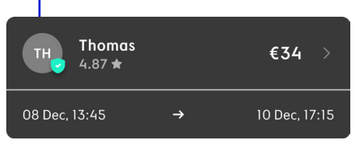
The idea is that the new profiles, as shown in Figure 105, offer insights for the lender over the potential borrower. They contain personal information, combined ratings, reviews, trip scores and open requests.



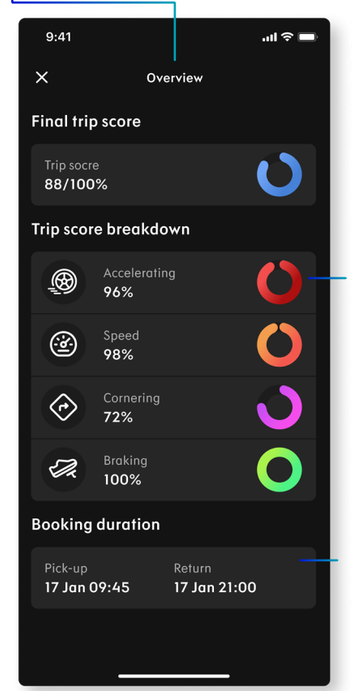
This profile card shows the name, profile picture, verification of the user, the reviews, the overall combined score and how long someone is active.

In the trip cards, everything from a previous booking review is shown. The time when the booking took place. The review of the lender in the form of stars, text and chip suggestions. The system provides the trip score, which changes colour accordingly.

Figure 105: Borrower profile.



The 'Open requests' section shows all requests from a borrower. This way lenders can see potential bookings. It is an easy way to provide the car more often when satisfied with this borrower. The requests are further discussed in Chapter 9.2.4.



Clicking on the arrow icon opens a new screen. On this screen a score overview is shown. This way lenders can see how the percentage is built up.

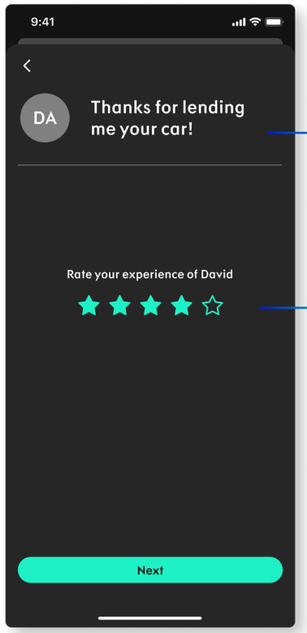
A breakdown is shown to see how the user scored per part.

The booking duration is also shown in order to relate the score to the time borrowing.

Figure 106: Trip score breakdown.

9.2.3 Mobile app screens: Reviews

One part of the profile cards is the reviews. A new flow with chips, which are the outlined suggestions, is created. The flow is explained via each step divided into four screens (Figure 107 - Figure 110).

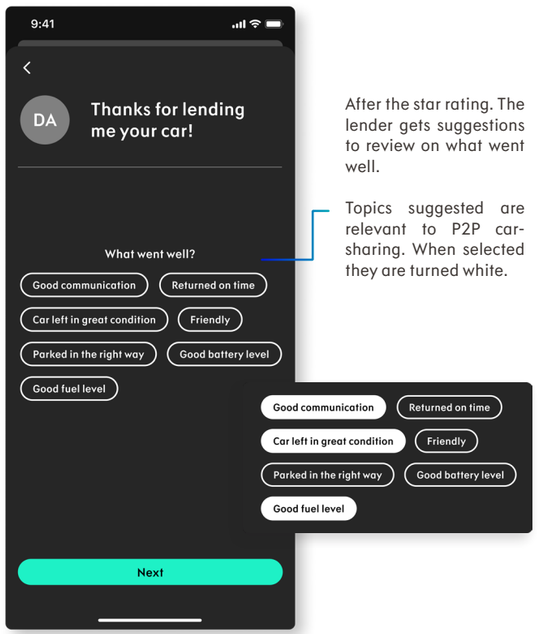


Brief thank you note with the picture of the borrower.

The first step is to give a star rating. The most easy and fast one.

The flow uses the principle of one type of information per time. This makes it easier for users to think about their answers. They also have the feeling that filling something in is mandatory.

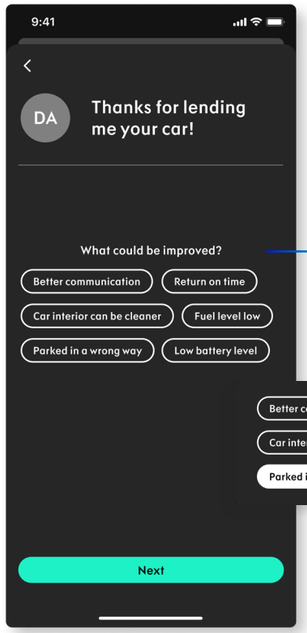
Figure 107: Review flow step 1.



After the star rating. The lender gets suggestions to review on what went well.

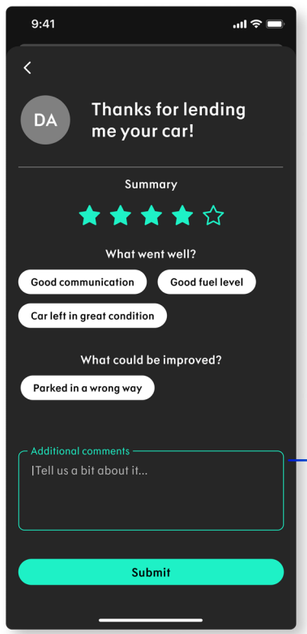
Topics suggested are relevant to P2P car-sharing. When selected they are turned white.

Figure 108: Review flow step 2.



In the third step lenders get suggestions about what borrowers could improve.

Figure 109: Review flow step 3.



The last step provides a summary about the review.

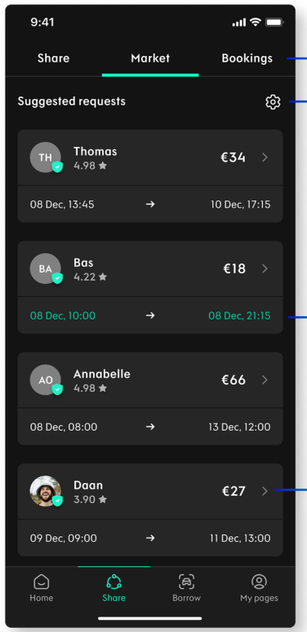
If lenders want to, they can give additional comments about the booking.

The review can be submitted and the flow will be closed.

Figure 110: Review flow step 4.

9.2.4 Mobile app screens: Market

The requests that were shown on the profile of the borrower, are also located on the 'Market' page. Besides this page, it is also shown what a lender sees when wanting to accept a request.



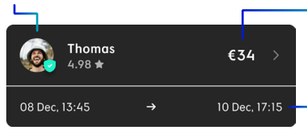
The Market is located between the share and bookings pages.
The page shows suggested requests based on the lenders location or own settings.

Clicking the settings icon opens up Figure 113.

Based on the car usage and thus availability of the car, a request shows up green when the system knows it is available.

Clicking the arrow opens up Figure 114.

Figure 111: Market page.

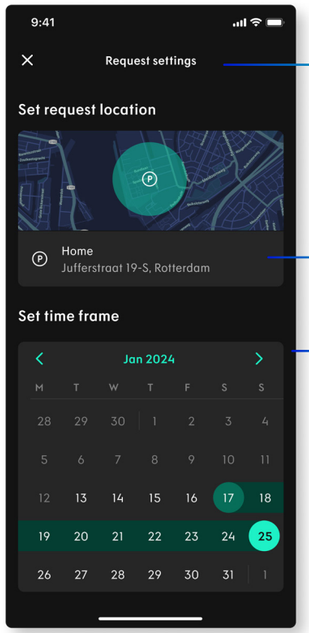


The profile picture, name, rating and verification are shown to provide a first image of the borrower.

The price is shown to persuade the lender. It is based on the price that is set up in the share settings.

The date and time are shown, since availability is the first thing that will be checked.

Figure 112: Request construction.

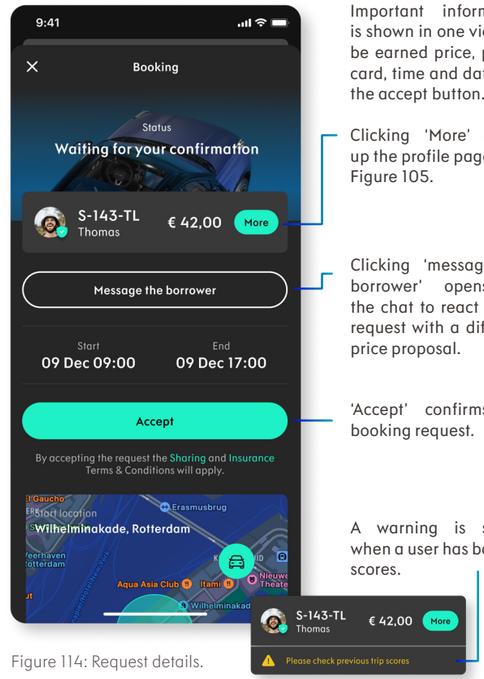


To filter suggestions lenders can set preferences.

One filter is to show requests based on the pickup location.

The other filter is the time frame. Lenders can set for what dates they want to see requests.

Figure 113: Request settings.



Important information is shown in one view: To be earned price, profile card, time and date and the accept button.

Clicking 'More' opens up the profile page from Figure 105.

Clicking 'message the borrower' opens up the chat to react to the request with a different price proposal.

'Accept' confirms the booking request.

A warning is shown when a user has bad trip scores.

Figure 114: Request details.

9.3 Product Service

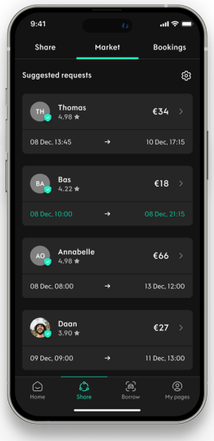
Besides the explanation per screen, the next three pages show how the new system influences the current car-sharing journey from a lender point of view.

9.3.1 Service journey lender

1

Lender:
being stimulated

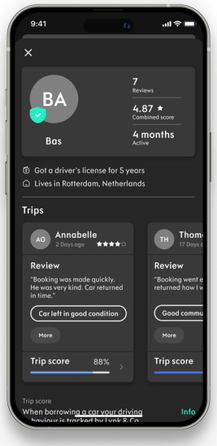
The lender can browse on the market page to see potential earnings.



2

Lender: researches the potential borrower

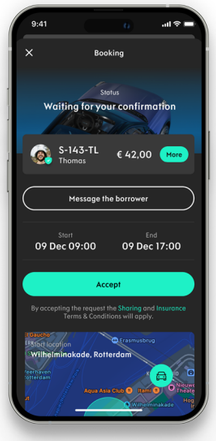
The lender clicks on the profile to view relevant information. To make an indication about the driver and their behaviour.

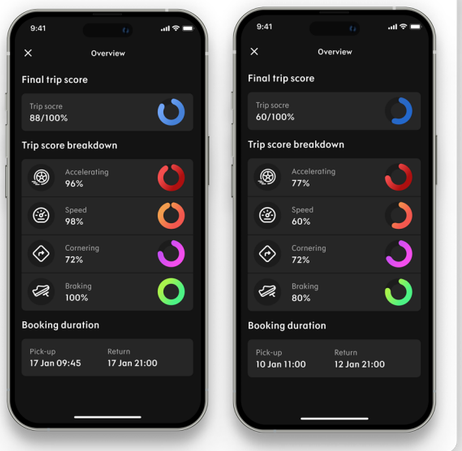


3

Lender: decides on booking

The lender checks the final details. He can message the borrower with a price proposal or accept via the suggested price.





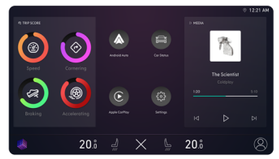
4

Borrower:
booking starts

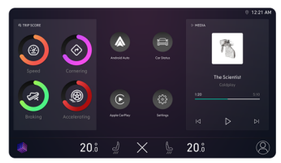
5

Borrower: receives feedback during driving

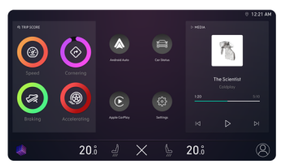
The borrower starts ends the trip and got a score of 91%.



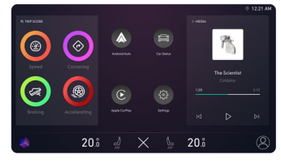
During the trip the score is adjusted to the driving style.



The borrower receives feedback after a wrong action.



The borrower starts with a score of 100%.



6

Borrower: returns car

7

Lender: returns to car

The lender returns to the car again and sees how it is returned and looks.

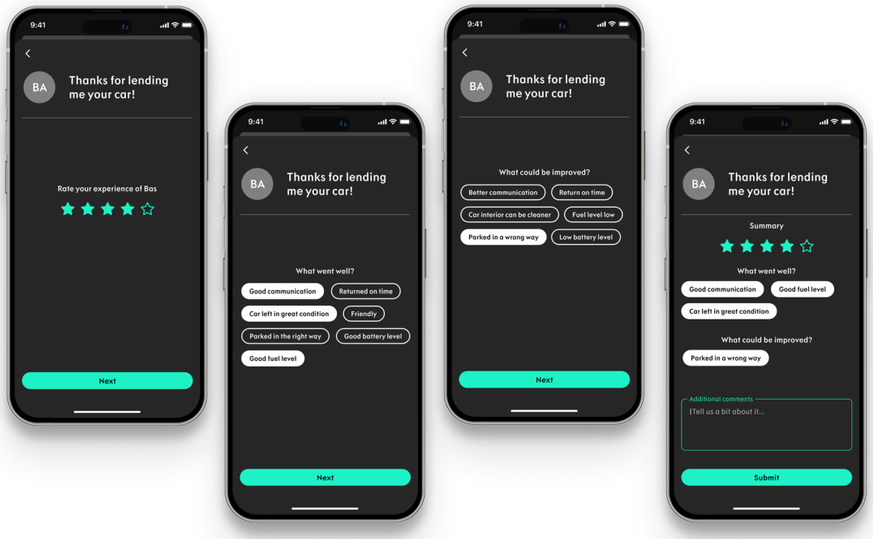
Lender: waits on ongoing booking

The lender knows the system keeps track of the car usage.

8

Lender: reviews booking and borrower

The lender knows what to review on and uses the suggestions to make a fast and detailed review.



9.3.2 Current journey influence

Stimulus influences four parts of the current service, shown in Figure 116. The explanation of how to read the visual can be seen in Figure 115.

The first one is the stimulation when the car is idle. In the current service, lenders are not stimulated. The only trigger can be a booking request if they made their car available, so the car needs to be available first. In the new system, lenders are actively triggered to share their cars via the requests on the market page and the to-be-earned money.
The second one is deciding on a request, either from the new market page or the current way, when a car is provided for sharing. The new system differs from the one that is live (Figure 86 on page 83) because it provides more insights and more sharing related information (time active, license obtained, trip scores and reviews) for the lender to better indicate.

The third one is during an ongoing booking. Currently, the lender has no information about it. Due to legal and connectivity reasons, there is still no information during the booking. However, lenders feel more calm because they know the in-car system monitors and steers the borrower.

The fourth moment is the one after the booking. Where a more detailed and car-sharing-specific review can be provided about the borrower.

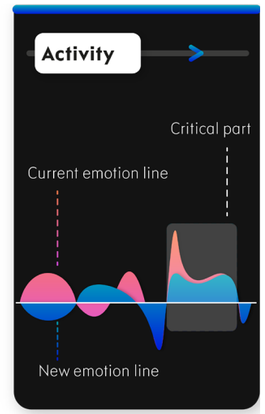


Figure 115: Explanation journey map.

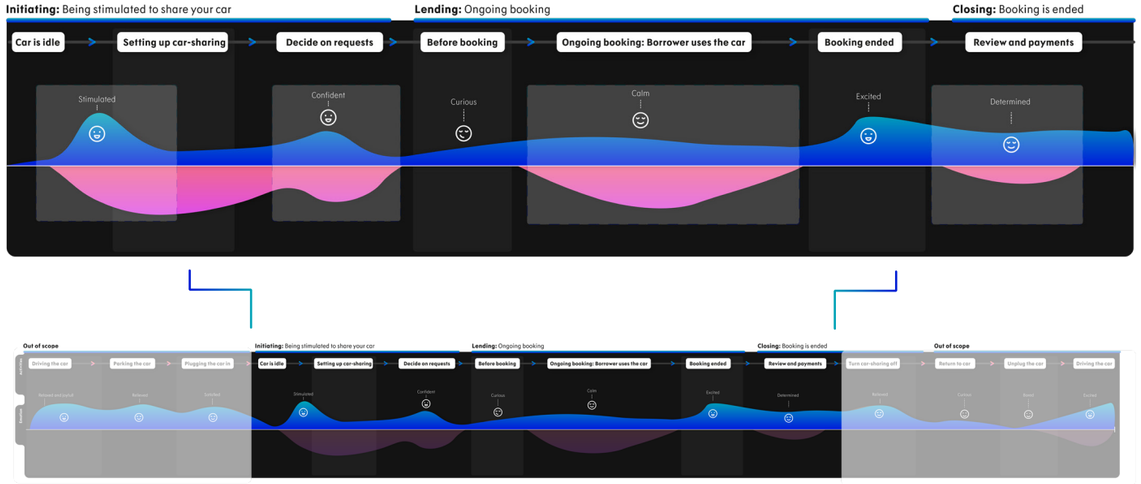


Figure 116: Difference current and proposed car-sharing service journey for lenders.

Chapter 10

Conclusion

In this chapter, recommendations for the concept and the car-sharing service in general are shown. Next to that, the discussion and conclusion are stated. Finally, this thesis comes to an end with a personal and project reflection.

10.1 Recommendations

As this project lasted 20 weeks, further development and research is advised. The system should be further optimized and tested by borrowers and lenders, which could lead to more recommendations. Examples of them and other topics that emerged during this project are listed in this paragraph.

10.1.1 Mobile app

In this section recommendations related to the mobile app are discussed.

Borrower view
During this project, everything is designed from a lender's point of view. Therefore, the first recommendation is to research and translate the designed screens into how they would look for borrowers. For example, how would the mobile app screen look when a borrower creates a request and what type of information do they find relevant? Or what would reviewing a lender from a borrower's point of view look like? Creating this could persuade borrowers to participate on the sharing platform. More borrowers on the platform create more demand.
To get more borrowers on the platform, the onboarding of them is also important. It was found that most people do not know the service or find it difficult to use it for the first time. A recommendation would be to give owners materials (e.g. flyers or onboarding videos) they can distribute in their neighbourhood. Another stimulation to get more borrowers could be to provide discounts for inviting people to the platform (e.g. first drive for half the price), this way people get acquainted with the service.

Besides focusing on the borrower to make the service complete. There are also recommendations regarding the designed lender screens.

Review system
The topics on which the lender can review the borrower are based on insights from the research. However, more research needs to be done on how to phrase these suggestions. They need to be concise but still convey a clear message. A user test could be performed in which owners of the 01 could rate what they find most important and frustrating with car-sharing. Next to that, people who borrowed a shared car could rate what they would have liked to give specific ratings on.

Trip score
There is a distinction between people who share for economic reasons and people who want to share to do good. With the latter, most people do not want to track how closely related people drive. Therefore a recommendation is that there needs to be a function to turn off the tracking of driving behaviour. This could be before every booking or when setting up the general car-sharing settings. Owners should be free to decide if they want to use this function or not, they should not feel obligated.

Market
Within the market section in the mobile app, it is also recommended to implement a feature that provides the opportunity for the lender to share for no money. Sharing with friends often goes without the idea of making a profit out of it. This way these existing customers are not forced to change.

With the requests and the borrower's point of view recommended earlier, it will also be useful to develop the ability to add an introduction message to these requests and to the already existing ability when a borrower reacts to an available car. This makes sharing more personal, which is something owners want when sharing their car. Suggestions on what to write are the purpose of borrowing and when it happens.

10.1.2 In-car system

Besides recommendations for the mobile app, the in-car system is also reflected.

Haptics
At first, I would suggest testing the principle in a driving vehicle on a closed road. After hat testing in public is needed. To continue the designed in-car haptic feedback, the vibrations could be further explored to find out what types are best perceived as different types of warnings. With this project, the working principle is researched and confirmed but to really be in line with Lynk & Co's brand identity, the experience with the vibrations is recommended to further explore.

Journey points
In the journey map, it was shown that there are two more critical points: stimulation before and ending sharing. A recommendation would be to change the current car-sharing application in the car.
First of all, use it to show the lender the amount of potential borrowers and what can be earned and saved when parking in this area. This stimulates them to provide the car.
Next to that, it would be good to research how to end the journey with a high positive emotion. A suggestion would be to show the benefits of sharing when on the AVN screen when entering the car again after it was returned. This is the time when the lender has concerns about how the car is returned, this emotion can be influenced by showing the (economic) benefits.

10.1.3 Others

Borrowers and lenders mentioned that the ability to chat with each other would help a lot in booking a car, it makes it more personal. It makes it more accessible for the borrower and creates more trust for the lender. Creating a chat function is therefore very relevant and would solve current problems.

10.2 Discussion & Conclusion

10.2.1 Discussion

I am aware that this thesis only touches upon some parts of the car-sharing service. And to make and change such a service, it is far more complex than described here. However, I believe that the biggest concerns are found and mapped. The thesis shows valuable insights into the current problems and even provides a solution for them. Even though the influence of this report is limited, the insights and conclusions in this thesis are still able to provide suggestions and recommendations to those currently working on car-sharing.

Feasibility
The solution builds upon existing sensors to get data and the current infotainment system and mobile app to show this data to the user. In the thesis, existing systems are used as a starting point. The mobile app is analysed and suggestions are based on the current structure, design guidelines and future design. The in-car system can be implemented via one of the widgets on the AVN and one of the hubs of the DIM. Therefore, the solution is not only theoretically able to be implemented but also practical.

Desirability
From the perspective of the borrower, it became clear that tracking their driving behaviour during a booking was not seen as an obstacle to using the service. It was even seen as a benefit. They clearly indicated that they wanted the same if they shared their car and that they could see the benefits of getting a car booked more easily.
From the perspective of a lender, the solution tackles their biggest concerns: lack of trust and transparency in how someone drives their car. The newly designed profiles were seen as more trustworthy.

Viability
The willingness and noticing of benefits of both borrower and lender to use the new system implies high viability. Next to that, Stimulus tackles the biggest concerns with car-sharing: providing better indication and giving more trust and control during the booking. Making owners more willing to accept booking requests.

Limitations
It is essential to acknowledge the presence of limitations that influenced the outcomes of this thesis. Time constraints, resource limitations, and external factors beyond control impact the depth and breadth of a project and the same goes for this one.

During this project I was located at the Amsterdam office of Lynk & Co. This is not the office with test facilities relevant for me. Therefore it was sometimes difficult to try out things from the service and the car and to test prototypes. I managed to work around this. But for obvious reasons, it would be easier and better for validation to be able to use a test car for my prototype.

The questionnaire, interviews and two user tests: in-car and mobile app, were mostly performed with students. Although it still provided relevant feedback on my prototypes. Participants were all from the Netherlands, around the same area. When implementing the proposed concept, it will be used across Europe, therefore a deeper understanding of cultural differences is needed.

Legislation is a vital aspect when introducing this concept. For the purposes of this project, legislation and policies are only briefly discussed within Lynk & Co with the legal and connectivity team. The relevant sensors (gyro sensor) and actuators (current infotainment system) are in place and they track data for the trip score. Collecting and using it may influence the development and introduction of the proposed solution.

Finally, not all sections of the journey are addressed. The points that were discussed in the recommendations still need development. To make the complete sharing journey for both borrower and lender more persuasive and beneficial all parts of the journey need to be researched and changed accordingly. Recommendations were provided as a starting point for what to develop next. The scope of this project did not allow it to recreate the complete journey. Therefore, implementing parts of the service is no guarantee to improve the overall service.

10.2.2 Conclusion

This thesis presents a new approach to P2P car-sharing for Lynk & Co. The solution especially focuses on the irrational aspect of car-sharing that is present among owners.

At the beginning of the project, the problem was formulated as 'Not enough people provide their car.' An attempt to understand the problem and reasoning was made via literature research and field research that was translated into a journey map. From this map, critical points of the service emerged. After summarizing other insights in combination with the critical points of the service a new problem statement was found: 'The acceptance rate of bookings needs to be increased.' Drivers that came from this are more trust in the borrower, control during the booking and stimulation to provide the car.

Through a combination of literature, field research, experiencing the current system, interviews and user tests of the concept, Stimulus is designed and has proven to work. It includes the irrational in its approach to tackling P2P car-sharing concerns amongst car owners. It stimulates owners to provide a car on a regular basis, it improves the capability for lenders to indicate borrowers and it increases the trust in the borrowers and the system during the booking.

10.3 Reflection

10.3.1 Project reflection

The project already started differently from other projects, normally a problem is provided. However, the project and its assignment were not assigned to me, but I came up with it myself. Something that was difficult in the beginning because everyone needed to be on board, the underlying problem needed to be found and I was free to shape the project.

At first, this freedom made it difficult in the beginning to make decisions. Therefore, the project was not that specific and focused on the topic that later on became important. At the start, there were also doubts from others, about how to make it academic and how to shape it in such a way that it is relevant for my further career.

If the project was done again there are two things I would do differently. First of all, I would change the way I approached the project. How I did it now eventually brought me where I am but I would limit the scope of the initial problem more than was done now. I investigated topics that in the end were not necessary or at least less time could be spent on them. Examples are the market analysis and the trends and developments. This way there would be more time for designing and testing.
Secondly, I would perform tests with the target group (Lynk & Co sharing platform users) only. During this project, almost all tests were conducted with students. Even though the working principle was still proven it would be even more meaningful to test them with Lynk & Co sharing users. This way other valuable insights for the project and company could emerge during these tests.

However, in the end, I enjoyed this freedom and working on this project. I could use my passion, knowledge and skills in such a way that I was able to design something relevant to my career and to Lynk & Co. My passion for cars and thus the more emotional approach is used to design for car-sharing, which in my opinion was very valuable. I have used my digital design knowledge in terms of visualising, rendering, mapping and prototyping and combined it with my passion: cars. I have even developed in this period. Getting skilled in Figma, prototyping and animating. But also setting up user tests, getting relevant insights and changing the design accordingly.

