



MORPH

MOBILITY • OWNERSHIP • RELATIONSHIP

PERSONALISATION • HOSPITALITY

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Contents

4

Introduction

10

Literature Review

26

Methodology

44

Findings

80

Design Concepts

170

Conclusions



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CHAPTER 1.

INTRODUCTION

In the MORPH project, we looked at how sharing behaviours will influence and form attitudes and decision making around purchasing or sharing vehicles between now and the near future. By using this knowledge, we designed shared spaces in fully autonomous vehicles that are embedded in well-rounded sharing services.

MORPH follows on from our second major project 'Emotional Tech' which explored how creative designs can help realise cutting edge technologies that users accept with special consideration to their emotional transitions during journeys. During the project we were particularly attracted by a mobility trend which may completely reshape vehicle-user relationships, the design of vehicles and the mobility market - the 'sharing economy'.

The Economist (2018) suggests that 'the total number of vehicles on the roads could have halved by 2050, UBS predicts by 2050 urban car ownership will fall by 70%'. Car driving as an aspiration is declining: while 83% of English men in their twenties held a driving licence in the early 1990s, in 2014 the equivalent figure was 63% (Metz, 2016). Average car users save an estimated £380 per month when they switch to car sharing (Botsman & Rogers, 2011). Carpooling is the second-largest commuter transportation system in the United States. It accounts for one-eighth to one-sixth of work-related trips (Benkler, 2004). Complementing this shift from owning things to using services is an increased emphasis on the value of experience and the growth of an 'Experience Economy' (Pine and Gilmore, 1998). However, some studies show that there is a gap between people's attitudes and behaviour in similarly motivated sharing activities (Hamari et al., 2015).

The MORPH (mobility, ownership, relationship, personalisation, hospitality) research project was set up to answer questions that have been lingering in the future forecasting of mobility design and monetisation strategies for many manufacturers and industry pioneers including:

Mobility – What types of vehicles would fit if a sharing economy happens at scale in the automotive industry, what are the implications for vehicle design and service innovation, and how will it interact with the growth of autonomous vehicles?

Ownership - How would vehicle and service design be affected when customers move from owning vehicles to sharing vehicles?

Relationship – How will the relationship between user-vehicles and user-brands be reshaped?

Personalisation - How might vehicle design consider the use of personal data, interior materials, and customisation for different individuals during short-ownership periods?

Hospitality - What can vehicle manufacturers provide so that end users feel more connected with the brand? What new products or services can be created to enhance the sense of hygge/cosiness in the context of one's mobility choices?

In the MORPH project, we looked at how sharing behaviours will influence and form attitudes and decision making around purchasing or sharing vehicles between now and the near future. By using this knowledge, we designed shared spaces in fully autonomous vehicles that are embedded in well-rounded sharing services. We encouraged vehicle designers to work back from the preferred future of shared autonomous vehicles to define two milestones between 2020 and 2060 and visualise the transformations in shared interior designs in line with the defined year (see the Transition Roadmaps in Chapter 5 Design Concepts in 5.1.5, 5.2.5, 5.3.5, 5.4.5). The milestones represent our thinking of how the drivers' role is replaced step-by-step, and how to help build the trust between passengers and the vehicles and the whole brand ecosystem .

1.1. Key research findings

We summarised key findings from our literature review of over 70 different publications, from 351 online survey answers and three interactive workshops with 15 participants as well as from our concept design process.

Building trust between vehicle/brand and users

Trust must be built between the user and the product, and among users while forming temporary and long-term product relationships. We investigated what are people willing to share and with whom in our surveys and workshops in order to find a buy-in point for potential shared mobility users. The study shows that people are inclined to trust people they know when sharing more personal possessions but would widen the pool to others when sharing less personal items. Trust levels are highest for family members, followed by friends, co-workers, and neighbours with the least trusted group being top rated users (those that are highly regarded by the service or others). Therefore, providing shared vehicle space and services that are designed to facilitate and maintain trust would be a key for creating new vehicles and services for shared purposes.

Creating an integrated experience

The importance of brand relationship increases as value creation moves away from individual products towards the experience provided. Staying relevant to users and building identity through brand engagement is therefore key in a fast-changing market place. The majority of our research participants mentioned that convenience, access and low cost are the most important motivations for choosing to use shared vehicles. Vehicle services that can make an individual's journey easier and link them to other activities before, after and during vehicle journeys would provide an integrated experience and therefore be more welcomed. Design strategies should focus on integrating in-vehicle features with services where appropriate to users according to preferences they provide.