I am very grateful that Lynk & Co gave me this opportunity. In addition, I thank everyone within Lynk & Co that I have worked with. This graduation project but also certainly my internship before that has helped me in my career and as a person.

10.3.2 Personal reflection

This graduation project was challenging at the beginning but very rewarding, not only on a project basis but also personally.

It was the first complete design project executed on my own. During the rest of the study, everything was in teamwork so this took some shifting. In hindsight, it has been precious, the hands-off and just-doing-it approach made me experience a design project on my own in the best way.

In addition, I was pleasantly surprised because I developed myself in different ways during the project. Both in my design skills, prototyping, setting up and executing user tests, involving relevant stakeholders and communicating the project, but most of all as a person. I found out what I am good at and what I am not.
I now know what I enjoy doing. At the start of the project, my interests were still very broad, which I still have and I therefore always want to keep developing and learning. But one thing is for sure, my main interest is service and UX design. Strategically designing a complete service at the concept level is something I want to continue with in my future career.

The 20 weeks provided me with multiple learning moments, but two of them stood out. The first one, was after the research, during the difficulty of finding the underlying theme of the research findings. A lot has been done but what is the essence, a bit of a lost feeling. The most important thing I learned then was to write down everything that was done and connect it. It works enlightening, not only at that moment during the project but a learning moment for when I am faced with something complex. The second one, was in the process when I was setting up my user test. Here I kept postponing the actual testing. Eventually, a deadline was set. This created some pressure, but I actually just went straight to prototyping, even though there are things you run into, you always find solutions because of the pressure.
Both learning moments can be combined in one lesson. You have to make choices and do it. How it exactly works out will be found afterwards. It either works out well or you learn from it, after which it works out well.

Not only do I want to reflect on this project but also my studies besides the design-related skills that were developed in these 5 years. With my design studies background, I will always look differently at everything in the world. I have become more creative, am more open to new things, improved my communication skills, and know how to work with different stakeholders and present myself in the right way. Therefore, I have gained much more experience during these 5 years, which I did not think of at the start and am grateful for that.

Chapter

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Chapter

Appendix

Appendix A: Borrower motivations

Due to the amount of different car-sharing services, it is expected to find a suitable service for many travellers. However, on average, 2% of Dutch people aged 18 and above have used car sharing in the last 3 years. This amounts to around 200,000 car-sharing users. (Jorritsma et al., 2021).

Reasons to not use car sharing

Possible reasons why car sharing is not (yet) used as much, were found through literature research and the conducted questionnaire (N=101). The survey results are combined with the survey from Lynk & Co. (2023a) and supplemented with relevant studies.

Unawareness
The first concern is about unawareness. From the conducted survey it was found that people have a lot of questions regarding car-sharing. They do not know which cars can be shared, when they are available and how the service exactly works. These factors hold back people from trying out these types of services. When a picture of a sharing vehicle (the Lynk & Co 01) is shown, 89% mentioned they did not know this car could be used to borrow. And even with a more traditional car-sharing company, a picture of a red Greenwheels car, only 48% were sure this is a sharing car. This lack of clarity does not help to persuade people into car-sharing services.

Travel habits
The next aspect that keeps people from borrowing a car has to do with people's travel habits. Over the last decades, people developed these habits. Participants indicated that they are more likely to use public transport or their own car, instead of using a shared car. Studies have suggested that people find it difficult to make new travel methods a stable mobility routine (Julsrud & George, 2020). Public transport has been around for a longer time. Therefore, people are used to it and they are not that willing to change their trusted way of travel.

Car usage
Another travel habit is the usage of the car. Nowadays, we live in a society, built around cars, a 'car culture'. According to Mattioli et al. (2020) this culture combined with the politics of the car industry, the car infrastructure, the land use for cars and the neglect of public transport contributes to the addiction to cars. This relates to the fact that we keep buying cars. According to CBS (2020), the car fleet is even growing faster than the population in the Netherlands. So, most people own one or multiple cars.

From the conducted survey it was also found that people who own a car are less likely to use a shared car. Because their car, or one in the household, is always available. This is in line with the findings of a conducted survey about travel behaviour, 82% of the participants (N=10908) indicated that they do not need car sharing as they have their own car (Ministerie van Infrastructuur en Waterstaat, 2023).

Several studies indicate a trend amongst younger people (millennials) in Europe, that they are willing to give up car ownership (Costa, 2021). However, according to Witte et al. (2022) in the Netherlands, this generation still aspires to car ownership but is temporarily unable to do so due to circumstances. When the living situation (an own home with parking availability) and income permit, these young people largely catch up with their car ownership gap (Jorritsma & Berveling, 2014).
So, the fact that younger people are uninterested in car ownership is not really true. They do own fewer cars but that is part of a structural decline in car ownership among all age groups (Witte et al., 2022).

Ownership and use
There is one other trend among all people, especially the new generations: the shift from owning goods to using and experiencing them (Morgan, 2019).
In which it is made clear that people value experiences over owning things. So, will use and experience replace owning products? There are several studies suggest that this does not seem likely.
First, consumption has 'external effects' on other people (Mason, 1992). One is the display of wealth. People like to show off expensive things, such as cars, to gain social status. This phenomenon does not only appear in the Netherlands but also across other societies. A second effect is the snob effect, in which people acquire scarce and exclusive products. Similarly, some people buy certain goods and services to belong to a certain social group.

Next to that, ownership of goods contributes more to a person's satisfaction with life than temporary use (Hudders & Pandelaere, 2015). To a certain extent, ownership appears to generate more satisfaction than use. Ownership gives full control of the owned object, whereas letting it or lending it to someone involves relinquishing some of that control (KiM, 2015).

These studies show motives why people still might value ownership rather than just using products. Which keeps them from borrowing cars.

Motives to use car sharing

However, there are studies that argue that experience is valued more than ownership (Carter & Gilovich, 2014)

Experience
Experiences (going to concerts, eating out, holidays) make people happier than possessions (clothing, television, car). The enjoyment people obtain from a new possession soon fades, whereas the positive memories of experiences remain (Carter & Gilovich, 2014).
With a car this is slightly different, because 'ownership' and 'experience' are connected. The car is not only an attractive possession, but also a means of having experiences. Driving a car is an experience in itself because 'going for a drive' is pleasurable. A car allows you to travel to unknown destinations, it gives you freedom.
However, when people think of using a shared car, there is not much excitement in this experience, due to the fact that the traditional shared cars are often the most standard models, as discussed in the market analysis. However, with peer-to-peer sharing people can choose a variety of cars, including more expensive and well-equipped cars that are attractively designed. In the survey by Lynk & Co (2023a), about why people joined their sharing platform, people specified that certain features of the car persuaded them to join, such as safety and driving on electric power. Therefore, it can be argued that it does not matter if this experience is made with their own car or with a shared car.

Disadvantages of ownership
Owners of products run the risk of having bought something they will later no longer need or of buying the wrong product. Moreover, owners are responsible for maintaining and repairing the product and have to bear the full costs, even if the product is only used now and again. Products also have to be stored or kept somewhere (for cars, a parking place, which in cities can be expensive). These disadvantages are why a growing number of people are choosing to share instead of own (access rather than ownership). They enjoy the benefits without having to bear the burdens (Chatterjee et al., 2013).

Saving money
This reason of access rather than ownership, relates to cost saving. People choose car sharing, so they only have to pay when they use it. Cars are becoming more expensive and running them likewise. Especially younger people, who cannot afford to buy their own car, prefer to only pay per use via car sharing (Witte et al., 2022).

Convenience
Although the Dutch public transport is well organised and amongst the best ones in Europe, travelling is relatively expensive (Greenpeace, 2023). And it can be quite a hassle, especially to locations that are less accessible. It can be stressful, unreliable and uncomfortable.
With car-sharing, there is more convenience, compared to public transport. It is faster, more flexible, comfortable and more reliable (Steg et al., 2001).
People familiar with car sharing, know where to find cars, in the city centre parking spaces are close to where someone lives, which relates to the earlier discussed aspect of investments in infrastructure. Next to that, car-sharing users like the fact that they do not have the hassle of finding a free parking spot and they can park close to where they have to be. The comfort aspect relates to the fact that people like to have their own personal space in the car, someone can play their own music and set the temperature.

Occasional trips
From the conducted survey the participants made clear that they would consider car sharing for occasional trips. Julsrud & Farstad (2020) already indicated that people do not use car sharing as the main travel pattern. Examples of occasional trips are going away for a weekend, driving to and from the airport, going on vacation and going to events. The shared car can even be seen as a second car, for car owners. When their own car is not available. These findings are in line with (KiM, 2015).

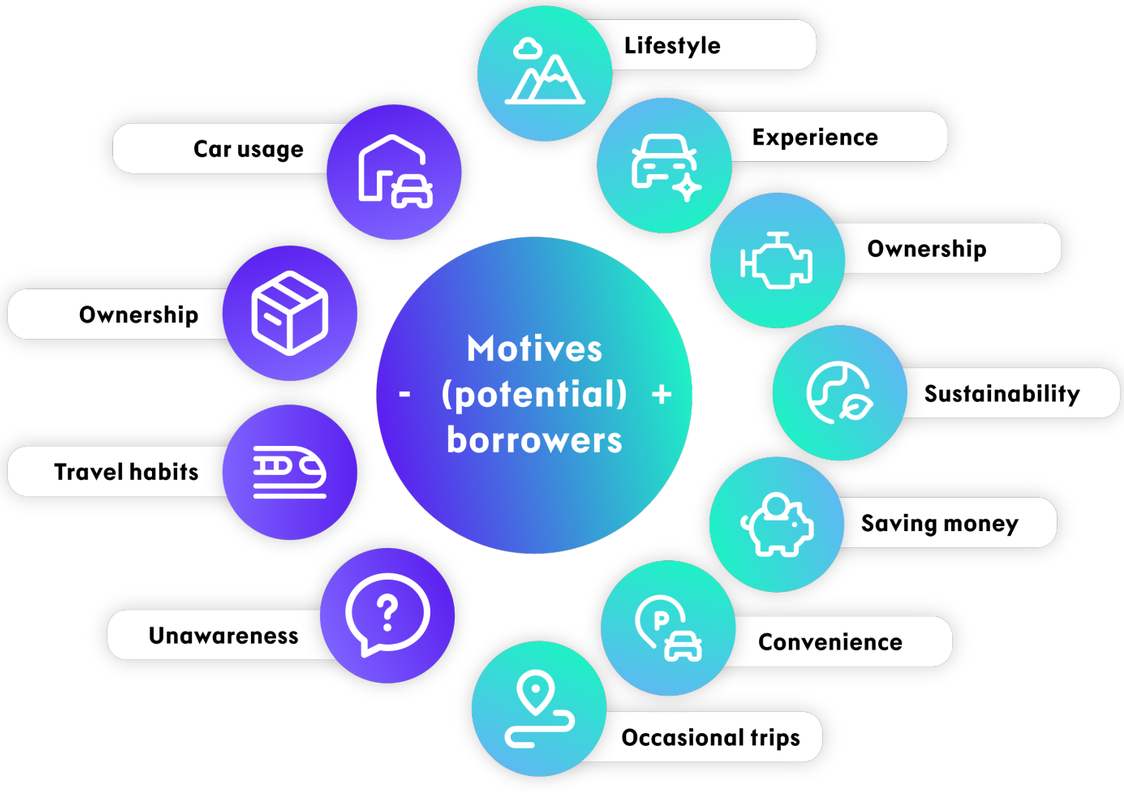
Lifestyle facilitator
Bardhi & Eckhardt (2012) found that people saw car sharing as a lifestyle facilitator. Because peer-to-peer sharing allowed them to try different cars and use them for different purposes, for example, the occasional trips. Making use of sharing platforms enabled them to drive a car, which creates experiences as well. It enables people to go to places that you cannot reach using public transport. Therefore, car sharing is a motive for people to have different and new lifestyles.

Sustainability
Car sharing is mostly related to sustainability, partly because this is also one of the drivers behind it. Sustainability is seen as an additional motivation for many people to use car sharing, as well as for users of the sharing platform from Lynk & Co. They were asked for their participation motives, and sustainability was mentioned as one of the main reasons (Lynk & Co, 2023a).

Insights

In conclusion, there are more reasons in favour of car sharing than there are reasons not to use it. However, the reasons against car sharing are all related to user behaviour. Such as their current travel habits and car usage. These are deeply rooted in people's habits. It can be argued that the bar to enter car sharing is too high. People are used to their travel habits and thus are less willing to try new things. They do trust these habits, because they have proven to work in the past, and therefore prefer these.

The fact that a lot of people own a car also plays a big role, their car is always available, so the need to use someone else's car is less. However, research has shown that car sharing can be very useful in specific cases and that people who tried them think the same. It can save people money, create experiences and enable people to do things that otherwise would not be possible. All the main reasons are listed in the figure below.



Appendix B: Questionnaire

At the start of the project a survey was conducted amongst travellers, users of car-sharing services, 01 owner that share and 01 owner that do not share. As my knowledge of the initial problem was not that big, the main focus of the survey was to explore and discover relevant problems and concerns with lenders and borrowers. In the end, a total amount of N=101 people participated. The questions where respondents had to give a grade on a scale from 1 to 7, 1 totally disagrees and 7 totally agrees.

The link to the questions for the Dutch version: https://forms.gle/xRS45cPwNiqdRtRq9
The link to the questions for the English version: https://forms.gle/Kax96ULA4hJEwoym8

Sectie 1 van 15

Deelauto diensten

Beste respondent,

Voor mijn masterscriptie aan de TU Delft, binnen de faculteit Industrial Design Engineering, doe ik onderzoek naar autodeel diensten.
Het invullen van de enquête begint met een wachtwoord: **172375**. Om zo spam reacties tegen te gaan, het duurt ongeveer 10 minuten en alle informatie die u geeft is volledig anoniem en wordt alleen gebruikt voor onderzoeksdoeleinden. U bent vrij om u op elk moment terug te trekken en te stoppen met deelname aan het onderzoek.
Alvast bedankt voor het invullen van de enquête!

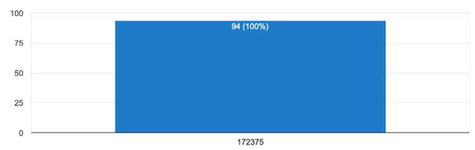
Met vriendelijke groet,

Thomas Hogeveen
TU Delft
Contact: t.hogeveen@student.tudelft.nl

Wachtwoord

Wachtwoord: Kopiëren

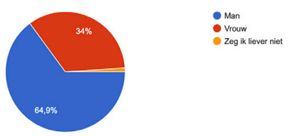
94 antwoorden



Algemene vragen

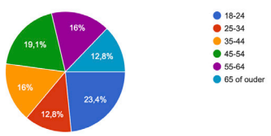
Wat is uw geslacht? Kopiëren

94 antwoorden



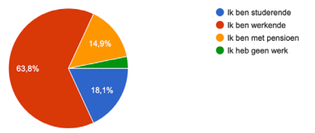
Wat is uw leeftijd? Kopiëren

94 antwoorden



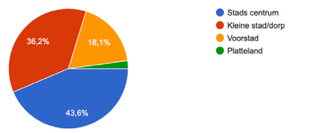
Selecteer wat voor u van toepassing is: Kopiëren

94 antwoorden



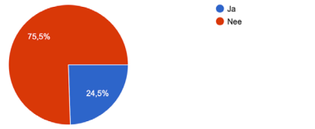
In wat voor **soort gebied** woont u? Kopiëren

94 antwoorden



Bent u eigenaar van een Lynk & Co 01? Kopiëren

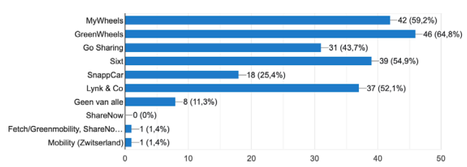
94 antwoorden



Vragen over auto's en autodeel diensten

Welke **merken** kent u met betrekking tot **autodelen**? (meerdere antwoorden mogelijk) Kopiëren

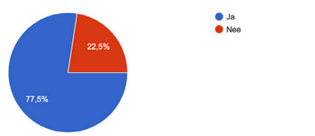
71 antwoorden



Mensen die niet in het bezit zijn van een Lynk & Co 01

Kent u dit merk of deze auto? (voordat u de foto zag) Kopiëren

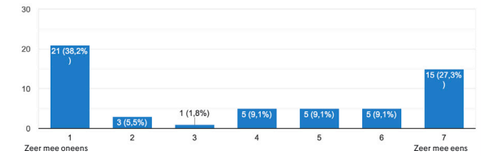
71 antwoorden



Herkenbaarheid van de Lynk & Co 01

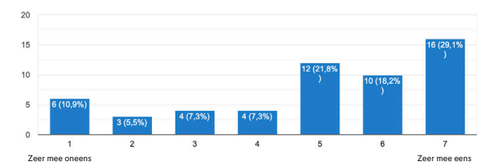
Ik ken deze auto vanwege het **maandelijkse lidmaatschap** Kopiëren

55 antwoorden



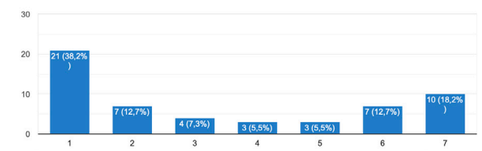
Ik ken deze auto vanwege het **uiterlijk** (blauwe accenten) Kopiëren

55 antwoorden



Ik ken deze auto vanwege de **mogelijkheid om hem te delen** Kopiëren

55 antwoorden



Lenen van de Lynk & Co 01 via het deelplatform

Heeft u ooit een Lynk & Co 01 geleend via het deelplatform? Kopiëren

94 antwoorden

Lynk & Co 01 lener

Waarom heeft u de Lynk & Co 01 gekozen om te lenen? (meerdere en eigen antwoorden mogelijk)

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer de 01 lenen: Mijn **boeking geaccepteerd** krijgen door de verhuurder was **moeilijk**

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer dat ik de 01 leende: De **01 vinden** die ik had geboekt was **moeilijk**

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer dat ik de 01 leende: De 01 **(ont)koppelen van/aan de laadpaal** was **moeilijk**

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer dat ik de 01 leende: Toen ik **instapte** had ik geen idee waar ik moest beginnen

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer dat ik de 01 leende: Het **infotainment scherm** bedienen in de 01 was **moeilijk**

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer dat ik de 01 leende: Ik heb **niet** alle **functies in de 01 ontdekt**

0 antwoorden

Nog geen antwoorden op deze vraag.

De eerste keer dat ik de 01 leende: Ik had na mijn boeking **moeilte** om de geschikte **inlever plek** te vinden voor de 01

0 antwoorden

Nog geen antwoorden op deze vraag.

Andere autodeel diensten

Waarom heeft u Lynk & Co nog **niet uitgeprobeerd** als deelauto? (als dit voor u van toepassing is)

62 antwoorden

- Nvt
- Heb zelf een auto
- Gebruik nooit deelauto's
- Teveel gedoe.
- Ik gebeuik de greenwheels het dichtst bij mijn huis
- Geprobeerd maar autos in de buurt reageerde/accepteerde mijn verzoek niet
- Heb de auto zelf nodig. En wanneer ik 'm niet gebruik geen zin/tijd heb daarvoor.
- Geen behoefte ivm eigen auto
- Ik lease een Link&Co nu.
- Mijn vrouw heeft een kleine auto.
- Zie vorige vragen
- Ik heb nog nooit een deelauto geprobeerd omdat ik nooit een hele auto nodig had. Eerder een scooter of fiets om mijzelf te verplaatsen binnen een stad waar ik zelf geen fiets had.
- Ik heb de auto gekocht na een proefrit
- Nog niet nodig omdat eigen auto altijd beschikbaar is.
- Tot op heden is er nog geen moment geweest waarop ik dit verkoos over het lenen van een auto van een bekende.
- Geen kans toe gehad, app werkt slecht
- Nog niet geprobeerd
- Ben huurder
- Niet van gekomen, gewoon besteld
- Deze auto huur ik zelf van Lynk en ik heb deze tot nu toe nog niet gedeeld met anderen.
- Wist Niet dat het bestomd
- Ik heb een eigen auto.
- Niet nodig
- Geen aanleiding.
- Geen interesse in gehad
- Niet bekend als deelauto
- Eigen auto
- Geen geld
- ik heb een eigen auto
- Ik lease Lynk &Co
- Huur er zelf een, proefrit gemaakt in Amsterdam
- De behoefte was er niet.
- Geen idee
- Geprobeerd, maar app werkt niet of wij begrijpen niet hoe het werkt.
- Ik heb een eigen auto en wil graag weg met de auto wanneer ik dat wil

heb auto gekocht

Ik heb zelf een auto

Ik wist niet dat dit mogelijk was. Bovendien heb ik zelf een auto dus gebruik ik geen deel auto.

Wij hebben zelf een auto en die wensen wij nog lang te houden.

Als ik een auto nodig heb leen ik die van m'n ouders

Niet aangeboden door mijn deelautoprovider

Ik maak geen gebruik van autodeel

Ik heb een eigen auto

Wordt niet aangeboden op deelplatform wat ik gebruk

Omdat ik al een eigen auto heb

Ik heb al een auto

Niet bekend met de optie.

Ik heb al een auto

Was er niet mee bekend dat dit kon

Gebruik geen deelauto

Eigen auto

Eigen auto's

Omdat ik zelf een eigen auto heb.

Ik heb zelf een auto, dus deze niet nodig

Heb een eigen auto dus n.v.t

Heb momenteel nog geen auto nodig

nooit deel auto gebruikt

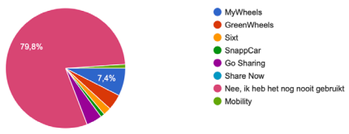
Ik wist niet dat dat kon

Nooit van gehoord

Niet nodig en dus geen belangstelling

Heeft u gebruik gemaakt van andere autodeel diensten? Zo ja, van welk merk heeft u het **laatst gebruik gemaakt**? Kopiëren

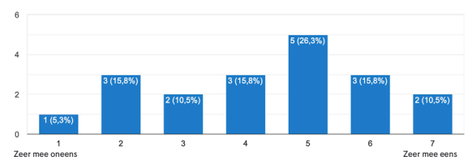
94 antwoorden



Gebruiker van andere autodeel diensten

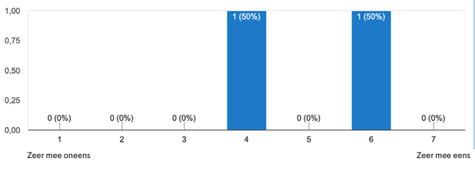
Ik gebruik een autodeel dienst in plaats van het **openbaar vervoer** Kopiëren

19 antwoorden



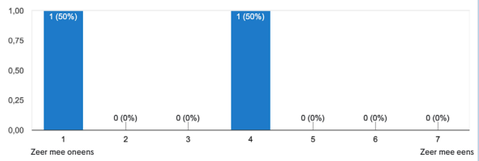
Ik gebruik een autodeel dienst in plaats van **mijn eigen auto** Kopiëren

2 antwoorden



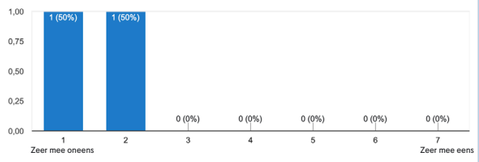
Ik gebruik een autodeel dienst in plaats van **met de fiets te gaan** Kopiëren

2 antwoorden



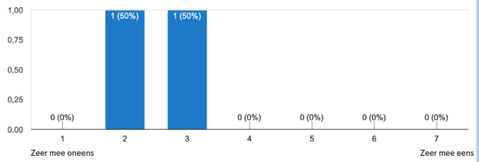
Ik gebruik een autodeel dienst als ik met een **groep reis** Kopiëren

2 antwoorden



Ik gebruik een autodeel dienst als ik **alleen reis** Kopiëren

2 antwoorden



Voor **wat voor soort reizen** gebruikt u een autodeel dienst?

2 antwoorden

Om naar plekken te gaan waar geen goede ov verbinding is

Grote pakketten of meubels halen

Kunt u een indicatie geven van de **afstand** van zulke reizen? (in km)

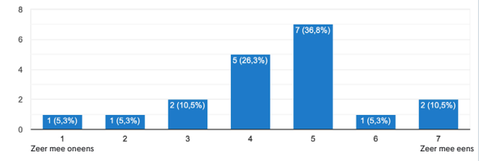
2 antwoorden

50

40

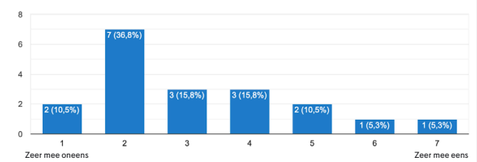
De autodeel dienst die ik heb gebruikt vond ik fijn omdat ik **vooraf gedefinieerde parkeerplaatsen** had (lege plekken gereserveerd voor deelauto's) Kopiëren

19 antwoorden



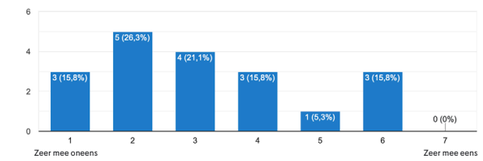
De autodeel dienst die ik heb gebruikt vond ik fijn omdat ik de auto **kon parkeren waar ik wil** (ik hoef de auto niet terug te brengen naar de plek waar ik hem heb opgehaald) Kopiëren

19 antwoorden



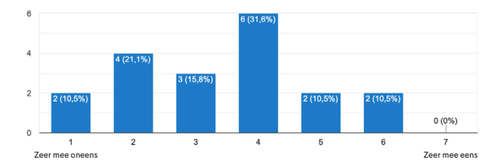
Het gebruik van deze service kan frustrerend zijn vanwege de **verschillende auto's** en dus **functies** Kopiëren

19 antwoorden



Het autodelen is soms frustrerend vanwege de **verschillende soorten opladers** (verschillende soorten elektrische voertuigen) Kopiëren

19 antwoorden



Zijn er andere voor- of nadelen die je hebt ondervonden bij het lenen van een auto via een autodeel dienst? Dan kunt u deze hier noteren

7 antwoorden

Geen

Voordelen: geen eigen auto meer nodig, verschillende typen auto's beschikbaar voor verschillende doeleinden (groot/klein, elektrisch of niet), zichtbaar hoe vol de tank/accu is, geen app nodig maar via website alles te regelen, koppeling met OV-chipkaart, vaste zones in de buurt met parkeerplekken, agenda van de auto zichtbaar wanneer beschikbaar.