Designing for personal customisation and social interactions

Our study shows that people have different requirements during journeys - some do not feel entirely at ease sharing rides with strangers, some want privacy and others prefer to interact with people. Vehicle and service designs that consider different needs or provide flexibility to let users rearrange their space would be ideal. The

choices of material, data connection or disconnection, and modular vehicle components are key elements that vehicle manufacturers might find critical when exploring shared vehicle innovations. A design strategy should be considered to give the choice back to customers when deciding what type of shared vehicle space they would like to hire for a specific type of journey and purpose, and their mood at the time.

Exploring non-monetary sharing market opportunities

Vehicle sharing started as a non-monetary community activity, and was later adopted for various business models. Looking back to the non-monetary models may help identify market niches, and new services that could build on the current customer journey. We looked at community activities and family vehicle sharing behaviours and found that lots of interior features can be redesigned for a family shared car in order to better fit the use of the car into each family member's schedule. Other services include apps to help schedule the use among family/community members, check other passengers' preferences to leave the car in a desired condition, and to link car use schedules with personal schedules to sync the activities.

Taking care of passengers' physical security concerns and emotional needs

Our study shows the concerns people have with using shared mobility schemes are mostly about personal safety, with the percentage increasing when there are a majority of female participants participating in the surveys. Emotional durability (Forlizzi, 2003) was addressed in past studies and in our Emotional Tech project. We found that users' emotions should be considered when a product (such as a car) can be used by multiple people (at the same time) to ensure each user has a positive experience. Physical security concerns can be very much influenced by a passenger's emotional feedback from the vehicle environment, the purpose of the journey and the other passengers. When designing shared vehicles and services, considering passengers' emotional needs in terms of eliminating their physical security concerns needs to receive more attention.

1.2. Concept designs

Following user investigation studies, we identified four design opportunities we would like to explore further with creative skills such as designing and visualising vehicle interiors and service touchpoints. The concept design phase is the core of the research project because it translates key research findings into concrete ideas through planning detailed vehicle spaces, user-vehicle and user-user interactions, and services to create a holistic experience for vehicle sharing customers. This designerly making is represented by defining problems, materialising concepts, and visualising actionable plans from the concept design research phase. The concept design phase was conducted as a scientific research process identifying key user problems, generating solutions, exploring solutions

with visual demonstrations and verifying solutions through repeated discussions amongst researchers, vehicle designers and service designers.

The final concepts represent four specific vehicle design directions according to the key research findings mentioned in 1.1, with identified persona and scenarios as well as detailed in-vehicle interaction presentations. We tried to make the concepts as concrete as possible so that audiences can look at, feel or even touch them (by using two interactive app demos) and understand the design opportunities they present. We gave a name, a tagline and a short paragraph to introduce each concept and describe their key features and unique functional attraction.

NANO

Shared vehicles, safe spaces

Four seater secure morphing pods

NANO shared taxi service with morphing interior design takes care of passengers' emotional needs and physical security concerns. Enclosure materials and flexible interaction modes improve passengers' trust of the vehicle, other passengers, service and brand.

ENROUTE

Mobile personal premium workspaces

A private desk and meeting space for two

A company leased vehicle for executive employees to work and meet clients on the go. The service customises interior modules according to the users' work requirements.

MOSEY

Communities on the Move

Thirty people in a high speed mothership relaxing in single and four seat last-mile pods

This high speed mothership transporting low speed interconnected pods provides social areas and private spaces for intercity journeys and door-to-door service. Long journeys become more comfortable thanks to a range of personal interaction choices plus the convenience of this local taxi-like service.

SPAREVROOM

Multi-use family vehicle/living space

Adjustable spaces for family use at home and up to three on the move

As an extension of the family home, the vehicle provides a detachable mobile space with an adjustable interior to suit the needs and schedules of all the family. The interior can be customised to serve the needs of home, work and social life.