Nadelen: bijna lege tank bij gereserveerde auto, stress bij te laat terugbrengen (afhankelijk van aanbieder ook boete), one-way niet altijd mogelijk

Met ov kaart inchecken was handig

Nvt

Telefonische bereikbaarheid in nood is niet altijd top

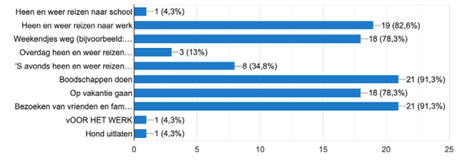
Hoe mensen hem achterlaten

Voor grote afstanden kan het snel gruwelijk duur worden

Lynk & Co 01 eigenaar

Voor wat voor **soort reizen** gebruikt u uw 01? (meerdere en uw eigen antwoord mogelijk) Kopiëren

23 antwoorden



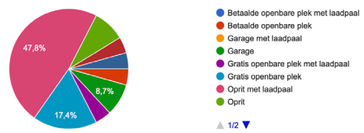
Voor wat voor **soort reizen** gebruikt u uw 01 **niet**? (meerdere en uw eigen antwoord mogelijk)

0 antwoorden

Nog geen antwoorden op deze vraag.

Als de 01 bij u **thuis geparkeerd** staat, hoe staat deze dan meestal geparkeerd? Kopiëren

23 antwoorden



Als de 01 bij uw **werk geparkeerd** staat, hoe staat deze dan meestal geparkeerd? (als u met de auto naar werk gaat) Kopiëren

23 antwoorden

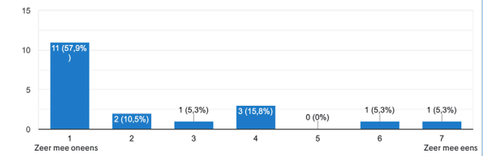
Biedt u uw 01 aan via het deelplatform? Of heeft u dat in het verleden gedaan? Kopiëren

23 antwoorden

Lynk & Co 01 eigenaar die de 01 niet aanbiedt op het deelplatform

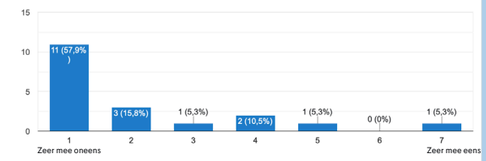
Ik zou sneller geneigd zijn om mijn 01 aan te bieden als ik tijdens de trip **meer informatie zie over mijn auto** Kopiëren

19 antwoorden



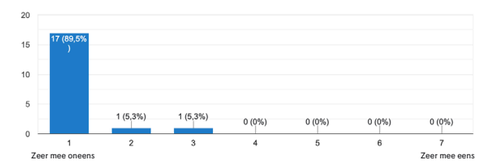
Ik zou sneller geneigd zijn om mijn 01 aan te bieden als ik vooraf kan instellen voor **wat voor soort trips** de auto gebruikt mag worden Kopiëren

19 antwoorden



Ik bied mijn 01 niet aan omdat ik **niet wist dat dit mogelijk was** Kopiëren

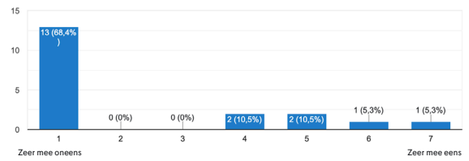
19 antwoorden



Ik bied mijn 01 niet aan omdat ik **niet weet hoe het werkt**

Kopiëren

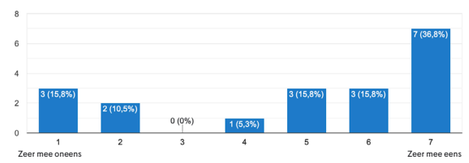
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat het **interieur** (binnenkant van de auto) **beschadigd** raakt

Kopiëren

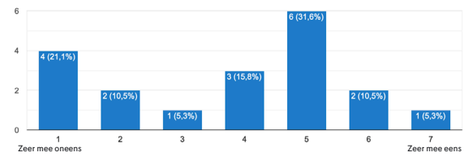
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat de **schermen** (infotainment en bestuurders scherm) in het **interieur vies** worden

Kopiëren

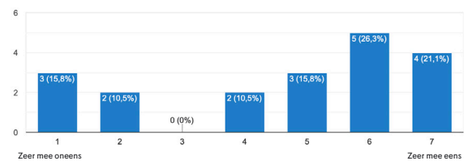
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat de **geur** in het **interieur** van de auto **vies** wordt

Kopiëren

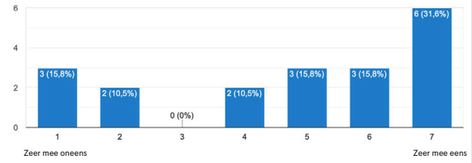
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat de **stoelen** in het **interieur vies** worden

Kopiëren

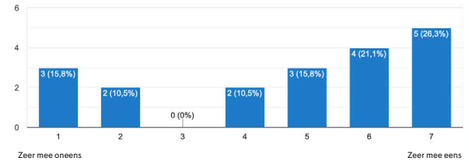
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat het **interieur vies** wordt door **afval**

Kopiëren

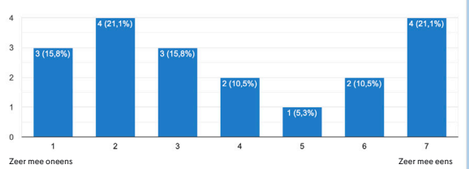
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat het **exterieur** (buitenkant van de auto) **vies** wordt

Kopiëren

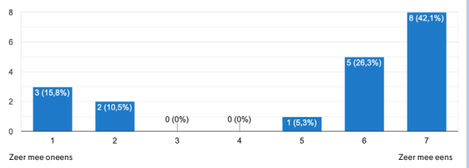
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat het **exterieur** van de auto **beschadigd** raakt

Kopiëren

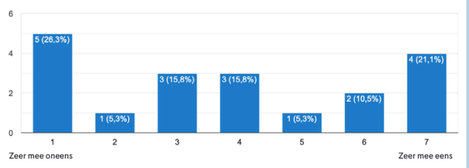
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat de **verkeersregels worden overtreden**

Kopiëren

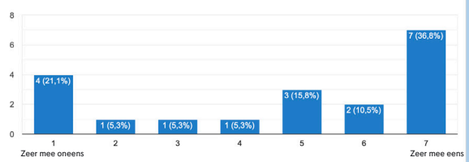
19 antwoorden



Ik bied mijn 01 niet aan omdat ik niet weet **wie** er in mijn **auto gaat rijden**

Kopiëren

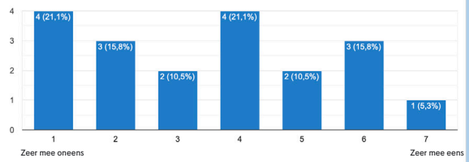
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat de auto teruggebracht wordt **zonder voldoende brandstof**

Kopiëren

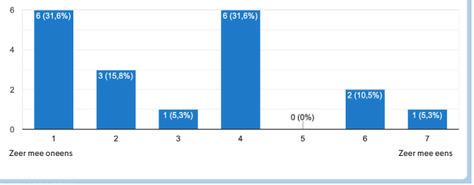
19 antwoorden



Ik bied mijn 01 niet aan omdat ik bang ben dat de auto teruggebracht wordt met een **(bijna) lege accu**

Kopiëren

19 antwoorden

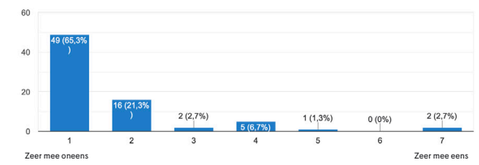


Mensen die nooit een auto hebben geleend via een autodeel service

Het is **duidelijk** dat ik auto nummer 1 kan lenen

Kopiëren

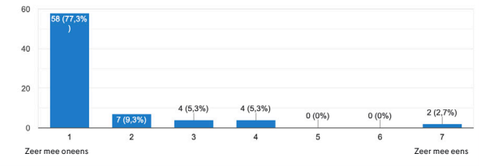
75 antwoorden



Het is **duidelijk** dat auto nummer 1 op dit moment (moment van foto) **beschikbaar is** om te lenen

Kopiëren

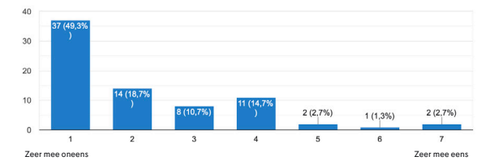
75 antwoorden



Het ziet er **gemakkelijk** uit om auto nummer 1 te lenen

Kopiëren

75 antwoorden



Licht uw antwoorden met betrekking tot auto 1 toe:

60 antwoorden

Het ziet er uit als een privé auto, daarom lijkt het of die niet gemakkelijk te huren is. Als je weet dat het wel kan is het natuurlijk toegankelijker.

Als je het niet weet, zie je niet dat dit een deelauto is

Geen aanduidingen

Het lijkt op een normale auto die aan de laadpaal staat.

Wanneer je niet bekend bent met het Lynk&Co concept is nergens aan te herleiden dat je deze auto kunt lenen.

Merknamen op de auto maken het voor mij duidelijk dat een auto gebruikt kan worden. Hier is dat voor mij minder duidelijk.

Het ziet er niet uit als een deelauto. Ik ken het concept, maar zou lynk nooit als eerste noemen als het om deelautos gaat.

Er is geen enkele cue op de auto dat ik kan zien dat het een deelauto is en of die uberhaupt beschikbaar is

Ik zou ervoor kiezen om de auto te branden met logo's om deze meer op te laten vallen als zijnde een leenauto. Dit zou ook gewoon een mooie elektrische auto van iemand kunnen zijn voor leken als ik. Branden met logo's gaat wellicht ten koste van de premium look, maar verhoogt de herkenbaarheid.

Hoe kan men nu weten dat deze auto deelbaar is? zonder app.

Niet herkenbaar. Oogt als particulier bezit. Niet op het oog makkelijk te lenen.

Hij is nog aan t opladen voor mijn gevoel

Ik vind de vraag lastig. Kan het bord niet lezen

Geen uiterlijke manifestatie

Plaatje van verkeersbord met tekst is nauwelijk/niet te lezen, dus voor mij allemaal niet duidelijk. Btw, ik lease een lynkco, ben dus wel gebruiker maar geen eigenaar... Weet niet of je dat goed verwoord hebt...

Niets , behalve de app, maat weten/zien dat dt een deelauto is

Je ziet aan de buitenkant van de auto niet dat deze te lenen is. Omdat de plek waar hij staat, ruim is, lijkt het wel makkelijk om hem mee te nemen.

Niet echt duidelijk

Deelplatform Lynk is nog steeds niet op orde

Het ziet er uit als gewone auto

Lijkt gewoon op een auto van iemand die aan het opladen is

Nvt

Auto nummer 1

Ze zien er voor mij niet uit dat ze te leen zijn

Niet iedere L&C is te leen.

Ik denk dat ik voor de beschikbaarheid van deze auto een app nodig heb. Verder is de auto geparkeerd, dus wellicht kan ik hem lenen, maar misschien wilt iemand er ook nog verder in rijden.

Ik vind dit vreemde vragen, ze hebben niets met de foto te maken

In de basis weet je dat het merk Lynk delen van auto's faciliteert, maar welke auto beschikbaar is weet je nooit zonder app.

Ziet er uit als iemands persoonlijke auto.

Dat blijkt nergens uit

Aan de buitenkant / de auto alleen zie ik niets.

Ken dit Systeme niet

Ik ken het concept niet.

Ik had geen idee dat blauwe accenten het teken van leenauto waren

Zie er niks aan.

Meeste Lynk&Co auto's zijn niet beschikbaar als leenauto

Het ziet eruit als een persoonlijke auto van iemand die aan het laden is.

Geen idee waaruit ik op zou kunnen maken dat en hoe ik de auto kan lenen

Kan nergens aan zien dat het om een deelauto gaat

Ik zie nergens een herkenning dat de auto een deelauto is

Geen herkenning, geen Signing...

Ik zie enkel een elektrische auto aan een laadpaal met blauwe accenten, voor de rest zegt de foto mij niet zoveel.

Je kunt aan een auto niet zien of je 'm kunt lenen

Hoe zou je dit moeten zien? Ook wel fijn dat het niet ziet. Niet prettig als iedereen ziet dat het een leenauto is.

je kunt nooit zien of auto van lynk is of prive eigenaar

Geen idee hoe dat moet

Ik vind het niet duidelijk dat het om een deel auto gaat. Had in eerste instantie gedacht dat het gewoon een auto van iemand is. Bovendien staat hij aan de laadpaal, ziet er toch minder toegankelijk uit.

Ik heb geen idee hoe ik kan zien dat je die auto kunt lenen

Ziet er niet uit alsof hij beschikbaar is om te delen omdat hij aan een laadpaal zit. Ik ken het merk wel dus weet dat sommige mensen deze auto delen

Ik zie niet waar aan ik kan zien dat het een deelauto is

Hoe moet ik zien dat de auto beschikbaar is en dat ik die kan lenen?

Ik zie nergens dat ik die auto's kan lenen?

Geen ervaring met delen of lenen van auto's

Hij staat aan de laadpaal

Geen behoefte om te lenen

Ik heb werkelijk geen idee

Kan ik nergens aan zien

Ik heb werkelijk geen idee

Kan ik nergens aan zien

Ik kan nergens zien dat ik deze auto kan lenen

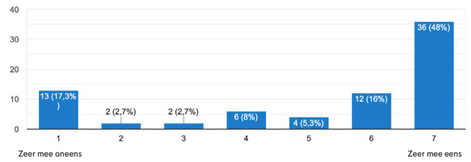
Zelfde als vorige vraag. Daarnaast maakt het feit dat hij aan de laadpaal zit het iets moeilijker om hem te gaan lenen, maar het is ook weer niet een hele moeilijke handeling om hem van de laadpaal te halen.

Auto nummer 2

Het is **duidelijk** dat ik auto nummer 2 kan lenen

Kopiëren

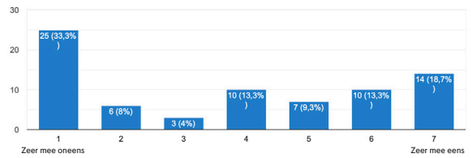
75 antwoorden



Het is **duidelijk** dat auto nummer 2 op dit moment (moment van foto) **beschikbaar is** om te lenen

Kopiëren

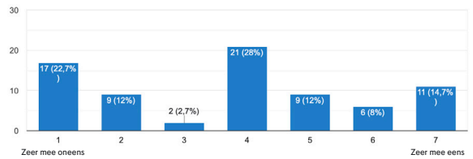
75 antwoorden



Het ziet er **gemakkelijk** uit om auto nummer 2 te lenen

Kopiëren

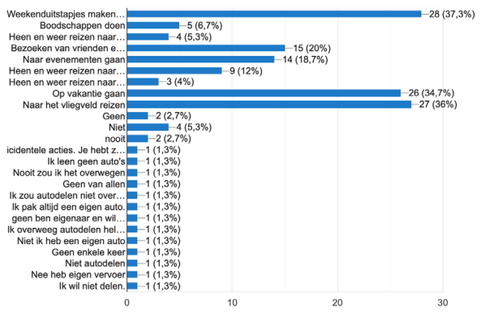
75 antwoorden



Voor **welk soort reizen** zou u autodelen overwegen? (meerdere en uw eigen antwoord mogelijk)

Kopiëren

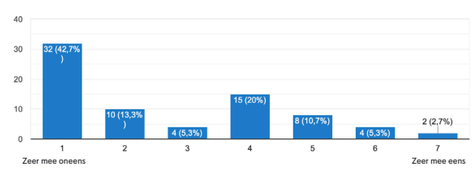
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat ik denk dat er **niet genoeg auto's beschikbaar** zijn

Kopiëren

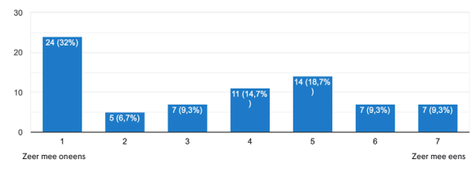
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat ik in plaats daarvan het **openbaar vervoer gebruik**

Kopiëren

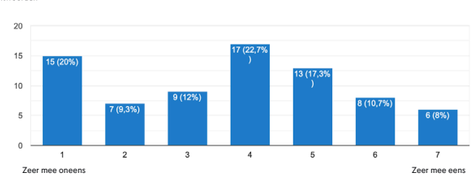
75 antwoorden



Als u onderweg ziet dat een auto **beschikbaar** is om op dat moment te delen, zou u dan **eerder bereid** zijn om deze dienst te gebruiken **in plaats van het openbaar vervoer**?

Kopiëren

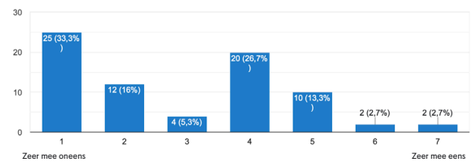
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat het **niet goed aansluit op andere vormen van vervoer** (metro, trein, bus etc.)

Kopiëren

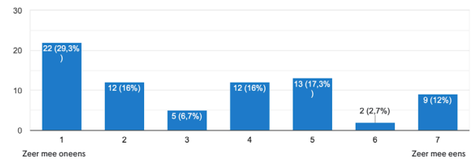
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat ik **niet begrijp** hoe zo'n **service werkt**

Kopiëren

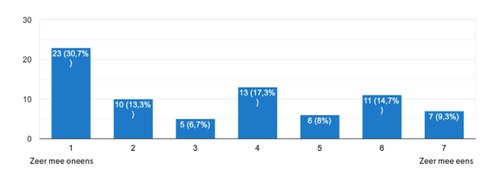
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat ik **niet weet welke auto's gedeeld** kunnen worden

Kopiëren

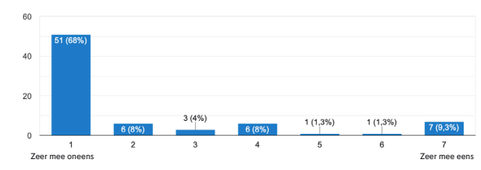
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat ik **niet weet** hoe een **elektrische auto werkt**

Kopiëren

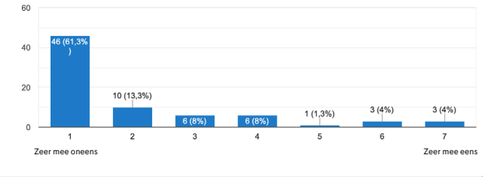
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat het **opladen van de elektrische auto** te **ingewikkeld** is

Kopiëren

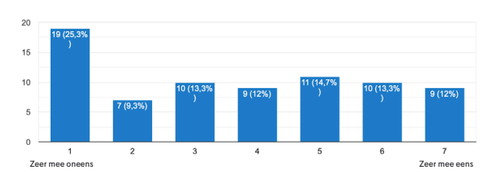
75 antwoorden



Ik gebruik geen autodeel dienst/ ik zou geen autodeel dienst gebruiken:
Omdat ik **niet weet waar** ik deze **auto's kan vinden** en **parkeren**

Kopiëren

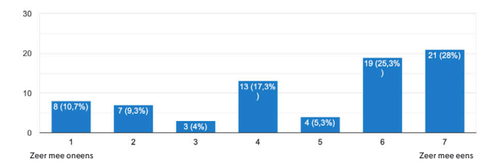
75 antwoorden



Als ik **altijd toegang** tot een **gedeelde auto** zou hebben, zou ik nog steeds mijn eigen auto kopen

Kopiëren

75 antwoorden



English version:

Sectie 1 van 14

Car sharing services

Dear respondent,

For my master thesis at Delft University of Technology in the Netherlands, within the Faculty of Industrial Design Engineering, I am conducting research on car sharing services.
To avoid spam, the survey starts with a password: **172375**. It takes about 10 minutes and all the information you provide is completely anonymous and will only be used for research purposes.
Thank you in advance for completing the survey!

Kind regards,

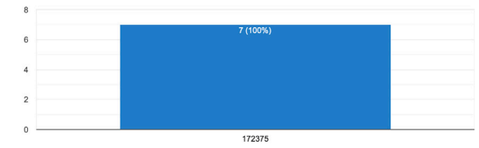
Thomas Hogeveen
TU Delft
Contact: t.hogeveen@student.tudelft.nl

Password:

Password:

Kopiëren

7 antwoorden

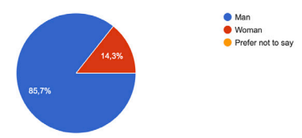


General questions

What is your gender?

Kopiëren

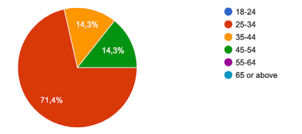
7 antwoorden



What is your age?

Kopiëren

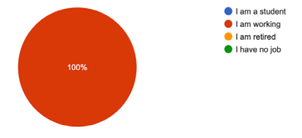
7 antwoorden



Select what applies to you:

Kopiëren

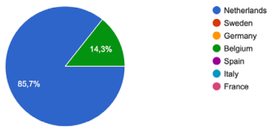
7 antwoorden



In which country do you live?

Kopiëren

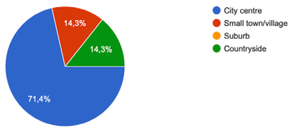
7 antwoorden



What kind of area do you live in?

Kopiëren

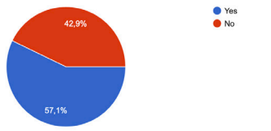
7 antwoorden



Do you own a Lynk & Co 01?

Kopiëren

7 antwoorden

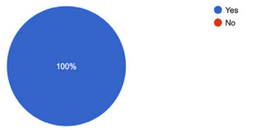


People who do not own a Lynk & Co 01

Do you know this brand or this car (before seeing the picture)?

Kopiëren

3 antwoorden

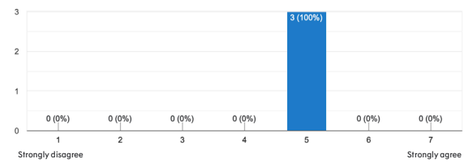


Recognition of the Lynk & Co 01

I know this car because of its **monthly membership**

Kopiëren

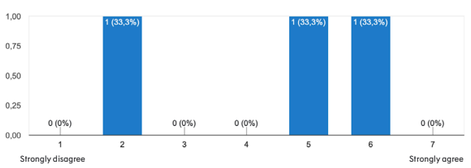
3 antwoorden



I know this car because of the **design** (blue accents)

Kopiëren

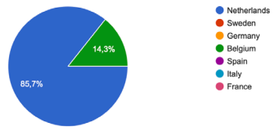
3 antwoorden



In which country do you live?

Kopiëren

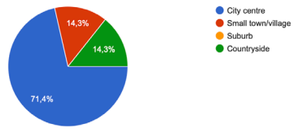
7 antwoorden



What kind of area do you live in?

Kopiëren

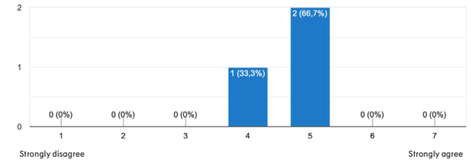
7 antwoorden



I know this car because of the **possibility to share** it

Kopiëren

3 antwoorden

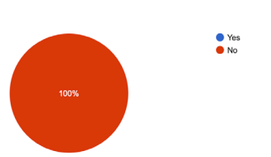


Borrowing a Lynk & Co 01 via the sharing platform

Have you ever borrowed a Lynk & Co 01 via the sharing platform?

Kopiëren

7 antwoorden



Lynk & Co 01 borrower

Why did you choose the Lynk & Co 01 to borrow? (multiple and own answers possible)

0 antwoorden

Nog geen antwoorden op deze vraag.

First time borrowing the 01: Getting my **booking accepted** by the lender was difficult

0 antwoorden

Nog geen antwoorden op deze vraag.

The first time I borrowed the 01: **Finding the 01** I booked was difficult

0 antwoorden

Nog geen antwoorden op deze vraag.

The first time I borrowed the 01: **(Dis)connecting** the 01 from/with the **charging station** was difficult

0 antwoorden

Nog geen antwoorden op deze vraag.

The first time I borrowed the 01: When I **entered the car** I had no idea **where to begin**

0 antwoorden

Nog geen antwoorden op deze vraag.

The first time I borrowed the 01: **Operating the infotainment** screen in the 01 was **difficult**

0 antwoorden

Nog geen antwoorden op deze vraag.

The first time I borrowed the 01: I **did not discover** all the **features** in the 01

0 antwoorden

Nog geen antwoorden op deze vraag.

The first time I borrowed the 01: I struggled to find the **suitable drop-off spot** for the 01 after my booking

0 antwoorden

Nog geen antwoorden op deze vraag.

Other car sharing services

Why have you not yet tried Lynk & Co as a sharing car? (if applicable to you)

4 antwoorden

- to many clicks to set up sharing
- Because I have a car
- App didn't work / Couldn't book a car
- Because I have a Lynk & Co 01 myself

Have you used other car sharing services?

Kopiëren

7 antwoorden

User of other car sharing services

What is the name of the car sharing service you used?

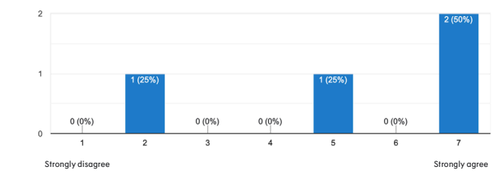
4 antwoorden

- Green wheels
- ShareNow
- GreenWheels
- Greenwheels

I used a car sharing service instead of using **public transport**

Kopiëren

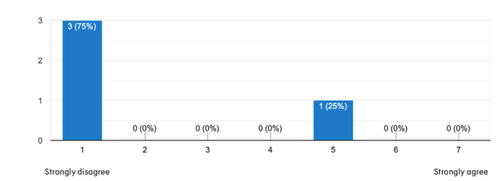
4 antwoorden



I used a car sharing service instead of using **my own car**

Kopiëren

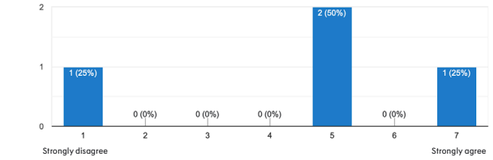
4 antwoorden



I used a car sharing service instead of going by **bicycle**

Kopiëren

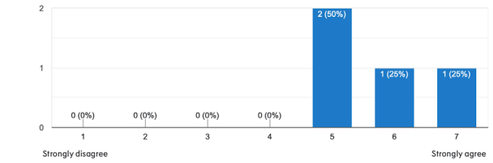
4 antwoorden



I used a car sharing service while traveling **with a group**

Kopiëren

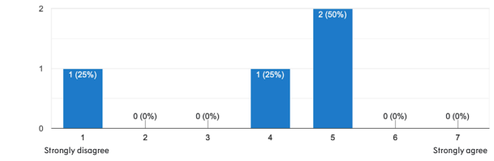
4 antwoorden



I used a car sharing service while traveling **on my own**

Kopiëren

4 antwoorden



For **what kind of trips** do you use a car sharing service?

4 antwoorden

- When it rains to go from A to B in the city
- New expat in country, went shopping at IKEA.
- Short trips, while picking someone up from the airport. It was not possible to go to the end destination
- Coming back from bars

Can you give an estimation of the **distance** of such trips?

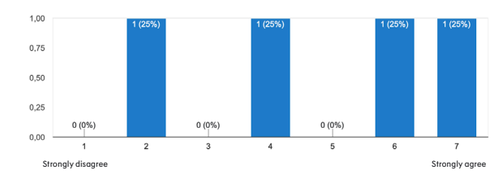
4 antwoorden

- 20 minutes
- 40km
- <40 km
- 5-10km

I liked the car sharing service I used because it uses **clear predefined parking spaces** (empty spaces reserved for shared cars)

Kopiëren

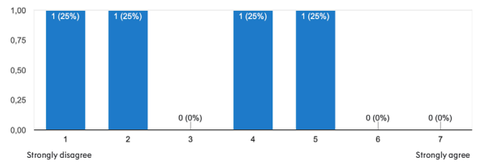
4 antwoorden



Using the car sharing service can be **frustrating** because of the **different cars** and therefore **different functions**

Kopiëren

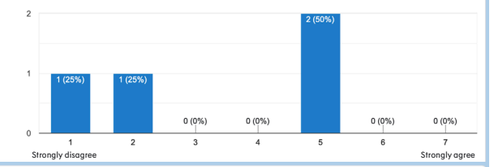
4 antwoorden



Car sharing can be **frustrating** because of **different types of chargers** (different types of electric vehicles)

Kopiëren

4 antwoorden



Are there any other (dis)advantages you have experienced when borrowing a car through a car sharing service? If so, please note them here

2 antwoorden

Only borrowed a car once FYI. Making sure the car was locked AND no one else could borrow while parked during my journey.

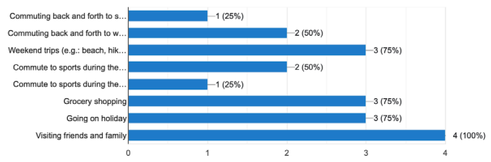
Price

Lynk & Co 01 owner

For **what kind of trips** do you use your **01**? (multiple and your own answers possible)

Kopiëren

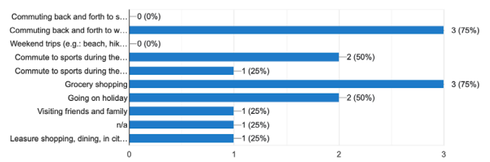
4 antwoorden



For **what kind of trips** do you go by **foot, bicycle or public transport**? And thus leave your **01 at home**

Kopiëren

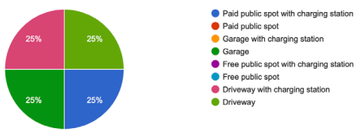
4 antwoorden



When the **01 is parked at your home**, how is it usually parked?

Kopiëren

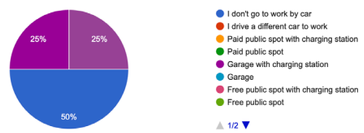
4 antwoorden



When the **01 is parked at your work**, how is it usually parked? (if you commute to work by car)

Kopiëren

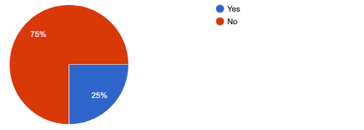
4 antwoorden



Do you offer your 01 via the sharing platform? Or have you done so in the past?

Kopiëren

4 antwoorden

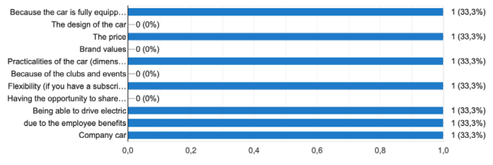


Lynk & Co 01 owner not offering the 01 on the sharing platform

What is the **reason** you got a **Lynk & Co,** while this **is a sharing car** and you are **not sharing** it?

Kopiëren

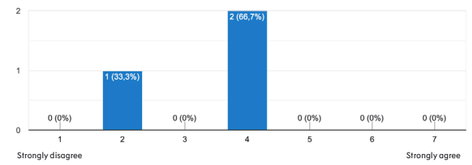
3 antwoorden



I would **be more likely** to share my 01, if I **can control** which **functionalities** someone can use

Kopiëren

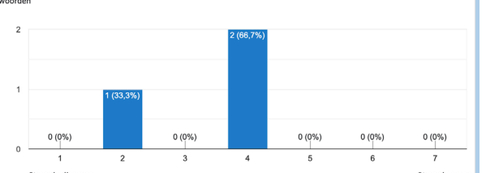
3 antwoorden



I would **be more likely** to share my 01, if I see **more information** about my car **during the trip**

Kopiëren

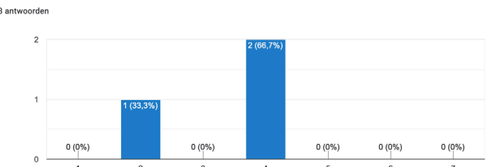
3 antwoorden



I would **be more likely** to share my 01, if I can **pre-set what kind of trips** the car can be used for

Kopiëren

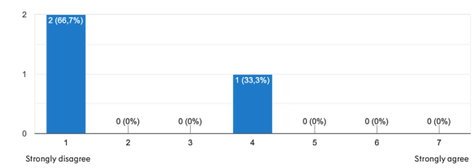
3 antwoorden



I don't share my 01 because I did **not know** this was **possible**

Kopiëren

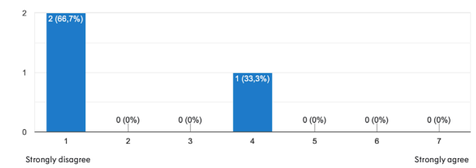
3 antwoorden



I don't share my 01 because I **don't know how it works**

Kopiëren

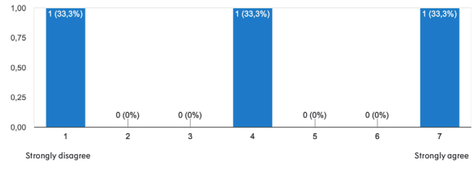
3 antwoorden



I don't share my 01 because I am afraid people will touch my **personal items**

Kopiëren

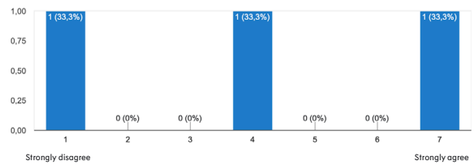
3 antwoorden



I don't share my 01 because I am afraid the **interior** (inside of the car) will be **damaged**

Kopiëren

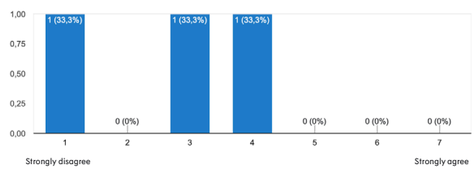
3 antwoorden



I don't share my 01 because I am afraid the **screens** (infotainment and driver's screen) in the interior will get **dirty**

Kopiëren

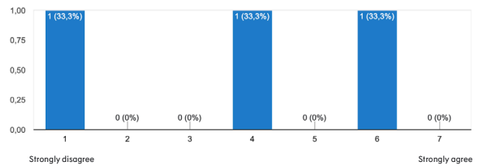
3 antwoorden



I don't share my 01 because I am afraid of a **dirty smell** in the car

Kopiëren

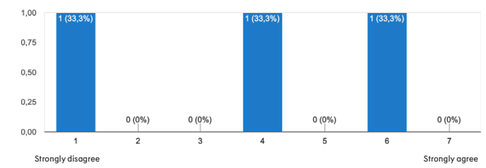
3 antwoorden



I don't share my 01 because I am afraid the **seats** will get **dirty**

Kopiëren

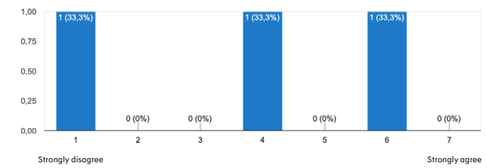
3 antwoorden



I don't share my 01 because I'm afraid the **interior** will get **dirty** from **litter**

Kopiëren

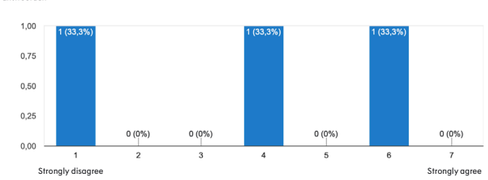
3 antwoorden



I don't share my 01 because I am afraid the **exterior** (outside of the car) will get **dirty**

Kopiëren

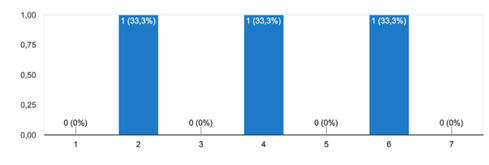
3 antwoorden



I don't share my 01 because I am afraid the **exterior** of the car will be **damaged**

Kopiëren

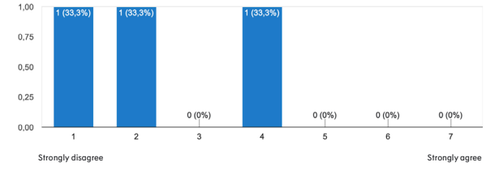
3 antwoorden



I don't share my 01 because I am afraid **traffic rules will be broken**

Kopiëren

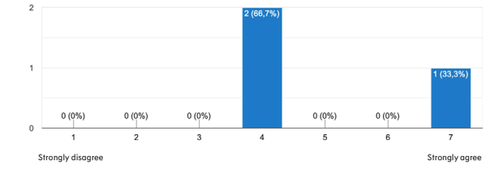
3 antwoorden



I don't share my 01 because I **don't know who** will drive my car

Kopiëren

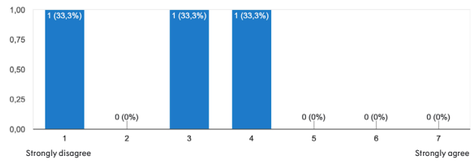
3 antwoorden



I don't share my 01 because I am afraid the car will be returned **without enough fuel**

Kopiëren

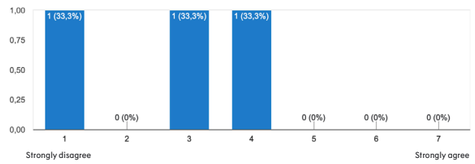
3 antwoorden



I don't share my 01 because I am afraid the car will be returned with a **(nearly) empty battery**

Kopiëren

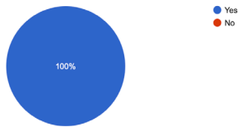
3 antwoorden



Would you be more willing to share your 01 with people you **know**?

Kopiëren

3 antwoorden



Explain your answer, why you chose yes or no:

3 antwoorden

Would love to be able to share it with my neighbours and family and friends but because of the garage its a bit tricky to do so when you're not home.

i have personal stuff in the car.

I have a Company Car, currently it is not possible to share a Company Car

With **whom** would you share?

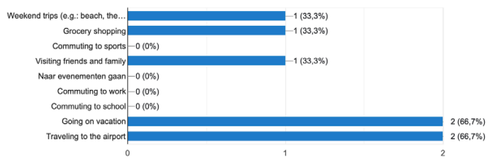
Kopiëren

3 antwoorden

For **what type of trips** would you consider car sharing? (multiple and your own answer possible)

Kopiëren

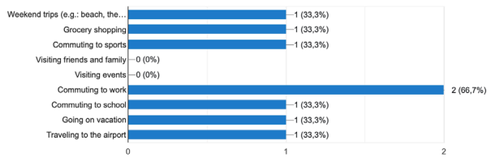
3 antwoorden



For **what kind of trips** do you **not use a car**?

Kopiëren

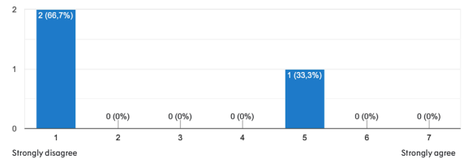
3 antwoorden



I do not use a car sharing service/ I would not use a car sharing service: Because I don't think there are **enough cars available**

Kopiëren

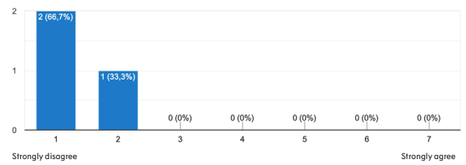
3 antwoorden



I do not use a car sharing service/ I would not use a car sharing service: Because it seems **inconvenient** to get in a **different car** every time that is different from what I am used to

Kopiëren

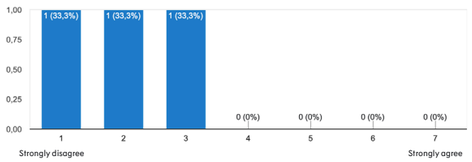
3 antwoorden



I do not use a car sharing service/ I would not use a car sharing service: Because I **don't understand** how such a service works

Kopiëren

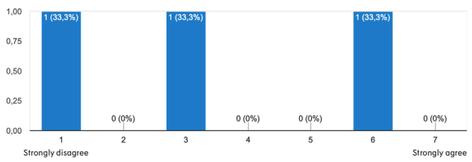
3 antwoorden



I do not use a car sharing service/I would not use a car sharing service: Because I don't know **which cars can be shared**

Kopiëren

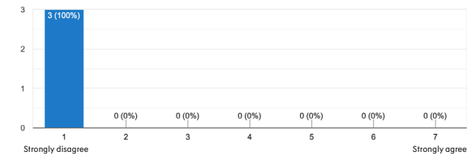
3 antwoorden



I do not use a car sharing service/ I would not use a car sharing service: Because I don't know how **an electric car works**

Kopiëren

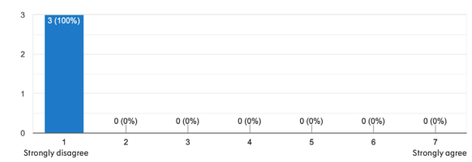
3 antwoorden



I do not use a car sharing service/ I would not use a car sharing service: Because **charging** an **electric car** is too **complicated**

Kopiëren

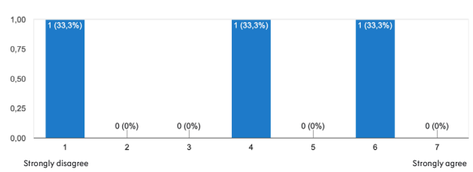
3 antwoorden



I do not use a car sharing service/ I would not use a car sharing service: Because I don't know **where to find and park these cars**

Kopiëren

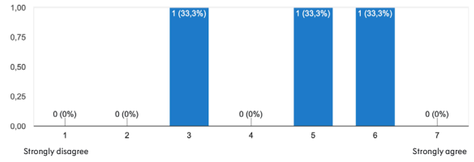
3 antwoorden



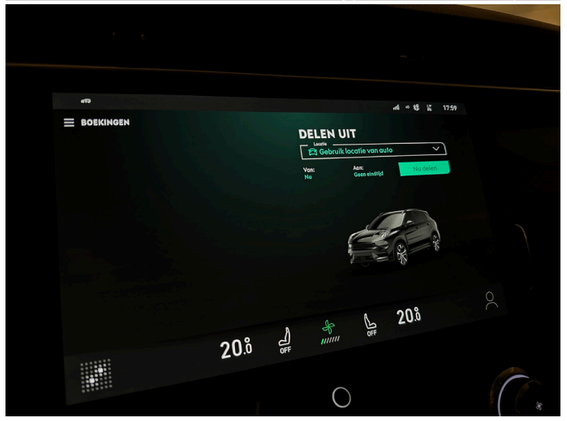
If I **always have access to a shared car,** I would **still buy my own car**

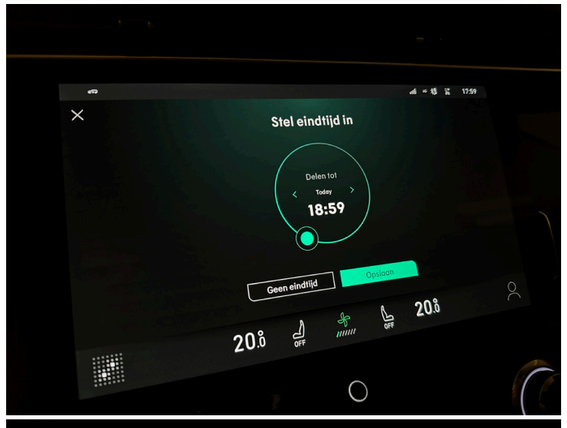
Kopiëren

3 antwoorden



Appendix C: 01 interior features

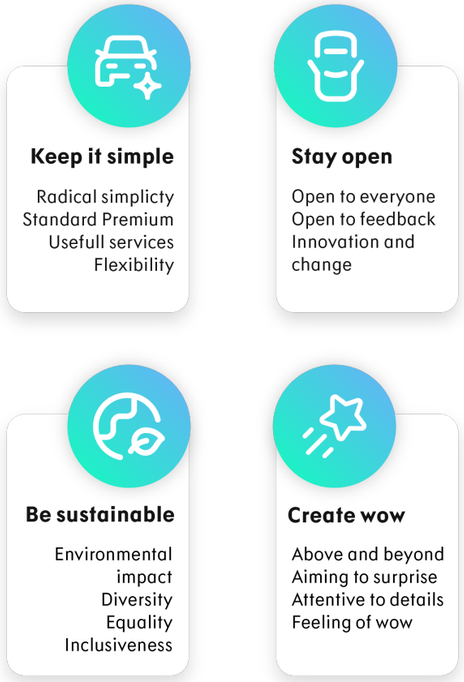




Appendix D: Supplement brand analysis

Brand values
The brand values of Lynk & Co are analysed, to know what the brand stands for and what they want to convey to the outside world. These values are also used during the design process, later in the project.

Lynk & Co upholds four values: keep it simple, stay open, be sustainable and create wow (Lynk & Co, 2023). All 4 values, with their core, are shown in the figure below.



Mission statement
The mission statement starts with a headline: "A new way to move." Below is a description that is as follows: "This isn't your typical car company. Sure, we do make a car (and it's pretty damn good), but we're also creating a better way to own and use cars. " (Lynk & Co, 2023).

Besides this statement, there is another one, which is: "We're always working to make mobility more flexible and hassle-free for everyone."

Lynk & Co clearly focuses on a new type of mobility and takes a different approach to owning a car. As seen with the brand values, they highlight flexibility and simplicity.

Sales channel
The brand does not use conventional dealerships. They use 'clubs', located in city centres. In these clubs, the car can be seen but not bought. This is only possible via digital channels. Besides a display for the car, local products and coffee are sold. This sales channel is in line with their strategy of being different.

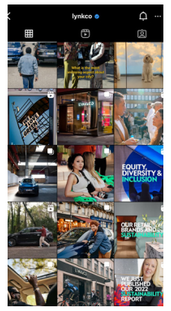


Advertisement
When looking at the ads used by Lynk & Co, they consist of banners in city centres and online advertising via social media. In these ads, a lot of bright colours and patterns are used, but the car itself is never shown completely. The text and pictures of parts of the car in the ads show that Lynk & Co does not want to portray them as a 'classic' car company. The bright colours also show a daring and bold brand.

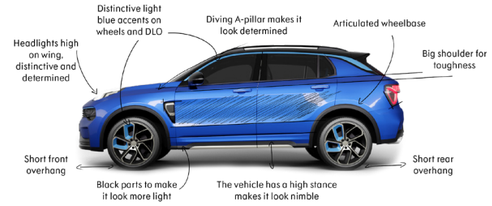
Interviews
In interviews with the CEO of Lynk & Co, Alain Visser, there are a number of things that constantly reoccur: being different, flexible, bold, simple and sustainable.

Being flexible and simple comes back to having a subscription and therefore not owning a car. "One of the trends I see with younger people is that of dematerialization. Young people value possession and status much less than my generation did." (Elle, 2020). "Have a new mobility concept and create a brand that's cool." (Tillers, 2022).
Being different and bold is also in not wanting to be a traditional car company. "But what we are trying to do with Lynk & Co, is to change a dirty industry from within. Spotify said: stop buying and owning CDs, just listen. We say: don't buy a car, just drive." (Elle, 2020). "So I thought: if we start a new brand, let's also do something completely different that is in line with new consumer trends." (AutoWeek, 2021).
Furthermore, not wanting to be traditional is also reflected in not owning traditional dealerships, but clubs. "This is why our shops are not traditional dealership shops, but creative hubs - like clubs." (Elle, 2020).
Finally, sustainability is mainly in car sharing. "Our main spearhead is car sharing." (Financieel Dagblad, 2023). "Our intention is to increase the utilisation of a car," Alain explains." (Tillers, 2022).

Social media
Looking at the social media channels, such as Instagram and Facebook. Lynk & Co shows more than just their car, a lot of their posts are experience and lifestyle-based.


Portfolio
Lynk & Co's logo exudes that they want to be different. The logo is in line with the shapes that are used on their cars, which at this stage is the only model, the 01. As discussed in the report in Chapter 2.4.2, the car shows a determined, tough and bold look.



Appendix E: Supplement SWOT Analysis

Strengths (internal)
The strengths are related to the unique selling points of Lynk & Co. In order to know the strengths and thus opportunities of the company it is important to know what differs and makes them stand out from other companies. The current strengths of Lynk & Co are listed below.

The car itself is possibly the biggest strength, it is a luxurious car and equipped with all the latest features (panoramic sunroof, 360° camera, automatic tailgate, heated seats, etc.). The car has a hybrid drivetrain, which means that it is partially electric. This is considered a strength since it gives the ability to drive on electric power only (range of 75 km) but also the reassurance of being able to drive on petrol.

Besides the car, there is the already existing sharing platform, which consists of the app for the mobile phone, the in-car app and all the backend connectivity. This is a good base for further development.

Next to that, there are the clubs, which are comparable to standard dealerships. Except they have a unique style, are located in the city centre and people can see the car but can also join activities or drink a coffee.

At last, there are also strengths that are unrelated to the car but very important. The flexibility, which is mainly referring to the monthly subscription. Where people can subscribe to a car, and cancel this whenever they want (like Netflix).

Weaknesses (internal)
The weaknesses of the company and especially the car-sharing service can be divided into three parts. The first, and maybe the biggest one, is the fact that the car is privately owned. The fact that the car is owned by a person instead of an organisation creates concerns about sharing the car.

The car itself is also not designed for car sharing only, so no specific durable materials, or things inside the car that can easily be cleaned. Sharing a car, that is not really designed for this is difficult.

Another weakness is the fact that Lynk & Co in Europe, shares parts and software with Lynk & Co in China. On itself this is not bad but it means that some parts of the car and connectivity are designed with the Chinese market in mind. So, not everything is specifically designed and made for the same purpose and user.

Then there is the fact that the car-sharing service and the car itself are highly dependable on connectivity. The car is connected to the internet, it uses it for services and apps in the car but also to send information to others such as the lender. The borrower also has the digital key on their mobile device, to open the car. When there is downtime and slow response, are other factors that influence the working, the whole experience of the service for both lender and borrower is bad.

At last, the customer service is considered as a weakness. According to reviews on TrustPilot (2023), the service that is advertised does not even exist and when a customer reaches out, the reactions are mostly negative.

Threats (external)
This part is about external factors, threats and opportunities.

One of the threats is that there are a lot of different companies that provide similar or slightly different car-sharing services, the car-sharing market is dense.

Related to these sharing services. It has been proved that people are less cautious with things that do not belong to them. There are exceptions, but the main users do not treat things as they would with their own belongings. This can be a threat because it makes people reluctant the share services and therefore the willingness to share things with others.

Most owners of the 01 that share their car, currently share it with people they know, either friends or neighbours, they are w. It is important to acknowledge the fact that communities become more diverse and therefore people percieve the same experience differently. It could be challenging to provide a suitable sharing service per user, as personalisation becomes more important.

Opportunities (external)
The opportunities come from the relevant trends and developments that were found. The main opportunities lie within the car and the communities in cities.

Within the car, there are already a lot of digital features, a 12.3" infotainment screen, adaptive lights on multiple spots, the ability to use the dynamic sound system and connectivity between the user, car and cloud. Currently for car sharing these things are not optimally used, which creates the opportunity to do so.

Cities are creating policies regarding shared mobility, they are moving from the car as the main means of transport towards connected modalities with shared vehicles. Some neighbourhoods even asked if they could get a shared car and how that would work, they were interested from an economic and sustainable point of view. Lynk & Co can play a role in these highly populated areas by focussing on community or group sharing.

Besides that, there are emerging technologies that could help with providing car sharing and control and trust for the lender. Artificial Intelligence combined with the connectivity in the car can enhance the user experience, it can create new experiences for the borrower and can also be used as a guide to help the owner take control.

This also relates to the fact that people look further than just a good-looking product, they find the experience of a service in combination with the product more important.

Customers are also making more environmentally friendly decisions. If Lynk & Co makes use of this, both lender and borrower can benefit from it. Showing the environmental benefits to people can persuade them to use the service. Within the car people also tend to drive slower and more cautious when they see how the range benefits. This focus is in line with the brand value, to be sustainable.

Lynk & Co is going to shift its focus in the future. By not only actively promoting flexibility but also car sharing. Flexibility is now offered through the monthly subscription, which will remain. In addition, the company wants to commit more to car sharing. From a business point of view, this has two reasons. Through car sharing, the cars are more on the street which creates brand awareness and people who use the car get acquainted with the brand. In addition, for every sharing booking there is a service fee that goes to Lynk & Co, so this creates additional revenue.

Appendix F: Interview municipality Rotterdam

This appendix consists of the consent form template, questions and answers that have been used for the interview with the municipality of Rotterdam (Gemeente Rotterdam). The interviewee got a signed copy of the consent form template. On the next page, the interview structure and answers are shown.

The influence of cognitive and sensorial ergonomics on private car sharing

This research is conducted as part of the MSc study Integrated Product Design Master Thesis at the faculty of Industrial Design Engineering at Delft University of Technology.

Student and contact:
Thomas Hogeveen
Thomas.hogeveen@outlook.com or Thomas.hogeveen@lynkco.com
+31 6 23468175

Informed consent participant

I participate in this research voluntarily.

I acknowledge that I received sufficient information and explanation about the research and that all my questions have been answered satisfactorily. I was given sufficient time to consent my participation. I can ask questions for further clarification at any moment during the research.

I am aware that this research consists of the following activities:

1. [Interview]

I am aware that data will be collected during the research, such as notes/audio recordings/photos. I give permission for collecting this data during the research. Data will be processed and analysed for this master thesis only. At the end of this master thesis (December 5th, 2023) this data will be accessible to the public, available via the Delft Repository. Before this date, the data will only be used by the researcher and the supervisors from the TU Delft and Lynk & Co.

The notes, audio recording and photos (if applicable), will be used to support analysis of the collected data. The photos can also be used to illustrate research findings in publications and presentations about the project. The audio recording will only be used to replay answers in case the researcher missed something during the interview.

I give permission for taking notes/audio recordings/photos of answers of my participation:
(select what applies for you)

- ☐ in which I am recognisable in publications and presentations about the project.
- ☐ in which I am not recognisable in publications and presentations about the project.
- ☐ for data analysis during the project as a representative of Gemeente Rotterdam (municipality)
- ☐ for publications and presentations about the project.

I give permission to store the data I provide in the Delft repository after completion of this research and using it for educational and research purposes.

I acknowledge that no financial compensation will be provided for my participation in this research.

With my signature I acknowledge that I have read the provided information about the research and understand the nature of my participation. I understand that I am free to withdraw and stop participation in the research at any given time. I understand that I am not obliged to answer questions which I prefer not to answer and I can indicate this to the research team.

I will receive a copy of this consent form.

_____ _____

Last name First name

17 / 08 / 2023 _____

Date (dd/mm/yyyy) Signature

The vision and policies of cities towards (private) car sharing – Interview Setup Gemeente Rotterdam (municipality)

This document is used as a guideline of the interview, which was 1 hour. The structure and interview are based on the Interview Template provided by the TU Delft. Here guidelines about asking questions, ethics and explanation are shown.

Interview structure

1. Introduction (myself and topic)
2. Explanation purpose of interview
3. Sign consent form
4. Questions
5. Closing words
6. Takeaways and insights

1. Introduction

Show appreciation that the participant takes time:
"Thank you for making time to do this interview with me."

Participant and I:
Introduction of myself:
"My name is Thomas, 23, and I am working on my master thesis at TU Delft, on the master integrated product design. Are you familiar with this study (explanation study). Furthermore, I myself live in Rotterdam.I am doing this thesis in collaboration with Lynk & Co. Are you familiar with this brand (explain brand)."

Introduction of participant.

Topic:
"Do you also know Lynk & Co as a sharing car? (Explain service). The project started by asking how more people want to offer their private car, the 01, on this platform. The focus is mainly on the owner of this car and how they can have more control. But for the owner to lend out the car, there must of course be borrowers, users of the sharing service. Users of share cars are in cities a lot so hence the relevance and link to the Municipality of Rotterdam."

2. Interview purpose

Explain why I involved the municipality.
"These services and also Lynk & Co's cars are especially interesting in big cities. Hence, I wanted this interview to get you as stakeholders on behalf of Rotterdam municipality. I therefore want to hear from your vision as a city, regarding car sharing."

3. Consent form

Let participant read the consent form.

4. Question structure

The question structure shown below is not the actual structure in how the interview took place. Questions were mixed and it was more a conversation and discussion. The structure served as a guideline to ask and not forget the relevant questions. Besides that some insights come from the conversation and not from direct questions.

General questions:

- What is your role within the Municipality of Rotterdam as a shared mobility consultant?

Of course, I don't work and decide on my own; that happens with a team of more than 100 people. But in general as a partial mobility consultant, I research the various possibilities and limitations in this area. I also discuss with various stakeholders, such as residents but also other people within the municipality.

- When defining the design of the streets in Rotterdam, is this mainly done by the city itself, or are there other parties involved?

This is mainly done by 'Stadsbeheer'. But this is of course done in collaboration with other stakeholders, who have an influence on this. Such as mobility companies, which make applications but also developers of new areas.

- When defining how mobilty will look in Rotterdam, is this mainly done by the city itself, or are there certain rules (e.g. so much space must meet part mobility) from above that influence this? (such as the national government)

This is not only done by the municipality of Rotterdam. There are certain rules that come from the government that we then also have to comply with. These rules include partnerships between car-sharing providers. But there are also collaborations with other municipalities that influence what the mobility supply of shared cars looks like.

Car sharing

- As mentioned within my project, I mainly focus on the city centers. When realising future plans, do you see cars (of residents) still mainly parked on the streets or do you try to move them to indoor garages of houses? Or really only at hubs outside the city, like on pg. 21?
- And do you have a say when new buildings and neighbourhoods are constructed (high-rise)? Or is it the other way around.

In the far future we do not want any cars on the streets, especially in the city centre. They are either moved towards garages (private or public) or towards hubs outside the centre. However, parking on the streets provides a huge income for the municipality. So, it is a difficult discussion between all stakeholders. In the near future we are slightly moving private cars from the streets to garages. By giving discounts to project developers and making parking outside more expensive.
In existing neighbourhoods it is difficult to change the car behaviour but in newly constructed areas we actively take part in the decision making about the use and parking of cars.

- I see more and more 'share' hubs for mopeds in the city, how do you see this for cars in the future?

We are already researching on how to set up 'shared cars' hubs in some neighboorhouds. But it is important to say that we do not only see the hubs for cars but for all different types of transport. People can switch easily to create a seamless journey.

- Do future plans take into account different types of car sharing? (p2p and b2c)

We do see and make differences in two-way, one-way, and free floating. For example, in a neighbourhood when there are a lot of parking spaces used by shared cars. We cannot allow more of this car sharing type.
But we only focus on the b2c sharing. As with p2p people can decide themselves if they share and therefore these cars are not 24/7 available.

- Will private car sharing be taken into account in the future? Can these vehicles also be parked in special areas or? On pg. 23 it says that they will be taken into account but not exactly how.

No not really. But we can help and advise people in neighbourhoods when they want a shared car. There were some requests already of people that wanted to replace parking spots for green. We bring them in contact with car sharing providers, that can also be p2p. But from a planning point of view, we focus on b2c, as the cars always have to be available.

- What are your plans regarding shared cars in garages? I read something about share cars going to garages? Will that include residents' cars and will this work? Since cars have to be opened digitally, and there is no connection in garages.

We are looking together with car sharing providers on how to improve the connectivity issues and besides that newly built garages do have a good connection. But indeed, shared cars are going to be moved to garages, which brings a new issue, how are they visible for potential users? In general the cars are going to be moved from the street.

Relevant topics

- Lately, there have been a lot of annoyances on the news about shared cars taking up charging stations, as such cars have to be put back after use. Have you thought about how to tackle this issue?

Yes, we aware of this. But not really investigating this. We are looking into a service on how to move your car after being fully charged but this is for private cars. With car sharing, the cars are often taken very fast. And it can also be the case that people see the 'same car' which is actually already another looking like same car.

- Will more charging stations also be installed or are there other plans regarding shared cars and charging?

With b2c car sharing that is station based, so a pre-defined parking spot, the provider have to arrange this themselves. For free floating we are responsible, because users can use charging stations that are in this area and installed by the municipality.

5. Closing words

Show appreciation that the participant takes time and thanks for the interview.
"Thank you for making time to do this interview with me."

6. Takeaways & insights

- Rotterdam is mainly committed to car sharing for longer trips outside the city.

- Share cars are seen as a complement to other means of transport, not a replacement. Last mile, for example will be by public transport and bicycle.

- Share cars are an integral part of planning for redevelopment and new area developments.

- For already existing areas, there are plans of changing the landscape design by making little steps. Such as replacing space for parking with trees. And within the city centre this is more difficult, as it is mainly full with buildings.

- There are already neighbourhoods that make their own requests for getting a shared car.

- Municipality can give permission to car saharing providers, whether they are allowed to operate in Rotterdam.

- In the far future, parking of cars (including shared cars) will only be in garages. Closer to now, efforts are being made to have more and more cars off the streets. (Shared cars therefore less visible on the street, harder to find, not everyone has access to private garages).

- 'Sustainable use of space' in the city centre such as making more green. As an example, (shared) cars in neighbourhoods mainly at the edges in 'hubs'.

- Difference in 'neighbourhood' and 'district hubs'. The first one has only different types of mobility, the neighbourhood hubs also have, for example, parcel points and pharmacies.

- Providers of car sharing services are responsible themselves for installing charging stations.

- New projects of high rise buildings in the city centre can get a 'discount' if they want to use shared cars in their garages, instead of private cars.

- People expect the city to provide a parking space, as the car is seen as the main modality, this makes the transition to shared mobility difficult.

Appendix G: Trends & Developments

Political & legislation

On the political side, measures are being taken mainly with sustainability in mind. These include making city centres more 'liveable', making people pay more to drive their cars and looking at replacement transport in the form of sharing. Often, these measures are part of rules from higher up, in the European Union.

Ban of combustion engine
The European Union bans the sale of new petrol and diesel cars from 2035 onwards and from 2030 new cars have to be 'cleaner', meaning that they are only allowed to have half the emission compared to what they have now (European Parliament, 2023). This means that owning a car becomes less accessible for everyone.

Banning of cars in the city
Municipalities are banning cars from city centres, a well-known Dutch term for this is 'autoluw'. The idea behind this is to make city centres more liveable by only allowing pedestrians and cyclists. The centre of Rotterdam, for instance, has an environmental zone, which means vehicles that do not meet certain emission classes are not allowed to drive here (Municipality of Rotterdam, 2022). This development affects where cars are allowed to drive, and thus the amount of cars. But it also affects where cars are parked and which cars are allowed.
Besides cities in the Netherlands, other European cities are doing the same. In London, for example, car ownership is already becoming a burden for many, the municipality obliged congestion fees, and this in combination with a lack of parking and traffic jams makes it less interesting for people to own a car inside the city. By contrast, in rural areas such as the state of Iowa in the United States, private car usage will remain the preferred means of transport by far (Mckinsey & Company, 2016).

Investing in shared mobility
The government and municipalities are also investing in shared mobility. The so-called 'hubs' are emerging, offering this kind of mobility. Mopeds, bicycles and cars are parked here, and there are even specific parking spaces in city centres just for shared cars. This trend of making cars available so that not everyone has to buy a car is influencing the future of car sharing.
Besides this trend influencing car sharing, it can also work the other way around. Rotterdam partners with car brands to make strategic decisions for the future on how cars can be part of a liveable city.

Demographic

There are also trends that come from the changing demographics, such as ages, group compositions and locations of people.

Increasing population (in cities)
The world population will increase in the coming years (up to 2030). In the Netherlands this trend is also visible, the population is expected to grow to over 19 million people (CBS, 2023). The number of people will grow by over a million, but the land on which people live will not. According to a prognosis by the Netherlands government, Plabureau voor de Leefomgeving (2022), these people will mainly move to medium-sized and large cities. These areas will have to be able to accommodate more people, which means that more land will be used for this. And so there will also be less space for cars. The same trend is showing itself in the rest of Europe (ESPAS, 2019; Deloitte, 2017).

Growing diversity
Not only is there increasing population growth, but the population is also becoming more diverse. An ageing population is causing more elderly people, rising immigration means that more and more immigrants are living in the Netherlands (CBS, 2023b), and globalisation makes it easier for people to live somewhere else. These aspects cause diversity to grow. Which for car sharing, makes it more difficult to create personal and human-centred solutions.
Besides this, diversification brings a lot of differences in culture and especially the behaviour of people. This brings growing concerns about the sharing economy.

Demand for car-sharing
The demand for car sharing is increasing (ESPAS, 2019), but differs very much per group. It is important to know who the potential users are and what causes them to use car sharing. A study by Amirnazmiafshar & Diana (2022) showed a trend that people with higher education have more demand for car sharing. Due to the fact that they are more adapted to the internet and these new and therefore complex systems. These people are also more adaptive to a new lifestyle, which includes a new way of travel and more awareness of the environment.
Besides the educational level influencing the willingness to use car sharing, another factor is age. Younger people (20-30) are more open to the use of car sharing, especially electric vehicles (EVs). Because they do not have 'owning a car' as the main priority and they prefer a more sustainable lifestyle.

Socio-cultural

The socio-cultural environment refers to trends and developments in changes in attitudes, behaviour, and values in society.

Sustainability
People feel a greater responsibility towards sustainability (Deloitte, 2022). Consumers make conscious decisions with sustainability and the environment in mind. Sustainability is a big driver for car sharing not only from a company point of view. But also users mention that this is one of the main reasons why they use it.

Working from home
The COVID pandemic influenced the way people work, 'hybrid' working is the new standard and in the future, this will be even more (Forbes, 2020). People work 2/3 days from home and the other ones at the office. As many people still go to work by car, this influences the location of where cars are parked during the day.

Community
We live in the age of digital connections. These connections are not personal which creates a growing need for personal interactions within someone's community, mainly between people but also between the user and a brand. People are and will be more isolated and separated, this creates the demand for more personal interactions. (Deloitte, 2017).
Next to that, people interact with a brand via a digital environment, and the "old-fashioned" way of interacting is lost. The new (complex) services bring questions and concerns to the users, and a lot of brands are tackling this by building a community between people and themself. Users find this important as this can serve as a replacement for personal interaction, in which they can share ideas, ask questions and thus interact with the brand. (Forbes Agency Council, 2023).

From owning to using
There is a trend of using goods instead of owning them. People, especially the new generations: the shifting from owning goods to using and experiencing them (Morgan, 2019; Deloitte, 2017). A growing number of people are choosing to share instead of own (access rather than ownership). They enjoy the benefits without having to bear the burdens (Chatterjee et al., 2013).

"It is not mine"
However, this trend of using instead of owning relates to another trend that emerges from this. The way people use products that do not belong to them. People are less cautious with stuff they do not own. Which creates trust issues towards others. Something that must be taken into account, especially when it comes to sharing a private car.

Economical

Economical trends are factors that relate to the financial conditions of people and the market.

Sharing as an economic interest
The trend of 'from owning to using' can also be seen from an economic perspective. A car is expensive and owning one comes with disadvantages. That is why more people are preferring to share instead (Chatterjee et al., 2013). Especially young people do not have the financial assets (money and space) to acquire a private car. Therefore, sharing one when needed is chosen.

Change in mobility
McKinsey & Company (2016) state that in 2030, 1 out of 10 cars sold will be a shared one. Individuals increasingly use multiple modes of transportation to complete their journey; goods and services are delivered to rather than fetched by consumers. As a result, traditional car business models will be complemented by other mobility solutions, especially in dense urban environments that proactively discourage private car use.

New market entrants
The sharing economy is growing and is forecasted to grow even further in the future (McKinsey & Company, 2016; Statista, 2023). This creates attractive business opportunities and therefore a lot of companies will try to join this. Existing companies are going to alter their business models and innovative and daring start-ups from outside the industry will try to interrupt the existing business models of the traditional car manufacturers.

Economic growth
ESPAS (2019) states that the global economy will grow, allowing people to have more money to spend. The majority of the world will be middle class, which sounds promising. However, it is worth mentioning that human well-being and thus the quality of life not only depends on someone's income but also on factors like social support, freedom and trust.

Technological

Everything is connected
Not only for people it will be easier to communicate over the Internet but more products will also be connected. By 2030, the number of devices connected to the internet will have reached 125 billion, up from 27 billion in 2017. (ESPAS, 2019). Almost all European cars will be connected to the internet in 2030, providing a lot of data that potentially can be used to enhance the car-sharing experience.

Disengagement
The fact that people will be more connected through their devices, makes them also connected 24/7. This creates the desire to fully disconnect and disengage (Deloitte, 2017). People will value time when not connected to the internet even more in the future.

Artificial Intelligence
Artificial Intelligence (AI) is already upcoming, but how will it influence our lives and car travel in 2030? The market of AI implemented in human-machine interfaces is expected to grow by 354% by 2030 (Precedence Research, 2022). By utilizing machine learning algorithms, AI enables vehicles to learn from data and adapt to different driving conditions. The most common examples relate to autonomous driving and robots on the factory floor.
More focused on people, AI could potentially create personal interactions and enhance user experiences. It can understand different users and tailor sharing experiences towards them. Examples are gesture and voice recognition, seamless services, virtual assistants, real-time information, prediction and taking action.

Cybersecurity
Using all this personal data brings ethical considerations with it. When using more connected devices, more data is needed and used. Therefore, in the future, cybersecurity and transparency will become bigger topics than they currently are. Brands and their services need to be more transparent about where data is stored and how it is used (Deloitte, 2017). Especially when it comes to cars and car sharing, a lot of personal data from different users is already used. This will become even more due to the fact that more things will be digital and connected.

Car interior
Car interiors are no longer just spaces that have to accommodate a seating area and provide assistance for the driver. Interiors take centre stage as buyers focus on the cabin experience.
New vehicle types, such as (autonomous) EVs, partially driven by sustainability, influence the architecture of the car and therefore the interior.

Displays include more features to give the user the ability to adjust more things, however, this can also work the other way around.

There are car manufacturers who showed concept car interiors where displays will be replaced by holographic systems and controlled via voice. Lighting, in general, becomes more important, for example, smart materials that emit lights based on the interaction with the user. A new range of sounds that are used to inform people inside and outside the car. And even displays on the outside of the car to interact with the user.
Next to this, cabin experiences will be highly customizable and adaptive to the user. Smart virtual assistants to guide people will become even more important. This makes the interior an important part of the complete user experience. (McKinsey & Company, 2021).

Ecological

Climate change is an important topic, therefore ecological trends will be very important in the coming years. They will drive companies, users and decision-makers.

Embracing climate positivity
Consumers demand sustainable products and services (Forbes, 2022). People across all generations are willing to spend more on sustainable products. They embrace climate positivity and will make more environmentally aware decisions.

Electric Vehicles
Emission regulations, improved charging infrastructure and increasing consumer acceptance will create a strong momentum for sales of electric vehicles (hybrid, plug-in hybrid, electric and fuel cell) in the coming years. The speed of adaptation is influenced by the total cost of ownership, which presents opportunities as well for car sharing.
BEV and PHEV are already increasingly popular in Europe (ACEA, 2023) and show a relevant issue, whether the electricity grid can cope. If EV sales rapidly increase this will become even more important in the future. Especially with car sharing, because most of the time when returning the car, it must be placed at a charging station.

Energy
Combining two trends, the one that there will be more people and that these people have more income brings another development: the increasing demand for energy (ESPAS, 2019). With products and cars, being more connected creates a higher energy consumption. The amount of electric cars that will increase, have a huge influence on energy usage. All these batteries need to be charged.

'Greener' cities
The trend that cities will have more citizens influences the way cities are designed. They will be 'greener', meaning that cars will no longer drive urban planning (Kolczak, 2017). This change in landscape design will influence where cars drive and where they are allowed to park.

Urbanisation |

Humans are moving towards highly urbanized areas. These cities are constantly changing to accommodate all these people. Changes due to regulations and the fact that municipalities try to make cities more 'liveable'. Consequently, having less space for cars, different parking solutions and a more open attitude towards different mobility solutions. The (shared) car will therefore be part of Mobility as a Service (MaaS), not a stand-alone mobility offer. Besides this, parking off cars will happen more in garages and at charging stations.

| Hyper connectivity

Communication between people, and products but also within products will happen all the time. This sharing of data will create more smart objects, that can communicate with people in new ways. The data can be used for user patterns and behaviour. However, this also empowers other trends. The fact that people value being 'offline' even more, as this will be seen as an experience. And personal connections between people and within services will become even more important.

Access based experiences |

People are shifting from owning goods to using them when needed. They value having experiences higher and prefer brands with good services and user experiences. In cars, and therefore also car-sharing, the car interior is evolving and can play a big role in this experience. This space will be more intelligent, intuitive and adaptive to the user, it will become an important aspect of the user journey.

| User behaviour

The growth of the population comes with more diverse communities. This diversification will make people differ more from each other in terms of their interests and their behaviour. A per-person tailored experience will become more important for the borrower but also the lender. Besides that, access is more important than owning, which brings new complications: responsibility towards the product, control and trust between people.

Appendix H: Lynk & Co 01 owner interview

This appendix consists of the consent form template, question structure and answers that were given during interviews with Lynk & Co owners. The interviewee got a signed copy of the consent form template. On the next page the interview structure and answers are shown.

The influence of cognitive and sensorial ergonomics on private car sharing

This research is conducted as part of the MSc study Integrated Product Design Master Thesis at the faculty of Industrial Design Engineering at Delft University of Technology.

Student and contact:
Thomas Hogeveen
Thomas.hogeveen@outlook.com or Thomas.hogeveen@lynkco.com
+31 6 23468175

Informed consent participant

I participate in this research voluntarily.

I acknowledge that I received sufficient information and explanation about the research and that all my questions have been answered satisfactorily. I was given sufficient time to consent my participation. I can ask questions for further clarification at any moment during the research.

I am aware that this research consists of the following activities:

1. [Interview]

I am aware that data will be collected during the research, such as notes/audio recordings/photos. I give permission for collecting this data during the research. Data will be processed and analysed for this master thesis only. At the end of this master thesis (December 5th, 2023) this data will be accessible to the public, available via the Delft Repository. Before this date, the data will only be used by the researcher and the supervisors from the TU Delft and Lynk & Co.

The notes, audio recording and photos (if applicable), will be used to support analysis of the collected data. The photos can also be used to illustrate research findings in publications and presentations about the project. The audio recording will only be used to replay answers in case the researcher missed something during the interview.

I give permission for taking notes/audio recordings/photos of answers of my participation:
(select what applies for you)

- ☐ in which I am recognisable in publications and presentations about the project.
- ☐ in which I am not recognisable in publications and presentations about the project.
- ☐ for data analysis during the project as a representative of Lynk & Co 01 owners
- ☐ for publications and presentations about the project.

I give permission to store the data I provide in the Delft repository after completion of this research and using it for educational and research purposes.

I acknowledge that no financial compensation will be provided for my participation in this research.

With my signature I acknowledge that I have read the provided information about the research and understand the nature of my participation. I understand that I am free to withdraw and stop participation in the research at any given time. I understand that I am not obliged to answer questions which I prefer not to answer and I can indicate this to the research team.

I will receive a copy of this consent form.

Last name	First name
25 / 07 / 2023	
Date (dd/mm/yyyy)	Signature

On the following pages, the interview structure is shown with related answers from all participants (N=5). The interview is used to supplement already existing research and validate answers. Insights are used for the current car sharing experience.

Sharing your 01

This document is used as a guideline of the interview, which was approximately 30 minutes per participant (N=5). The structure and interview are based on the Interview Template provided by the TU Delft. In this document a general structure is shown for the questions, there was always aimed to get a conversation instead of asking and answering.

Interview structure

1. Introduction (myself and topic)
2. Explanation purpose of interview
3. Sign consent form
4. Questions
5. Closing words

1. Introduction

Show appreciation that the participant takes time:
"Thank you for making time to do this interview with me."

Participant and I:
Introduction of myself:
"My name is Thomas, 23, and I am working on my master thesis at TU Delft, within the master integrated product design. Are you familiar with this study (explanation study).

Introduction of participant.

Topic:
"I am researching the current car sharing interaction."

2. Interview purpose

Explain why I involved the municipality.
"At the start of the project I performed a survey amongst Lynk & Co owners and travelers in general. The responses from Lynk & Co owners who do share their car was relatively low. That is why I want to get qualitative instead of quantitative data."

3. Consent form

Let participant read the consent form.

4. Question structure

The question structure shown below is not the actual structure in how the interview took place. Questions were mixed and it was more a conversation and discussion. The structure served as a guideline to ask and not forget the relevant questions. Besides that, some insights come from the conversation and not from direct questions. There were 5 participants.

Questions:

- How did you acquire the 01?

Four of the five participants indicated they got the car via the monthly subscription. The other one said it was a company car.

- Why did you choose the 01?

Participants indicated all similar answers, interesting was that no one mentioned the design of the car and the brand itself. Answers mainly consisted of: "Because it is fully equipped", "The price", "The flexibility" and "The drivetrain". This indicates that users are not the typical 'car people'.

- What is your main motivation for providing your 01?

Participants answered quite different from each other. Some mentioned that they want to contribute to sustainability and want their car to be used more often also with sustainability as an underlying reason. Besides these, most answers related to economic interest and the fact of lowering costs of having a car. One participant answered that they like the experience of sharing the car.

- To whom are you most willing to lend your car?

Participants answered different, but with a general theme in mind: People they know or are alike. They mentioned that they are willing to share their 01 with friends, family, colleagues and neighbours. One of the participants mentioned that he wanted to share with anyone. When asked if he already did this, he answered with "No". A reason for this is that he does not get much requests and when he gets one, he is not quite sure every time about the borrower.

- What is the main reason to reject requests from borrowers?

For the participants who answered that they were willing to and sharing with people they know, they said they do not reject them as they discuss beforehand via WhatsApp. There were two reasons given for rejecting by others: "The timing is inconvenient", they mentioned that most of the time the car is visible but they also reject a lot as the timing of borrowing a car is not good. Next to this answer, one participant was hesitant about the borrower.

- When you share your 01 are you afraid of who will be driving it? The question relates to with who do people want to share.

They all indicated that they do not like not knowing who is going to drive the car and for some this is also a reason not to share their 01.

- When you share your 01, are you afraid your car will get damaged on the exterior (outside of the car)?

Interesting that even when sharing with people they know, all participants indicated that they are afraid of this to happen. When asked how they reduce this risk. Some mentioned that they do share with people they know but mainly people who are a bit more careful, just to be sure. Others said that they just hoped for it to go well and that they trusted them more after sharing went well.

- When you share your 01, are you afraid your car will get damaged on the interior (inside of the car)?

All five answered this question with "Yes", when asked about specific damages they mentioned several things: "Scratches on the dashboard", "Scratches on the doorstep when getting in and out", but also "Damages on the seating".

- When you share your 01, are you afraid your car will get dirty on the exterior (outside of the car)?

Interestingly participants mentioned that they do not really care about the outside of the car as this is something out of there control (the weather), it can happen them as well, they do not have to sit in it and it can be more easily cleaned.

- When you share your 01, are you afraid your car will get dirty on the interior (inside of the car)?

All five answered this question with "Yes" as well. But there was a slight difference between them. Some mentioned they are very neat and therefore do not like a littered carpet (sand and mud for example) and when someone gets in and out the car that they make the doorsteps dirty. There were two participants that said they were not very neat themselves so they do not really care about the car getting dirty. Interesting is that they said that they still wanted the car returned in a nice way, as how they left it.
Other examples of dirty parts of the interior that were mentioned were fingerprints on the screens, dirty seats and the smell in the car. There are also parts that are not seen as dirty but people still refer to them as dirty, such as touching the same steering wheel and buttons as someone else. One participant said they cleaned the car every time (with some wipes) after it was used by a friend or family.

- When you share your 01, are you afraid your car will be misused and traffic rules will be broken?

On this question, three answered with "yes" and two with "no". When asked why, the ones that were afraid of this to happen mentioned different reasons.
One participant related to themselves, how they use a shared moped for example. The two other participants thought that people will not be that careful as with their own belongings, "Like who is going to check it?".
The two participants that answered "no", believed in people's behaviour. However, one of them said "I also write down when someone drove so when I get a fine I can forward it, but I haven't got one yet, so I do trust them more. But I still keep writing it down".

- When you share your 01, are you afraid your car will be returned without enough or low fuel?

Participants indicated that they were not really concerned about this. "The fuel is paid by them and I can refuel quite close." And they said "They have to get the car back to my house so don't think they will risk it to be that low."

- When you share your 01, are you afraid your car will be returned without enough or a low battery level?

Participants were quite the same with answering, they said they did not really worry about it. When asked about how do you coop with the empty battery. Participants mentioned that they put the car in the charger themselves or charge it another time. "Luckily I can still drive on the fuel."
When asked the people who provided their car with sustainability in mind, about sustainability in relation to driving electric. Participants said, "You have a point, but sometimes it is not always possible."
When asked about when you drive a fully electric car, would you still think the same? All five participants turned their answers around and said: "It depends on the battery level, but I would want them to charge it", "I think I would not even share than because I'm afraid it will be returned empty".

Suggestions
I also gave two suggestions about car sharing to participants to see if they would be more willing to share if control played a role.

- Would you like to give personal instructions via the in-car systems?

All five participants mentioned that they would like to have that ability. "Now I have to discuss this via WhatsApp, it works well but would be interesting to have it inside the car or the app.", "Sometimes I get questions during the journey when I share with my family."
When asked about what kind of instructions. There were different answers but in general about providing answers to questions which are asked frequently, giving instructions on how features work and to give more specific instructions per borrower.

- Would you like to adjust car sharing settings via the in-car systems?

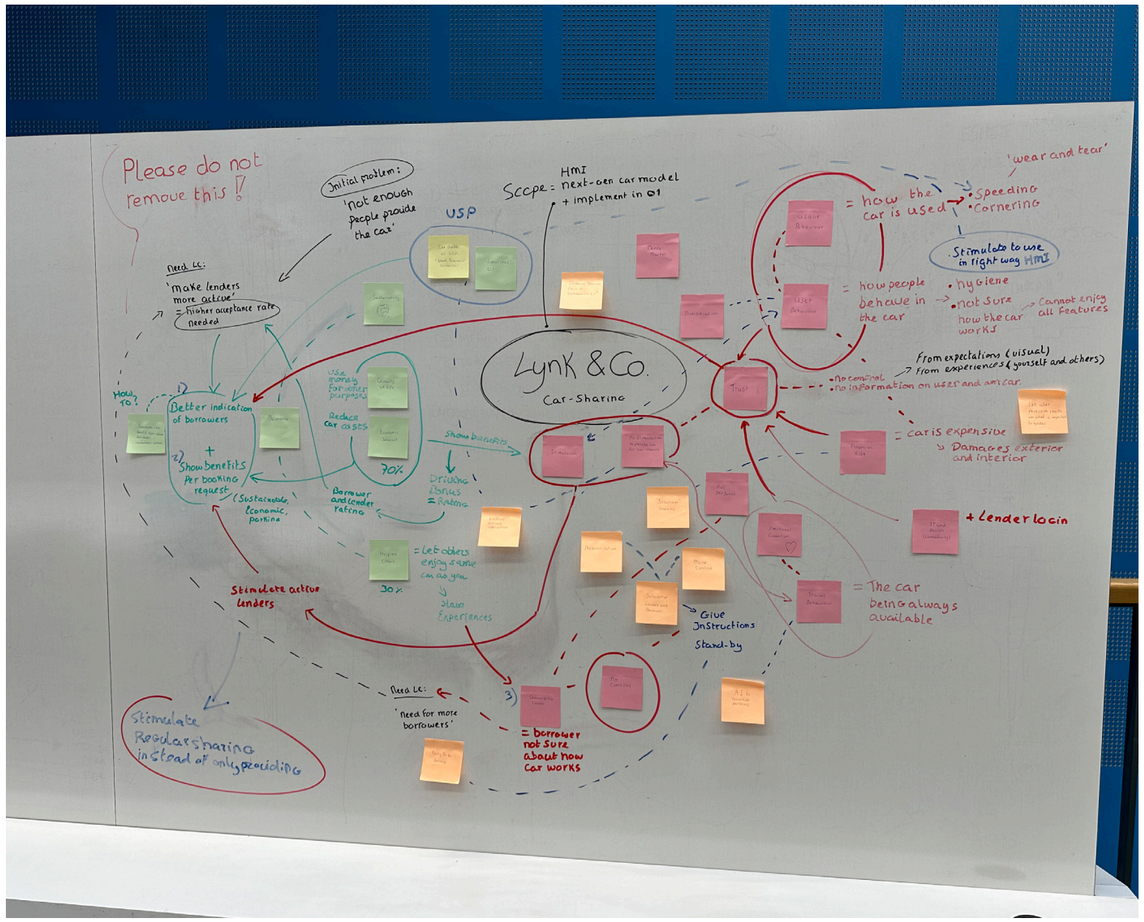
Participants were a bit hesitant with answering yes. "Is there an in-car app already then?" and "Currently I can only turn the sharing on and off."
One of the participants mentioned it would be nice to be able to make a scheme, instead of having to reject most of the time. Another participant mentioned that she 'would like to be able to disable some settings." And another one answered the opposite of this, "I want them to use all the great features just like I do."

5. Closing words

Show appreciation that the participant takes time and thanks for the interview.
"Thank you for making time to do this interview with me."

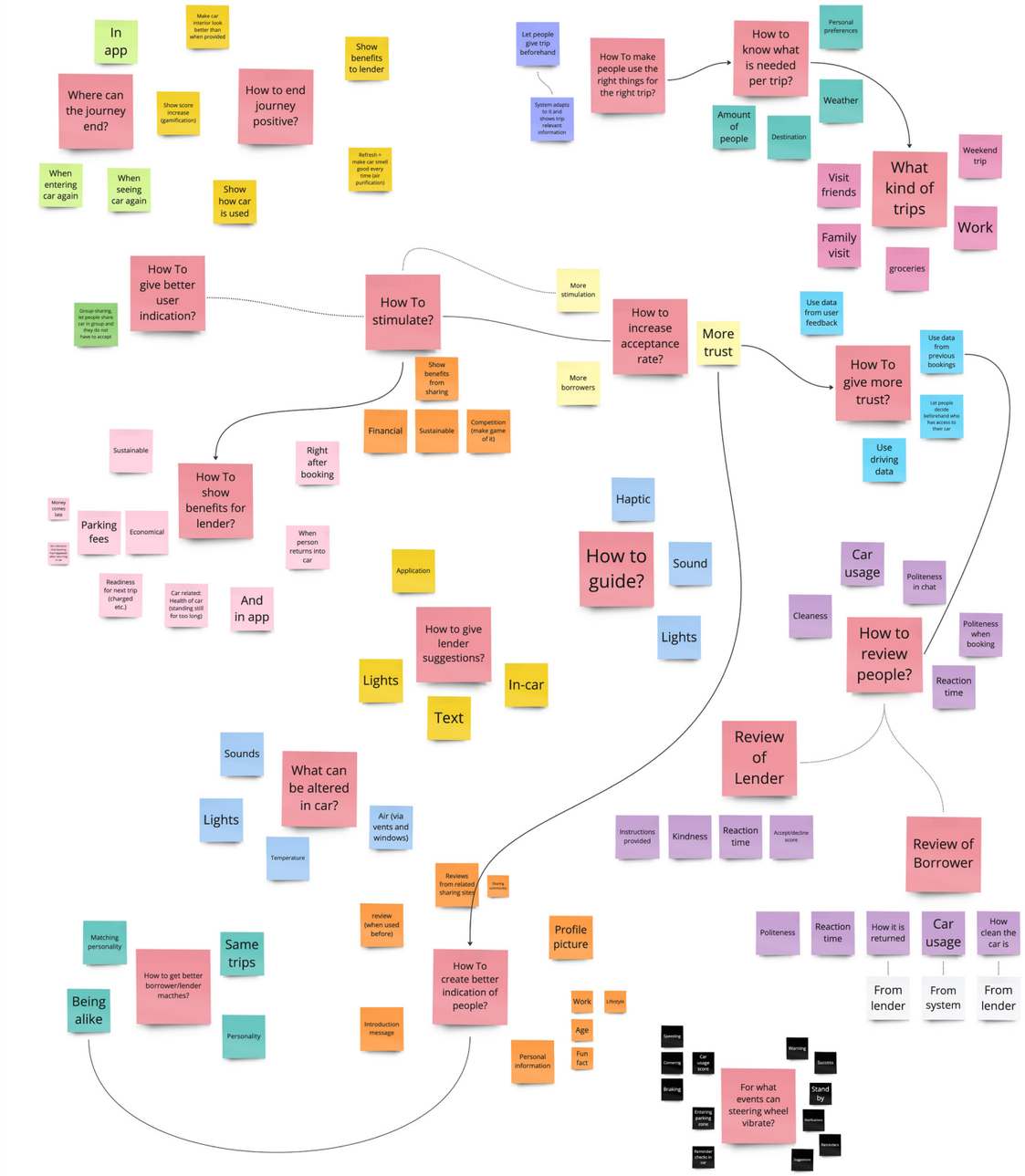
Appendix I: Mindmap

The physical version of the mindmap is shown below, in the form of a whiteboard with sticky notes and notes is shown, in here the most important insights are mapped out.

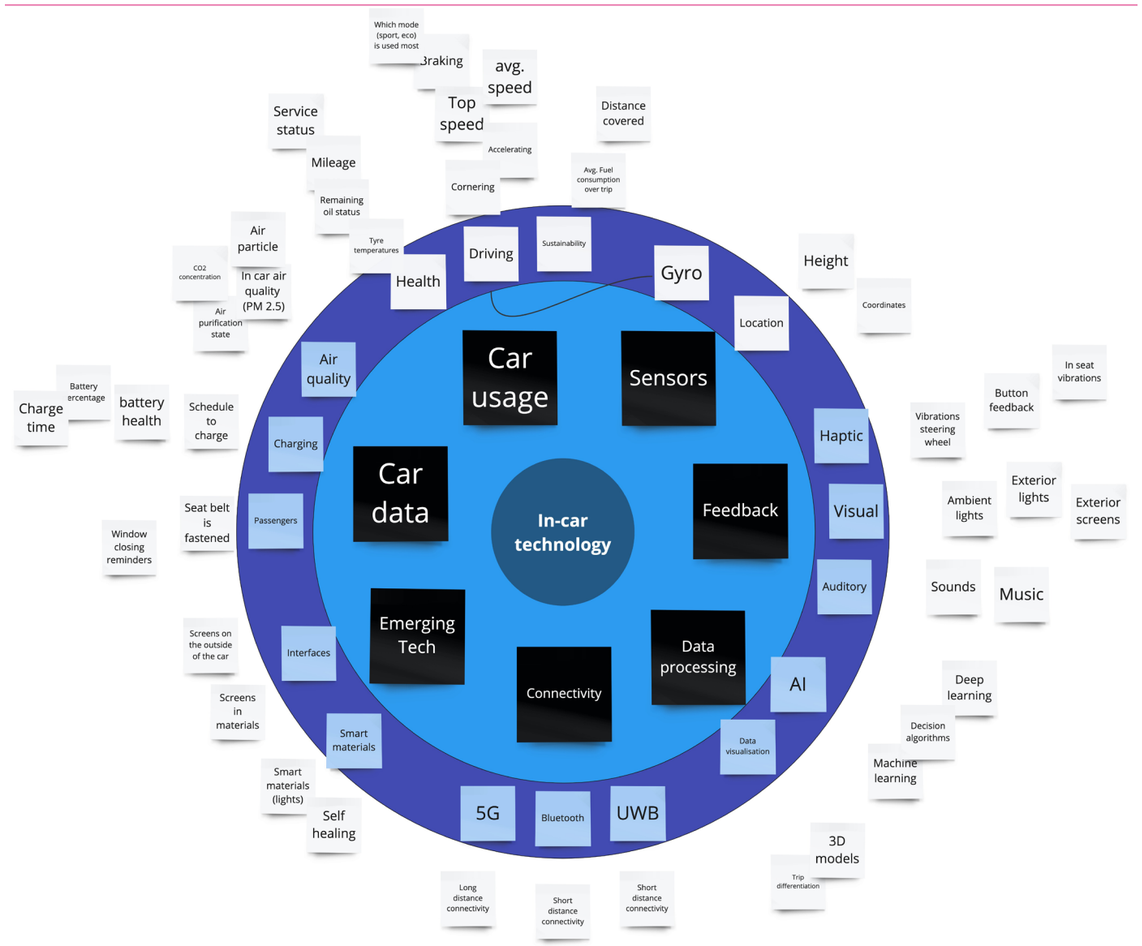


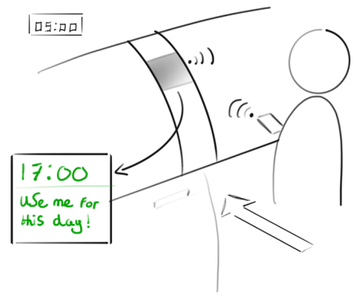
Appendix J: Ideation

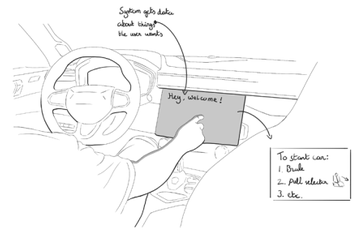
This appendix showcases the ideation phase with How-Tos, Technology exploration and the ideas (in this order). Below are the How-Tos.

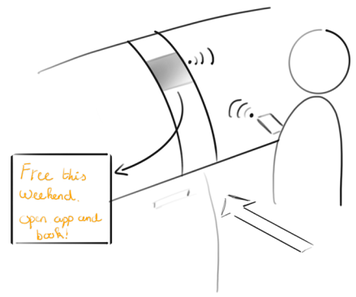


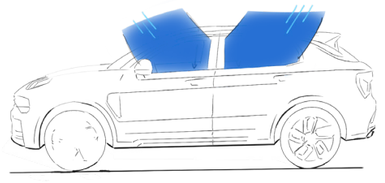
The complete technology exploration is shown below.

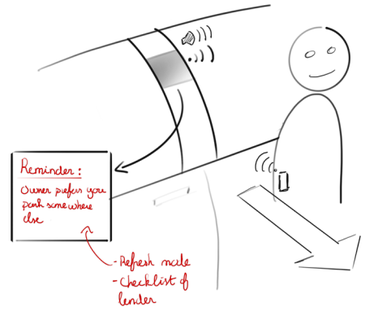


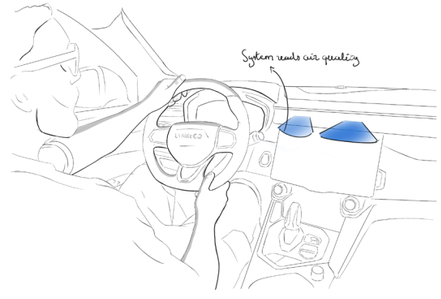






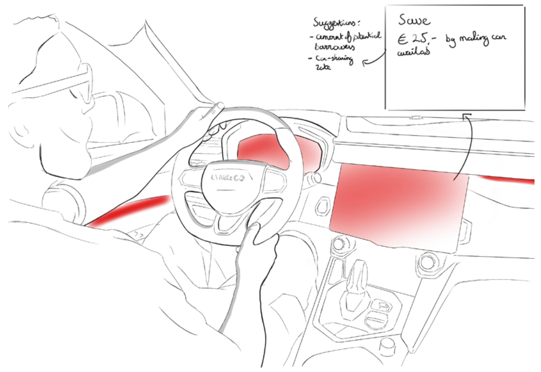


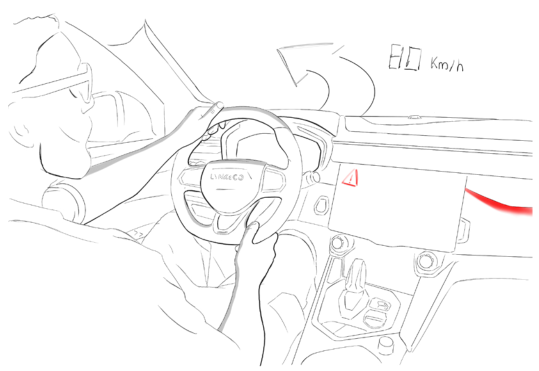


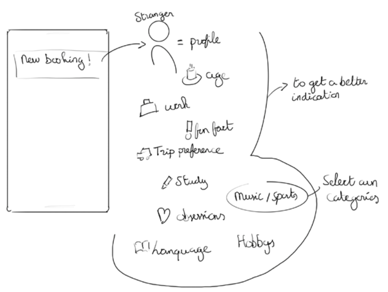


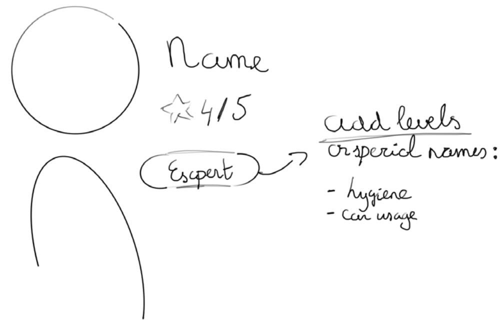

Review of lender
Create new levels based on behaviour
Review of borrower
System
Car usage
Response time

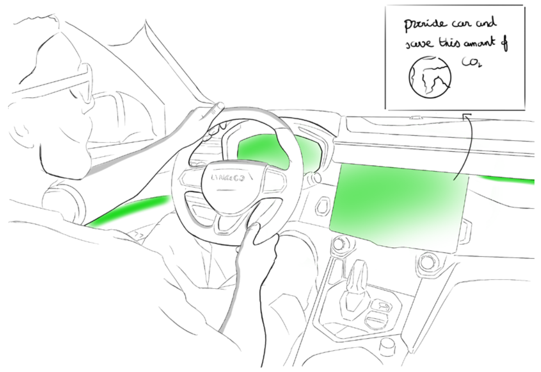

Your next trip is to the city, provide car to get battery charged

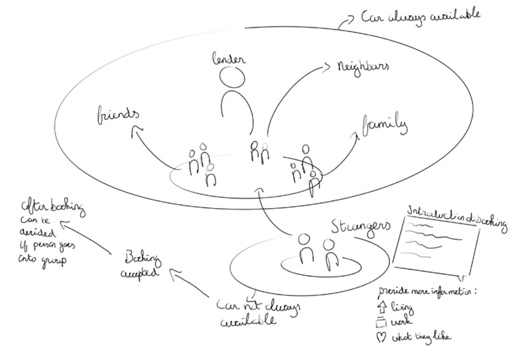

Save
€ 25,- by making car available

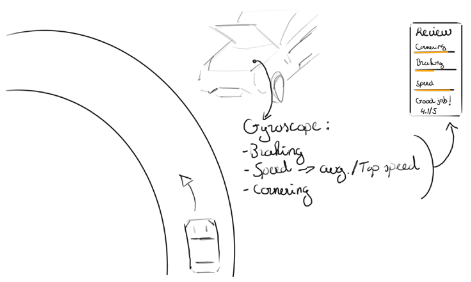

80 Km/h

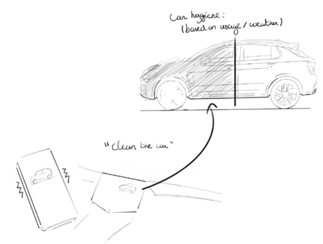

New booking!
Stranger
= profile
age
work
fun fact
Trip preference
Study
Music / sports
Select own categories
language
Hobbys
to get a better indication

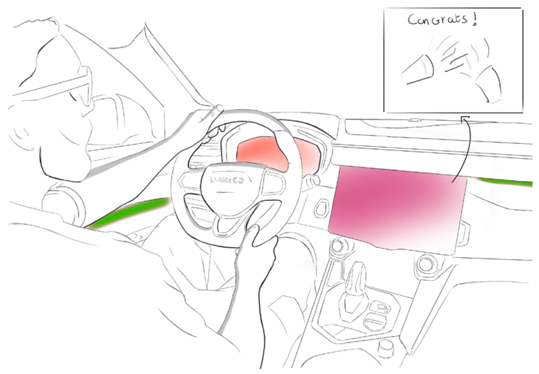

Name
4/5
Expert
add levels
or special names:
- hygiene
- car usage

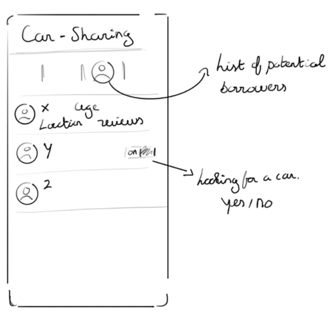

provide car and save this amount of CO_2

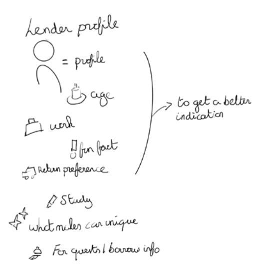

Car always available
lender
friends
Neighbours
family
Strangers
Booking accepted
Car not always available

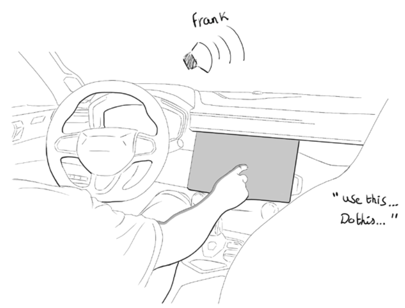

Review
Gyroscope:
- Braking
- Speed → avg / Top speed
- Cornering

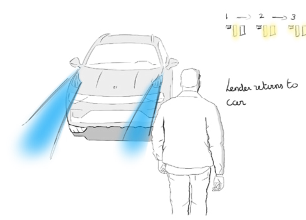


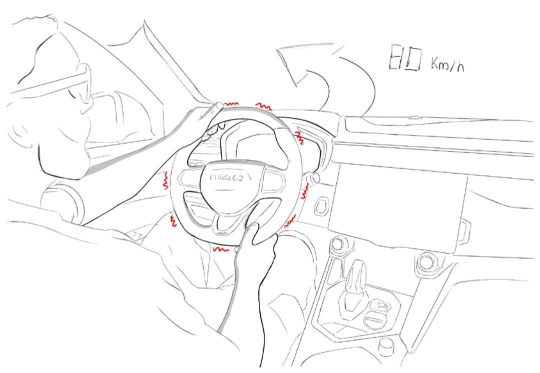

Congrats!

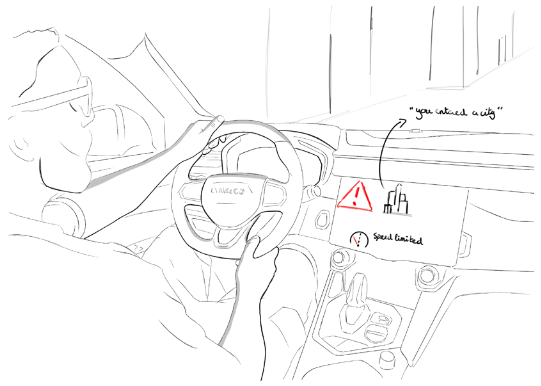
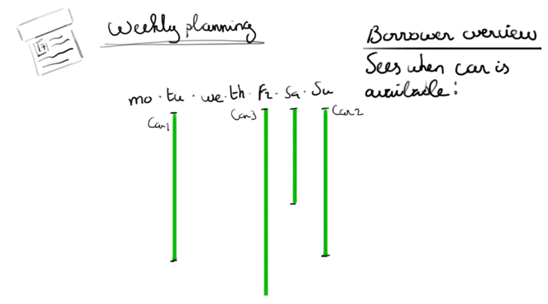
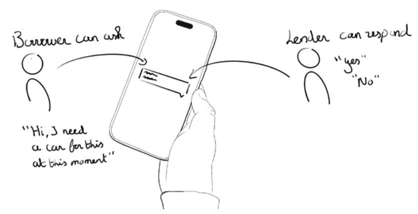
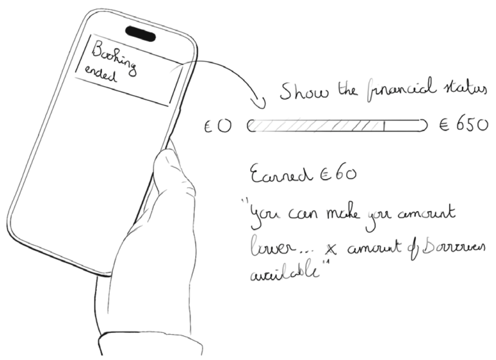
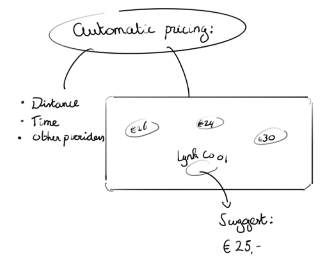
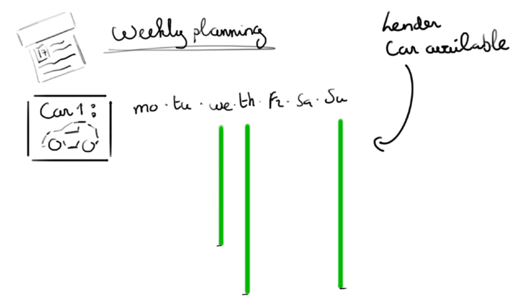
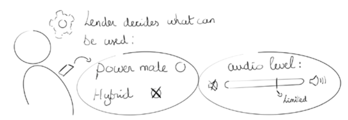

Car - Sharing
list of potential borrowers
age
reviews
looking for a car.
yes / no

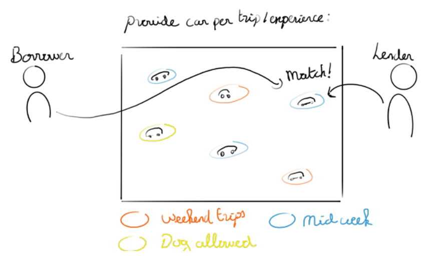
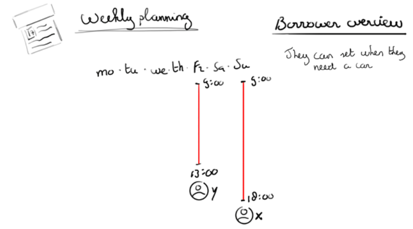
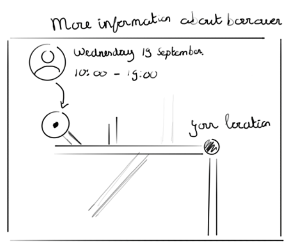
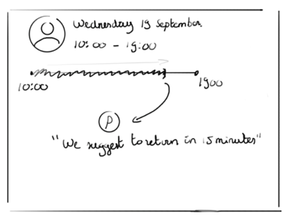
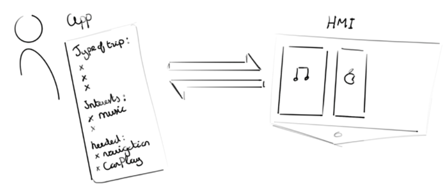
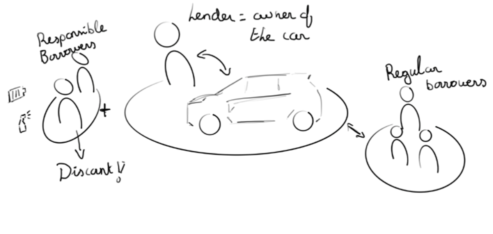

Lender profile
= profile
age
work
fun fact
to get a better indication
Study

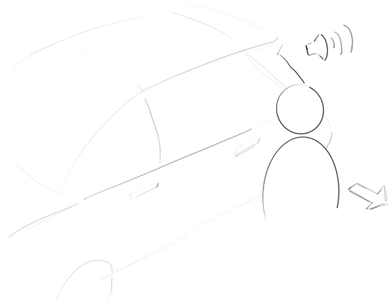

Frank
"use this...
Do this..."

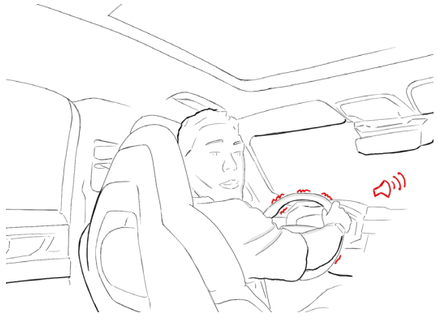


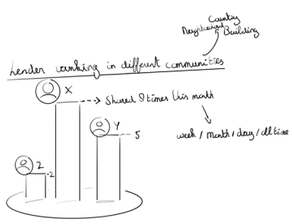

80 km/h

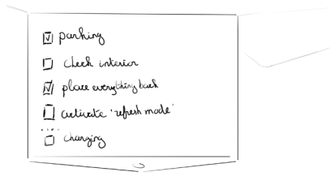
"We see a sporty drive style. If you drive calm your score is not affected"

"you arrived safely"
Speed limited

Weekly planning
Borrower overview
Sees when car is available:
mo · tu · we · th · Fr · Sa · Su
Car 1
Car 3
Car 2

Borrower can ask
Lender can respond
"yes"
"No"
"Hi, I need a car for this at this moment"

Booking ended
Show the financial status
€0
€650
Earned €60
"You can make your amount lower... x amount of borrowers available"

Automatic pricing:
· Distance
· Time
· other providers
Suggest:
€ 25,-

Weekly planning
Lender
Car available
Car 1:
mo · tu · we · th · Fr · Sa · Su

Lender decides what can be used:
Power mode
Hybrid
audio level:
limited

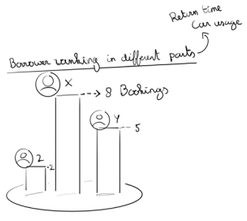
x needs a car we. 13
y needs a car Sa - Su
z needs a car for a week

Provide car per trip/experience:
Borrower
Lender
Match!
Weekend trips
Mid week
Dog allowed

Weekly planning
Borrower overview
They can see when they need a car
mo · tu · we · th · Fr · Sa · Su
9:00
13:00
18:00

More information about borrower
Wednesday 13 September
10:00 - 19:00
Your location

Wednesday 13 September
10:00 - 19:00
10:00
19:00
"We suggest to return in 5 minutes"

App
Type of trip:
Settings:
HMI

Lender = owner of the car
Responsible Borrowers
Regular borrowers
Discount

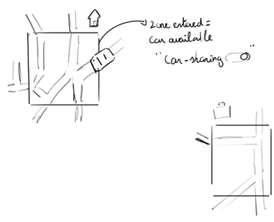












Appendix K: Arduino Code

```ino
// Define the pins for vibration motors and buttons
const int motor1Pin = 3;   // Connect vibration motor 1 to this pin
const int motor2Pin = 5;   // Connect vibration motor 2 to this pin
const int button1Pin = 4;  // Connect button 1 to this pin
const int button2Pin = 6;  // Connect button 2 to this pin

int pulseDuration = 200;  // Duration of each pulse in milliseconds
int numPulsesMotor1 = 3;  // Number of pulses for motor 1
int numPulsesMotor2 = 2;  // Number of pulses for motor 2

bool isMotor1On = false;
bool isMotor2On = false;

void setup() {
  Serial.begin(9600);

  // Set the motor pins as OUTPUT
  pinMode(motor1Pin, OUTPUT);
  pinMode(motor2Pin, OUTPUT);

  // Set the button pins as INPUT with pull-up
  pinMode(button1Pin, INPUT_PULLUP);
  pinMode(button2Pin, INPUT_PULLUP);
}

void loop() {
  // Check if button 1 is pressed
  if (digitalRead(button1Pin) == HIGH) {
    // Start 5 high-intensity pulses on motor 1 with different delay times
    for (int i = 0; i < numPulsesMotor1; i++) {
      analogWrite(motor1Pin, 255);  // High intensity
      delay(pulseDuration);
      analogWrite(motor1Pin, 0);  // Turn off
      if (i < numPulsesMotor1 - 1) {
        // Set different delay times between pulses for motor 1
        if (i == 0) {
          delay(50);  // First pulse delay
        } else {
          delay(50);  // Subsequent pulse delay
        }
      }
    }
  }

  if (digitalRead(button2Pin) == HIGH) {
    // First pulse: short initial pulse
    analogWrite(motor2Pin, 160);  // High intensity
    delay(100);
    analogWrite(motor2Pin, 0);  // Short pulse duration
    delay(100);
    // Second pulse: intensity increase
    for (int intensity = 80; intensity < 255; intensity += 25) {
      analogWrite(motor2Pin, intensity);
      delay(30);
    }
  }
  analogWrite(motor2Pin, 0);  // Turn off
  delay(10);                  // Pause between pulses
}
```

Appendix L: User Test Driving Score

Participant ID: ……..

Influence of cognitive ergonomics on borrowing a P2P shared car

This research is conducted as part of the MSc study Integrated Product Design Master Thesis at the faculty of Industrial Design Engineering at Delft University of Technology, in collaboration with Lynk & Co.

Researcher contact:
Thomas Hogeveen
Thomas.hogeveen@outlook.com or Thomas.hogeveen@lynkco.com
+31 6 23468175

Informed consent participant

I participate in this research voluntarily.

I acknowledge that I received sufficient information and explanation about the research and that all my questions have been answered satisfactorily. I was given sufficient time to consent to my participation. I can ask questions for further clarification at any moment during the research.

I am aware that this research consists of the following activities:

1. [Interaction Test]
2. [Online Survey]

I am aware that data will be collected during the research, such as notes/video recordings and photos. I give permission to collect this data during the research. Data will be processed and analysed for this master thesis only. At the end of this master thesis (December 2023) this data will be made anonymous and then accessible to the public, available via the Delft Repository. Before this date, the data will only be used by the researcher and the supervisors from TU Delft and Lynk & Co.

The notes, video recording and photos (if applicable) will be used to support analysis of the collected data. The photos can also be used to illustrate research findings, however, they will be made anonymous in publications and presentations about the project. The video recording will only be used to replay answers in case the researcher missed something during the interview.

I give permission to take notes/video recordings/photos of answers of my participation:
(select what applies to you)

- ☐ in which I am not recognisable in publications and presentations about the project.
- ☐ in which I am recognisable in publications and presentations about the project.
- ☐ for data analysis during the project as a representative of a car driver
- ☐ for publications and presentations about the project.

I give permission to store the data I provide in the Delft repository after completion of this research and use it for educational and research purposes.

I acknowledge that no financial compensation will be provided for my participation in this research.

With my signature, I acknowledge that I have read the provided information about the research and understand the nature of my participation. I understand that I am free to withdraw and stop participation in the research at any given time. I understand that I am not obliged to answer questions which I prefer not to answer and I can indicate this to the research team.

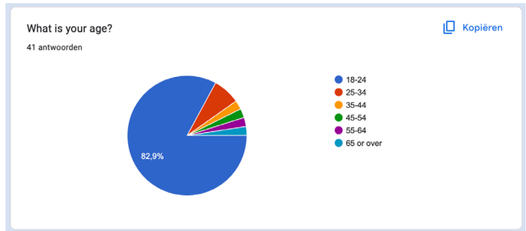
I will receive a copy of this consent form.

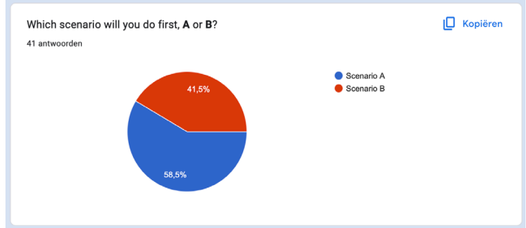
_____ _____

Last name First name

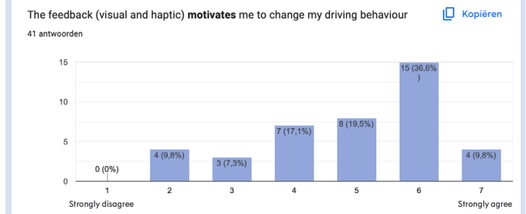
.. / .. / 2023 _____

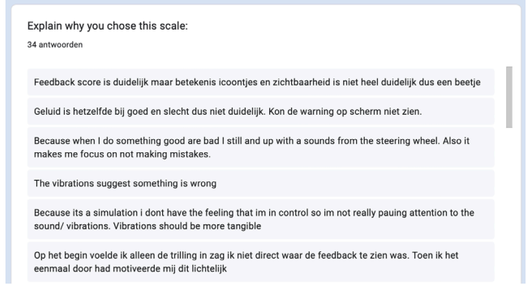
Date (dd/mm/yyyy) Signature





Scenario **A** (Feedback Action)





Ik heb het gevoel om een soort high score te willen halen zoals in een video game

I feel like like im doing something wrong so i want to change that

The vibrations were quite annoying, however, the screen did not really catch my attention.

Don't like to be told. Betuttelend

De trillingen en geluiden zorgen ervoor dat je oplet en alert bent, maar meeste manoevres kon ik zelf ook wel zien en dan zijn de trillingen wel heftig

De trilling geeft duidelijk aan dat er iets mis is. Ik zag het als een soort spel om de score weer hoger te krijgen.

De succes en warning rate had wat meer impact door de grotere aanwezigheid

Same as B it's like a game making it more fun

I think the difference is better with regard to scenario B and thus a bit more helpful

Deze was duidelijker!

Same as with B, it can feel quite random

hetzelfde als bij b

fijner omdat je meteen op dat moment feedback krijgt

Just like the previous

rechts goed, links slecht

During riding the difference between OK vibrations and Not good vibration becomes blurred

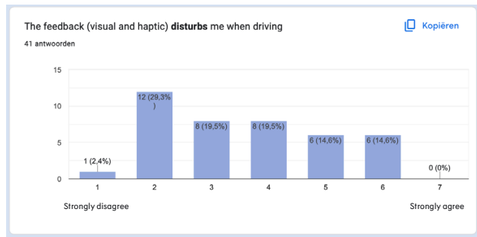
I like the haptic feedback, but not the visual feedback. The visual feedback seems to distracting. Everytime I get haptic feedback I feel the need to check the screen which is distracting.

I like the haptic feedback, but not the visual feedback. The visual feedback seems to distracting. Everytime I get haptic feedback I feel the need to check the screen which is distracting.

The score increased when I did something right, this made me happy about my performances

Het was duidelijk wat er mis ging omdat het op het moment zelf was. Het vershil in goede en foute trilling was niet meteen duidelijk.

Dit was stuk duidelijker dan degene hiervoor, misschien omdat ik nu ook wat meer gewend was.



It was okay

Het trillen is een klein beetje afleidend

Het is een extra handeling

Trillingen leiden niet af, maar kijk wel vaker weg van de weg om naar de score op het scherm te kijken

Mijn aandacht wordt afgeleid naar het dashboard, om de invloed op je percentage te zien etc. Dat is nadelig in onoverzichtelijke verkeerssituaties.

Not really, but i think in long trips or after a while it can be annoying

You have to get used to it, at first it is weird but you wait for the next one to come after some time

Omdat het weinig impact heeft op mijn focus op de weg

Nee in een normale situatie zie ik geen hinder maar ik kan me voorstellen dat het in het geval van een

Feels like im doing something wrong

The feedback in the wheel was more disturbing than the screen, but not too disturbing

Usefull

Leidt af en geeft het gevoel dat je het verkeerd doet

De eerste keer schrok ik een beetje maar daarna ben je er heel snel aan gewend

Je moet minder lang kijken naar het scherm om je feedback te lezen

It is a lot of shaking and sound after every action done

De trilling leidde mij af omdat je het niet niet kan missen aangezien je handen aan t sturen zitten

This disturbed less then scenario B due to the feedback being more constant and a clearer difference between the feedback

Ja maar door de trillen links en rechts snapte ik dat ik niet elke keer hoefde te kijken

When its vibrating i want to check te screen to see what's wrong.

ook zelfde als bij b, maar ik had het gevoel dat de feedback vaker terugkwam, en dat was minder fijn, ik hoef niet de hele tijd te weten dat ik het goed doe

gewoon duidelijk groen of rood groot vlak, is beter dan een icoontje dat verkleurd

I found it sometimes confusing which direction it wanted me to steer as well as sometimes the Im driving pretty straight so there's no need to steer more.

misschien aan het begin, je went eraan

It seems to annoy a bit and distract from the driving

The haptic feedback doesnt disturb me that much but the visual feedback does therefore a neutral score

The haptic feedback doesnt disturb me that much but the visual feedback does therefore a neutral score

Hard to look at the screen while driving and try to understand what's left and right.

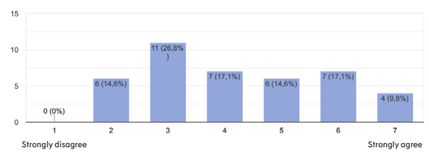
Ik vond van niet (misschien in de test wel omdat er ook wat lawaai bij kwam) maar niet echt. Wel denk ik dat het op een langere rit vervelender kan zijn als je bij alles een trilling krijgt.

Zelfde als het antwoord hiervoor.

The **visual feedback** clearly indicated what went wrong or was good

Kopiëren

41 antwoorden



Explain why you chose this scale:

37 antwoorden

Betekenis icoontjes onduidelijk en klein op scherm

Not specific to what went wrong

Ik kon de warning niet zien en het succes ook niet echt goed. Als je focussed op de weg zie je de feedback eigenlijk niet

I don't really understand sometimes what I did wrong or good

I did not see the screen

I would like to see a flash of red or something which is more visible and not on the touchscreen but for example in the dashboard or flashed onto the windscreen

Was duidelijk aangegeven met kleuren en tekst

I wasn't really looking at the tablet

Het percentage is super duidelijk maar de icoontjes zijn nog onduidelijk wat ze betekenen

Had het eerst niet door, maar in combinatie met visuals heel duidelijk

Tijdens het rijden vallen de icoontjes weg als je maar heel kort op het dashboard kijkt.

Sometimes hard to differentiate between the 2 vibrations

The screen being at your right doesn't grab your attention too much, I prefer to look straight ahead when driving

De drivers score ging omlaag maar vertelde niet persee waarom

Warning slider is wel duidelijk maar de icons waren me niet echt opgevallen

I didnt know there were two different buzzers

It was immediately clear that I approached the situation correctly or wrongly, which was great

Feedback is color only

Volgens mij 1 trilling was goed en meerdere trillingen fout maar weet dat niet zeker

Iconen redelijk klein maar zag duidelijk of iets goed of fout was en dat kon ik dan linken aan wat er net gebeurde (sturen/remmen etc.)

De iconen zijn duidelijk en er is een groot verschil te zien tussen warning en succes

Now kt was only the icons which are not very clear to me what they are

De rode en groen kleuren bij warning en succes waren alleen te zien als ik mijn ogen erg van de weg haalde

I do think the interface was clearer and thus more readable

Meer omdat ik nu wist wat de iconen waren omdat ik eerst B had gedaan.

Wel dat ik iets fout deed maar niet wat

The variables it gave feedback on couldn't always be influenced (like braking)

zelfde als bij b

beetje als net gewoon duidelijke groene en rode vlakken, visual dudielijker

It was more obvious than in situation B but in all honesty I didn't find the warning and succes necessary the score did help however as I wanted to do my best to keep my score higher but that also counts for situation B

links slecht, rechts goed

Sometimes a bit guessing what I did wrong, but most of the times you do know what you did wrong

The red and green colours were obvious if something was good or bad

It was clear that right was good and left was bad. However, the word warning was a bit confusing as I thought it was warning me for traffic ahead.

It was clear that right was good and left was bad. However, the word warning was a bit confusing as I thought it was warning me for traffic ahead.

De vlakken waren duidelijk, deze vielen op.

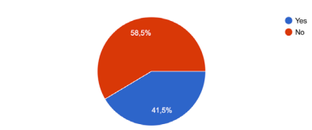
De iconen waren niet heel groot, ik wist nu wel dat het ene goed en het ander fout was en relateerde dat vaak aan de actie die ik maakte in plaats van naar het scherm te kijken.

Vond wel duidelijk wat het verschil was tussen goed en fout, maar wat precies niet altijd.

Did you already fill in the questions related to **Scenario B**?

Kopiëren

41 antwoorden

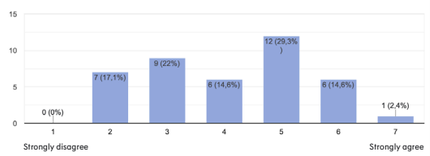


Scenario B (Feedback zones)

The feedback (visual and haptic) **motivates** me to change my driving behaviour

Kopiëren

41 antwoorden



Explain why you chose this scale:

36 antwoorden

Ik kreeg duidelijke feedback via de iconen en wisselende scoren over mijn rijgedrag dus weet goed wat ik aan kan passen waardoor ik gemotiveerd ben om te verbeteren

More clear to what went wrong

De procenten geven je een kans om het goed te maken. Die motiveren wel om beter te gaan rijden want je wil die 100%

When I am driving and I don't agree with the system. I would get annoyed by the system while driving. I also don't see the benefit in keeping my trip score at 100%.

I did not notice that the feedback was over a bigger time span

Same answer as A

Het geeft aan wat er goed of fout gaat

The feedback came earlier

Het tril signaal is voor mijn gevoel iets te laat omdat ik inmiddels weer in een andere situatie ben

Leuke challenge om score 100 proberen te houden

De late melding zorgt voor wat verwarring omdat je niet meer in het moment zit van de betreffende verkeerssituatie.

The specific moments are less clear, not exactly sure when it was I did something

Hetzelfde als net je wilt een soort highscore halen

I do want a higher score

It felt like the feedback was less "intimidating" this time, which did not really result in me changing the behaviour

Feedback tales long to absorb, sevearal indicators need to be considered

Door de trillingen was ik gefocused op het scherm

Minder trillingen is misschien wel fijn maar als het na een tijd pas is weet ik niet meer precies waar het mis is gegaan dus kan ik er niet van leren.

De trillingen met een geluid erbij viel wel op, waardoor ik meer op mijn driving behavior ben gaan letten. Ik keek weinig opzij naar de iPad want dat trok mijn aandacht minder.

It's like a game while driving, making it more fun

De haptic reactie kwam pas erna en was niet heel heftig

I do not think the correlation will be made directly and also do not think it will improve the driving style by much

Ik weet niet precies naar welk moment het terug refereert

Ik rij blijkbaar niet goed genoeg, dus dat kan anders!

Ik rij blijkbaar niet goed genoeg, dus dat kan anders!

It does not feel particularly purposeful, more random

Niet goed, niet slecht, ik voelde me niet altijd aangesproken omdat ik zelf niet reed

stuur gaf we goed direct feedback maar op het scherm keek ik niet vaak wnat ik wil op de weg letten

De feedback komt te laat binnen

The haptics did encourage me to steer extra where necessary but the visuals didn't aid me at all as it would've been distracting to look at and I didn't understand what each icon etc meant

Je let meer op

Much more then the 1st scenario, visual/haptic seems to be more in balance, leaving space to keep overview

Je let meer op

Much more then the 1st scenario, visual/haptic seems to be more in balance, leaving space to keep overview

The icons moving and changing colour are really distracting and it doesnt facilitate a comfortable and peaceful driving experience

The feedback came quite late so I wasn't aware of what went wrong and what went well.

Het was een beetje vaag wanneer ik iets fout had gedaan, dus wist ik niet precies wat er aangepast moest worden.

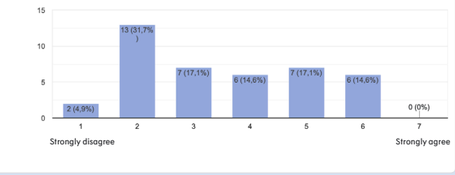
Ik weet dat ik iets fout doe, dus had het idee dat er wel iets moet veranderen maar precies wat was soms wat vager.

Ik vond het niet heel duidelijk wat er veranderd moest worden.

The feedback (visual and haptic) **disturbs** me when driving

Kopiëren

41 antwoorden



Explain why you chose this scale:

29 antwoorden

Het zijn kleine niet invasive feedback signalen

No the vibrations are not too hard that it is disturbing

Dat tril geluidje blijft een beetje verwarrend, omdat het klinkt alsof je iets fout doet. Ook als je het goed doet

It felt almost the same as in scenario A

It did not really disturb me

Same as A but i would like to add a new thing. The visuals are not really visible because it direct your eyes to the touchscreen and off the road which is not a wanted effect

De icoontjes waren redelijk klein en zorgde voor dat je er erg op moest focussen tijdens het rijden

Trillen is een beetje afleidend maar niet irritant, na 1 uur rijden met constant trillen wel

Trillingen niet, maar visuals leidden wel een beetje af omdat ik geneigd ben te kijken wat mijn score is

Ik weet niet precies wanneer ik een melding krijg, dus blijf vaker op het scherm kijken of er al wat nieuws bijgekomen is.

I was more used to it now

Hier lette ik nog wel iets meer op de icons als bij de vorige dus mn oven waren wel wat meer van de weg af maar niet hinderlijk veel volgensmij

The buzz for when im doing something good still feels like im doing something wrong

It was less disturbing this time, due to the fact there were less moments in which the feedback was activated

Four indicators to look at, decipher and process.

Bijvoorbeeld bij de bocht onnodig leidt alleen af

Het gevoel was zacht en het geluid ook maar het toonde wel een seintje van dat ik iets verkeerd aan het doen was.

I am focused on the score and when it shakes you immediately have you attention to that

I think it takes the attention off the road

Het duurde lang voordat ik het begreep dat leidde af

het was niet super merkbaar, dus ik had er geen last van, juist fijn om te weten wanneer ik iets niet goed deed

trilling is prima, scherm is afleiding, groot contrast blauw en witte balk dat heen en weer beweegt

It did not disturbs

It did not disturbs

Je kan ervan schrikken als het te hard is of het verkeerde moment

Maybe a bit, but much less than scenario 1.

The icons moving and changing colour are really distracting and it doesnt facilitate a comfortable and peaceful driving experience. The haptic is not disturbing

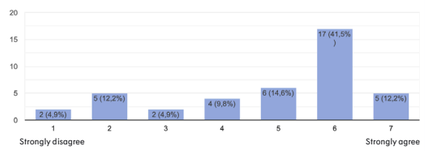
It was not annoying but sometimes hard to understand so I became confused

Ik vond het niet heel storend.

The **visual feedback** clearly indicated what went wrong or was good

Kopiëren

41 antwoorden



Explain why you chose this scale:

34 antwoorden

Beschrijving en zichtbaarheid goed

It is very clear what went wrong with the icons flashing red and green

Het liet goed zien wat je fout deed. Alleen moet je echt focussen op het scherm wil je het zien. Wat wel gevaarlijk kan zijn

Because the icons lighted up green or red I could easily see what the judgement was based on.

It showed on the screen wat mistakes were made. But it is showed a little bit small

Didnt look at the screen much. Same as A tho

Dit vond ik

I didn't look at the iPad while driving

De icoontjes waren nu wel duidelijk omdat er een naam onderstond

Duidelijker wat er fout of goed ging, maar minder connectie met het stuur? Zonder voorkennis van A minder snel idee of trilling links goed of fout is

De icoontje zijn groter, maar de percentage balk naam het grootste deel vd aandacht in.

Yes but when you are not thinking about it. It could be quite hard to tell the vibrations apart.

Same, the icons are clear but the placing doesn't work for me personally

Als je in een split seconde kijkt is het soms moeilijk om de icons uit elkaar te halen maar een stuk duidelijker als de vorige

Im only focussing on the percentafe, not the icons

This feedback was much better than the previous scenario, and really gave a clear impression what I did correct/wrong

But rsjes your eyes of the road too long

Zelfde trillingen bij postitieve acties en zelfde soort trilling bij negatieve

Iconen en de kleine tekst maakt het erg duidelijk

De driving score viel me op en de iconen zijn vrij logisch, de rest van de iPad trok mijn aandacht minder

I had to read what esch icon was

Het viel mij maar 1 keer op dat er iets op de ipad gebeurde

I did not see the visuals until the end of the scenario

Ik kon de woorden niet lezen en snapte het percentage niet sorry

It seemingly gave feedback on parameters not influenced by me

was erg duidelijk

balkje is duidelijk, maar ik kijk eigenlijk niet naar de icoontjes erboven

I don't understand the visuals

je wilt de 100% halen

The icons make sure to notify you what went wrong, better than letting the driver guess.

Yes it clearly indicates what went wrong but it is distracting

The indication of what went wrong and well was clear.

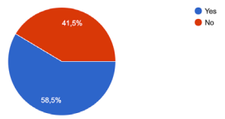
Duidelijk grote iconen, al moest ik de eerste keer wel wat langer kijken.

Ja vond van wel, het balke was groot en duidelijk en sprong er uit.

Did you already fill in the questions related to **Scenario A**?

Kopiëren

41 antwoorden

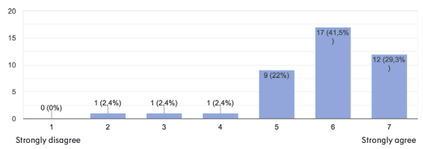


Tracking of driving scores

Haptic Feedback (vibrations) helps me to get notified

Kopiëren

41 antwoorden



Explain why you chose this scale:

30 antwoorden

Anders kijk je niet op t scherm in de auto

Yes it helps, and it is useful that the icons flash after the vibrations

Als je het snapt, dan helpt het. Maar als je het niet snapt dan denk je wat doet dit ding

I do notice it while I am driving

It gets your attention well

It did helped me recognize when i did something wrong which is helpfull. But sometimes i do something wrong on purpose and i dont want to be notified when i do. See at answers A or B for a possible downside to the vibrations.

Je wist dat je een notificatie kreeg

I didn't really look at the tablet

Als ik van te voren weet dat het trillen te maken heeft met een signaal dat er iets goed of fout gaat wel, maar anders maak ik zelf die link niet

Handen zijn heel gevoelig en aangezien ogen gefocust zijn op de weg is dit duidelijker dan wanneer je het bijvoorbeeld alleen met visuals doet.

Yes, i did notice i was looking at the screen more often and checking the driving score and not looking at the road.

Duidelijk dat er wat gebeurt/aan de hand is

Het is niet afleidend maar wel duidelijk

Im paying attention to it because i feel the vibtations

It was very noticeable, more than the visual feedback

But does not natter left ir right

Was gelijk gefocused maar had niet gelijk door wat er was

Na een trilling wist ik dat er iets mis of goed was en begon ik me heen te kijken

Het is een gevoel wat triggered

It is a more a wake up call

het signaal was niet missen

It makes you aware of things without looking and thus no need to take my eyes of the road

Die trillingen ben ik ook al gewend uit andere autos

It alerts you, but its unclear for what reason

het is een slimme en directe manier van kennis stelling

het is een slimme en directe manier van kennis stelling

ja dan ga je beter op je rijgedrag letten

It is a thin line as to how many vibration will provide the right amount of feedback. The balance with visual is key I think. But the haptic does give an extra dimension and is less easy to ignore
(thought: machine learning how many suits the particular driver? Thought: ask a driving instructor how many suggestion they give to learn the right behaviour)

The haptic feedback doesn't feel distracting from driving while still gettint notifications on my driving style.

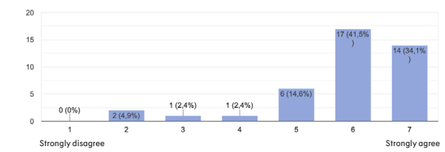
I mostly steer with one hand on the top of the steering wheel so the buzzers would not reach my hands.

Het roept gewoon attentie op van: hey er is iets.

I believe that the Driving Scores will make it **easier for me** to get my **booking to borrow** a car **accepted** (because the owner of the car knows more about my driving behaviour)

Kopiëren

41 antwoorden



Explain why you chose this answer:

32 antwoorden

Omdat ik een auto wil lenen

When sharing a car it makes sense to track behavior so someone does not trash your car

Het helpt om meer vertrouwen te krijgen bij de verhuurder wat een goed ding is. En als je gewoon netjes rijd heb je ook niks te vrezen.

It would stress me a lot and I wouldn't be able to drive comfortably.

If you drive good it will me it easier to be accepted for renting a car

Well i believe owning a car for just yourself is causing a society much harm. So including carpooling- or sharing helps a lot. It also helps people who cant afford a vehicle, to move arouns when needed. Solf i have a vehicle and i can share my vehicle with someone else, i would like it to be treated nicely. An implementation of this system will take care of it.

Als het iemand zou helpen en mensen meer vertrouwen in mijn rijgedrag zou geven zou ik er blij mee zijn

Because I like science

Lijkt me een handig systeem en het helpt tegen roekeloos rijgedrag

Auto's zijn duur en ik heb ze niet altijd nodig, dus zonde om zelf een te kopen. Maar als ik er een nodig heb dan is dit heel handig om snel een auto te krijgen

Tegenstrijdig, niet fijn om constant in de gaten te worden gehouden, wel fijn dat je een score op kan bouwen voor het huren van een auto.

It doesn't feel like sensitive personal information, so fine by me

Omdat je dan makkelijker een auto kan lenen als mensen zien dat je netjes rijdt

Als ik me gewoon netjes gedraag in het verkeer kan heb ik daar geen probleem mee en ik kan me goed het voordeel van de verhuurder indenken

To improve the technologies

This is absolutely a great way to track everyone

Every benefit comes with responsibility

Kan wel prima rijden denk ik dus vindt het dan ook niet echt om daar over beoordeeld te worden

Als ik hierdoor makkelijker een auto kan boeken sta ik dit wel toe

Ik vind het alleen maar goed dat mensen auto's zullen hierdoor delen, want er is veel te veel verkeer op de weg, en genoeg mensen die niet kunnen rijden, dus die deze driving feedback wel kunnen gebruiken.

Especially if you rent out your car you want to ensure people drive appropriately and safe

I still think that circumstances can change the score which will effect negatively from there on. But I do think it will help a little bit with the trust in other users

Als
Ik goed rij krijg ik eerder een auto dus ik ga meer m'n best doen

Knowing how someone drives doesn't necessarily make you sure that the car is safe(for example if someone drives it way too fast, the only thing that changes now is that you know)

net zoals bij airbnb bouw je een profiel op, en daar hangt een goed gevoel van vertrouwen aan vast

wel fijn om het rijgedrag van iemand te weten voordat iemand de auto gebruikt

niet 7 door slechte score waar je geen invloed op hebt

100% that a personal score will help make decisions, think about how much we value ratings to make a choice for restaurants, hotels, Uber drivers, products.
On the other hand the car borrower could be seen as a customer of the car owner, maybe this scenario gives different results.

I agree with the statement. I can imagine that a careful driving experience will make borrowing easier for me.

If the car owner is not happy about me, I am afraid I won't get another car next time.

If the car owner is not happy about me, I am afraid I won't get another car next time.

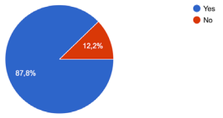
Lijkt me logisch dat als je meer inzicht hebt in hoe iemand rijdt je eerder geneigd bent om ja te zeggen op een boeking.

Ja dat lijkt me logisch, ik zou dat zelf ook wel willen weten.

Appendix M: Mobile App Test Results

I am willing to **allow a car-sharing service** to track my **driving behaviour** Kopiëren

41 antwoorden



Explain why you chose this answer:

13 antwoorden

- Als ik hieruit voordeel kan halen dan wel ja
- Ja sowieso want dat geeft mij meer kans om voor weinig geld te rijden en het boeit mij niet heel veel als een systeem weet hoe goed ik rij of niet. Conclusie: chiller om een auto te rijden en om je dan aan te passen dan te moeten fietsen of lopen of ov (met misschien zelfs regen)
- niet voor mezelf, wel voor anderen
- Only when driving in a borrowed car, not personal cad
- ja is fijner voor de medemensen en die gegevens zijn niet iets wat ik perse prive wil houden
- I don't mind it
- The feeling that other drivers know how im driving scares me a bit
- slechts omdat je die service gebruikt
- For me personally it would rip out the joy of riding and make travelling by car solely functional. The '1984 / big brother is watching you' scenario of a personal score does affect my sense of freedom of thought and living.
- If tracking allows me to borrow a car faster than it is fine by me.
- My driving behavior says nothing about my personal data, so I would be willing to share this with the company. But nothing personal!!!!!
- Deze is tricky, maar ja omdat je iets waardevols van een ander gebruikt
- Lynk & Co was chinees toch? Volgens mij weten ze toch al veel van me en als dit me helpt dan waarom ook niet.

Comparison 1 of currently live and new design

The **trust in the borrower** is higher in which screen? Kopiëren

10 antwoorden

Explain why

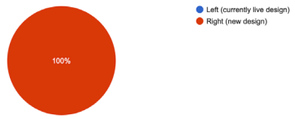
5 antwoorden

- Bij de optie rechts kan je op meer informatie over de borrower klikken en zijn of haar reviews lezen en dit geeft je meer gevoel.
- Rechts wel omdat je hier dus veel meer informatie ziet. Zou wel iets van de score of sterren verwachten op het eerste scherm. Maar als je dus doorklikt, de tweede geeft veel meer info. Ook is de info goed dus vertrouw ik diegene meer. Als de scores en rating slecht zijn dan natuulijk niet.
- Duidelijk, rechts geeft veel meer info
- Weet niet precies wat de blauwe score is maar de groene en de rest van de info geeft mij wel meer vertrouwen dan de 4 sterren
- Right side gives way more info so of course it makes me trust it more

Comparison 2 of currently live and new design

The **trust in the borrower** is higher in which screen? Kopiëren

10 antwoorden



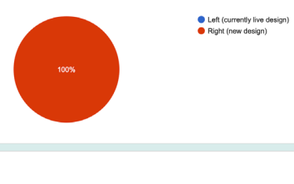
Explain why

4 antwoorden

- Zag dat hier ook een berichtje staat. Maar daar kan je alles neerzetten wat je wil toch? De goede scores staan hier nog steeds dus ik zou weer de nieuwe kiezen
- Nog steeds de rechtse. Meest relevante info staat er nog
- Wat minder info dus maar wel de meest nuttige dus nog steeds rechts
- Same as the first one actually, still more information.

The **ability** to make an **indication of the borrower** is higher on which screen? Kopiëren

10 antwoorden



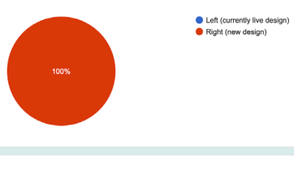
Explain why

5 antwoorden

- Omdat je zijn of haar drivingsscore kunt zien maar voornamelijk ook de reviews. De reviews bevatten nuttige informatie om een beeld te kunnen vormen van de borrower.
- Een indicatie kan ik wel beter maken van de rechter en dat is iemand die goed rijdt blijkbaar.
- Rechts kan je dus makkelijker een inschatting maken, het blijft natuurlijk een gok.
- Ja door meer info kan ik de rechter dus beter inschatten
- I can make an indication of the first one so that's is fine but a more specific one on the right.

The **ability** to make an **indication of the borrower** is higher on which screen? Kopiëren

10 antwoorden



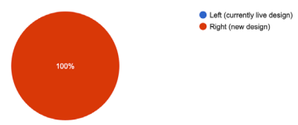
Explain why

2 antwoorden

- Zelfde als bij de vorige
- Rechts want dan zie je dus wel de juiste dingen om een inschatting te maken van hoe iemand rijdt

The **willingness** to **share my car** is higher on which screen? Kopiëren

10 antwoorden



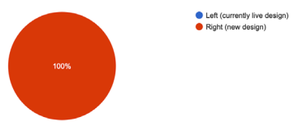
Explain why

4 antwoorden

- omdat je veel meer informatie over de borrower komt te weten waardoor je meer vertrouwen krijgt in iemand. Je auto leen je namelijk niet zomaar aan jan en alle man uit.
- Ik vul hier mijn antwoorden in voor alle drie de statements. Maar het nieuwere ontwerp geeft me meer vertrouwen en dus zou ik eerder lenen omdat je veel meer gegevens kan zien die relevant zijn (bij de eerste kan je volgens mij dus niet doorklikken).
- Dan zou ik liever met de tweede delen want je weet wat beter hoe iemand is
- So, I would choose the second one.

The **willingness** to **share my car** is higher on which screen? Kopiëren

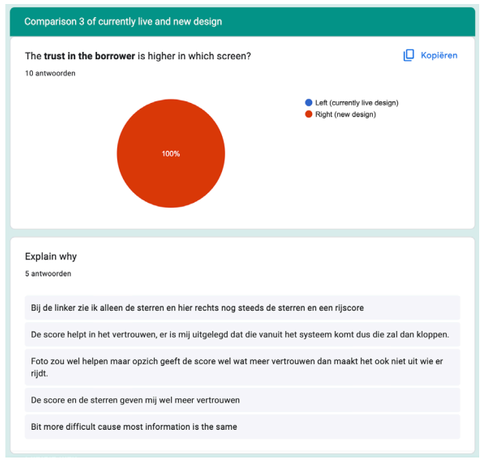
10 antwoorden

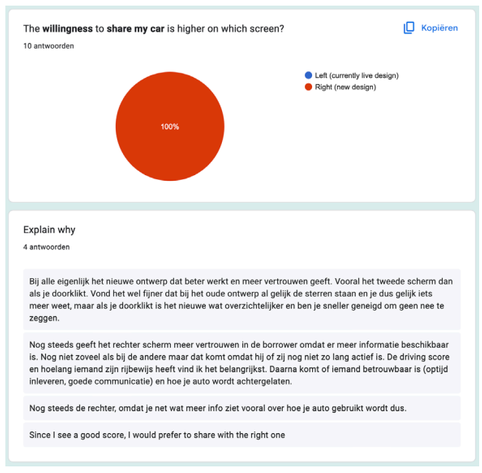


Explain why

2 antwoorden

- ik hoef niet perse te weten wat voor werk de borrower doet en hoe de borrower eruit ziet als iemand maar een goede driving score, review en 'lang' zijn rijbewijs heeft (dus niet nog maar 1 maand).
- Volgens mij heb je hier dus iets minder info. Maar wel de meest relevante gegevens al. Ook zie ik hier een berichtje, dat maakt het wat persoonlijker.





Appendix N: Project Brief

Influence of cognitive and sensory ergonomics on private car sharing — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 04 - 07 - 2023 — 05 - 12 - 2023 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Lynk & Co is a relatively new company in Europe, they offer their car (shown in image 1) via two ways: a subscription or it can be bought. What this brand really makes unique, is the opportunity to share the private owned car via a sharing platform (image 2). People who own the car can voluntarily offer for a self-determined price it on this platform. Anyone who has the Lynk & Co app can send a request and thus borrow the car for a number of hours, or even weeks. Car owners can then also earn money this way, which means they have to pay less for the subscription themselves.

This sharing platform is created with sustainability in mind: 96% of the time cars are parked. When the owner of the car does not use it, it would be better for the cars to be used by someone else, instead of these people buying a new car. As a result, fewer cars need to be produced. The idea of having a private car and sharing them can be made more specific than they do now. At the moment they just provide a platform to give people the opportunity to share their car, this is a quite general way. You can say your car is available and than see requests coming in from people you know but also from strangers. Lynk & Co is unique because of the sharing of a private owned vehicle with everyone. There are a lot of other different organisations that provide car sharing services (for example GreenWheels and MyWheels), but these cars belong to organisations and thus there is no big worry of how people will use the car. This is different from Lynk & Co, where privately owned vehicles are shared.

Key stakeholders are Lynk & Co itself, as seller of the cars, and contact person for users in case of questions and complaints. Then there are the owners of the 01, they drive their car and want their own car to look good (most of them). As touchpoints, they have the app, which provides connectivity to the car (climate control, charging state and pre-heating) and the sharing platform, also the Human Machine Interface (HMI) in the car contributes to this experience. Next to that there are the borrowers of the cars, they use the car from someone for a certain time. Other stakeholders are cities and public areas. They provide for example parking spaces, and they determine which cars can enter a city and where sharing vehicles can be parked, so they create regulations. Next to that, companaies that design and place charging stations are also stakeholders, because the shared vehicles are plug-in hybrid or fully electric. So, in order for the user to borrow the car they also use their products. At last, there are other road users/travellers (potential users), who participate in traffic and come across the shared vehicles.

space available for images / figures on next page

Initials & Name T Hogeveen Student number 4869893

Title of Project Influence of cognitive and sensory ergonomics on private car sharing

introduction (continued): space for images

image / figure 1: The Lynk & Co 01.

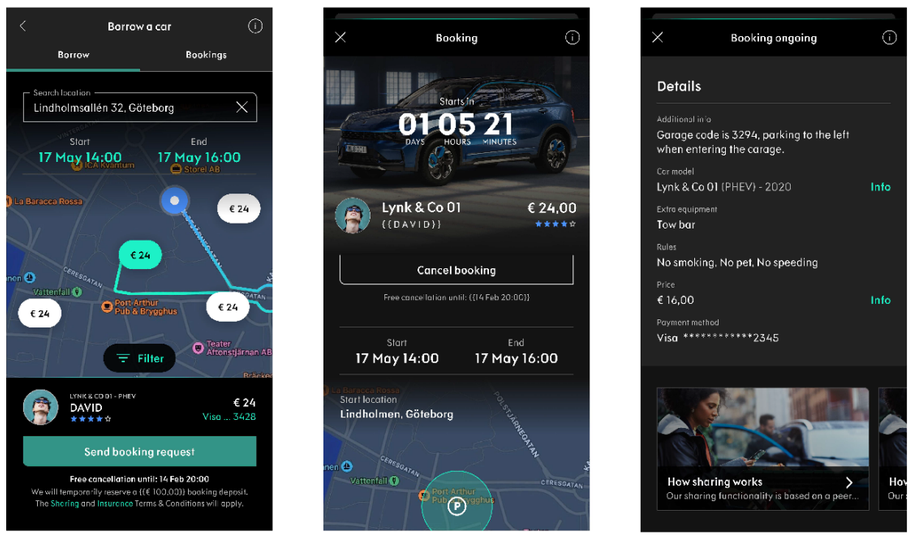


image / figure 2: Current screens of the Lynk & Co app (sharing platform).

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The problem is not necessarily the sharing platform itself, as this idea has proven to work. However, not enough people use this sharing function of sharing their private cars, currently around 19% of all users. Lynk & Co wants to focus more and more on this sharing part in the future. So, what are the reasons for the people to hold back from providing their car to be shared and how to engage and tempt more users to use this function?
Next to that, the Lynk & Co 01 is not really designed to share. Not for the owner but also not for the borrower. The car comes with a lot of (digital) touchpoints (screens in the car, the HMI, the app, charger), but they are designed for the main user. Getting in as a borrower provides you with the same information as some one who ownes the car, it's very general and this could be more user focussed.

In short, this is a problem from two sides: with the main problem being the owner who has concerns about lending their own car to someone they don't know and the people who lend the car are put off by the complexity of the system. During my research I suspect to find out what holds back owners of the 01 and what can motivate them to use private car sharing. This way I will find what to design and prototype during this project.

The scope is limited to the Dutch market, because this market is easier for me to test and this is, in terms of volumes, their biggest one. Furthermore, the design scope is to design a future (5 years) vision for Lynk & Co with different approaches on sharing, and physical/digital solutions to encourage users to use sharing. There are no real limits from the company about the outcome they want. However, since I'm a part of the digital experience team the outcome has to have some digital aspects. At last, the to be designed solution must take into account the brand values of Lynk & Co, user needs, different types of sharing and their future portfolio.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

I will research the current sharing platform experience for both borrower and private car owner, to find out what's holding back people (lenders and borrowers) to make use of car sharing. I will use this information to design and create a product-service combination, with a plan for different types of sharing, translated into the digital and maybe physical touchpoints for the user to encourage and persuade them to make use of sharing.

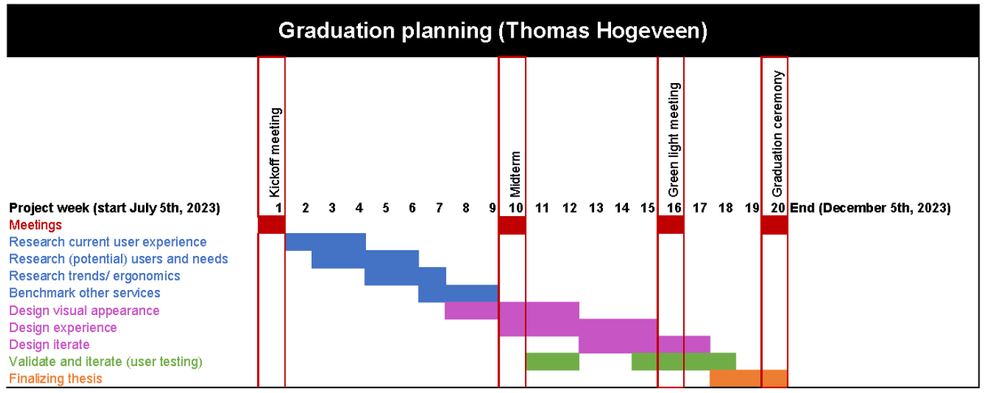
The type of solution I expect is a product-service combination. This solution should a physical prototype with the digital aspects included. Next to that, it should include a future vision for Lynk & Co, with solutions on how to get more people to use the sharing function. As mentioned in the 'problem definition' I expect to find my design challenge, during my first research. However, a good starting point would be to dive into the current journey and use their current touchpoints. How are these touchpoints perceived and how do people interact with them: the cognitive and sensory ergonomics.

I want to make the car/service more focussed on sharing instead of just a regular car. What I am going to design and prototype is a product-service for the (digital) touchpoints, which might consist of the charging stations, parking spaces, the app and parts of the Human Machine Interface (HMI). This is something I have to find during my research. When I found it, I can prototype different solutions with the car and mimick the whole journey for the car holder and borrower.

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 4 - 7 - 2023 5 - 12 - 2023 end date



This planning is made in Excel. I copied the same planning to Asana, a task tracking program. Via Asana I can add more detailed tasks, which are than automatically placed in a Gantt chart, that adapts accordingly. I will also invite my chair, mentor (TUD) and mentor from Lynk & Co to this, so they can also keep track during the project (if they think this is needed). The end date is December 5th, which extends the 100 working days. So, I have to take some days off during the project. They are not shown in this planning, as I will take sometimes some days off when needed.

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

In my further career I want to work within the mobility sector, Lynk & Co is not a normal car company. But a company that provides a fresh view on mobility. I have a huge passion for cars, but I also see that the cars as we know them now are not ready for the future. As a designer, it is very interesting to explore and see how cars can play a role in the future. Travelling from A to B by public transport alone is still impossible to most locations. Besides, many public spaces and places are built with the car in mind. Instead of wanting to ban the car everywhere, and pushing people in public transport or shared cars, we can also look at how car sharing can help provide a seamless journey: Mobility as a Service. I think Lynk & Co is an interesting player here, as they have already taken a different approach to the concept of a 'car'.

Besides that I want work with User Interface (UI) and User Experience (UX) design. Therefore, this project at Lynk & Co fits perfectly within my interests. With this project, I want to showcase my UI and UX skills within Figma and definitely expect to improve them during this period. Think of these skills as, using personas and customer journeys and investigating how the visual design of (digital) touchpoints can contribute to easing the complete experience. This also relates a little to public space design, because the cars are driven and parked in cities. How can touchpoints be designed to be helpfull for the user without distracting or intervening in the public space (one of my interests as well, city design).

With this project, I want to prove for my further career, that I am able to take a broader approach to the concept of a car and mobility. I want to show that I am a product design engineer that takes into account other design topics, such as digital design as well.

During this project I have the following Learning Objectives:

1. Project organisation: Independently lead a complete design project from leading presentations, to performing analysis by setting up user tests and conducting them, designing and prototyping, testing with users and verifying design decisions and asking for help or specifc knowledge when needed. This is normally done in a team, so a real challenge is to do this all on my own.

2. Justify design choices: Being individually able to use the right methods. Justify and verify my choices with respect to used methods and/or approaches used in the project. And being able to adapt the methods where needed.

3. Conducting user tests: Setting up and performing user tests, analysing and interpreting the results.

4. Communication and presentation skills: Effectively communicate to all stakeholders during the project. Meaning keeping the supervisory team up to date and providing the right information, but also being able to explain decisions on such a level that people from outside can understand.

5. Self evaluation: Reflect on my work quality and planning, and use feedback to evaluate myself and my work. And improving my results with this feedback and evaluation.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.