1.3. Key future research directions

Throughout the entire research journey, we investigated shared mobility trends via end users' perceptions of accessibility, inclusivity, interactivity, privacy, security, and trustworthiness when choosing whether to use shared vehicle services or not. The fact that most users want an affordable and high-quality experience pushes us to think beyond current cutting-edge technology offerings such as self-driving, self-parking and platoons. Divisions, seat arrangements, and supervision of passengers by drivers are traditional approaches to make passengers feel safe and comfortable. What design features should be considered when vehicle technologies are improving and passengers' behavioural patterns may change? The project set out to explore passenger motivations and concerns about sharing vehicles with others as well as actual sharing behaviours and future expectations. New vehicle design and service proposals have emerged during the research and they present future directions for designing autonomous shared vehicles and services. We summarise four future research directions that can inform novel design opportunities for car manufacturers and mobility academics.

Exploring materials for morphing interior design

The NANO concept explores interior designs to actively encourage passengers to comfortably share a journey with strangers, giving users options for interacting with each other or isolating themselves as they prefer. The vehicle has four doors to allow access to each passenger seat independently, and the seats' material was defined to be flexible, extendable and is able to be arranged by users. Future exploration of materials which can make people feel safe in a small room but still provide connection with the outside space may prove of interest.

Designing flexible space arrangement

In the MOSEY concept, different seat arrangements were experimented with by considering luggage storage, communal areas and a quiet zone in a large high-speed vehicle. According to our user study, individuals have different preferences about using seats and shared spaces when on different types of journey. There is a need for more design attention that provides flexibility for users to be able to arrange their seats and surrounding space. These design opportunities can be prototyped on current train or subway interiors.

Meeting demands for personal customisation

In our user engagement workshops, we asked the participants to draw their expectations on a vehicle floorplan and compare them with their current car layout. The most frequent aspect they addressed was customisation for specific purposes and types of journey / activities / personal behaviours. We explored this topic in the ENROUTE project with a corporate car sharing scheme where certain parts of the vehicle have modular sets of equipment and configurations to fit with the users' in-vehicle activities. Additional opportunities could be explored for economy and premium services.

Looking for design opportunities for community sharing

Our SPAREVROOM concept presents a family shared vehicle interior design and a mobile app to arrange activities and availability around a family's daily schedule. Our research shows that there should be more business opportunities for community sharing where new types of rating systems, new service models and vehicle sharing space for group interactions should be further explored. Especially post covid-19, people are mostly happy to share only with someone they know and trust. Therefore, sharing with acquaintances (family was the top choice in our study) might be preferred to strangers.

CHAPTER 2.

LITERATURE REVIEW

We started our research process by conducting a literature review into the shared economy and more specifically into shared mobility. We looked at academic articles, industry reports and media coverage in order to investigate its evolution and growth. Our review consulted over 70 different publications. We summarised the content of each, detailing key points about the sharing economy and shared mobility to inform us of future directions that we could explore in the design phase.

“Sharing economy businesses have emerged in recent years as a disruptive approach to the traditional way of planning, modeling and doing business.”

(Muñoz and Cohen, 2017).

2.1. Sharing economy

The term ‘sharing economy’ or ‘collaborative consumption’ describes a situation in which strangers share idle assets through enabling technology and platforms in ways that produce economic, environmental, social and practical benefits (Rinne, 2018). Sundararajan (2016) argues that three main technological developments have enabled the emergence of the sharing economy, these being: 1) the ability to render physical things (money, music, manufacturing processes) as digital information, with 2) increasingly powerful and compact hardware and 3) the spread of modular software applications that build on each other. Most sharing economy platforms have some common technology-enabled features, they are available as mobile apps, they allow cashless transactions, they allow sellers and seekers to rate each other and make those ratings available to both and they use dynamic pricing to adapt to supply-demand changes (Narasimhan, et al., 2017). Several sharing services operate outside of traditional economic structures and as such are not bound by regulations, which could give rise to legal conflicts. Insurance is one example of how peer-to-peer rental services are running into regulatory barriers (The Economist, 2013).

There are two types of product service systems: usage product service systems and extended-life product service systems (Botsman and Rogers, 2011). Usage product service systems describes when a product is owned by a company or individual and multiple users share its benefits through a service. Typical scenarios are when the product is idle or not in use for long periods such as cars or household tools; when the product has limited use due to changes in fashion trends or seasons such as clothes or accessories; or if the item fulfils a temporary need such as equipment needed for a baby or child at different ages; or when the product diminishes its appeal and value after use such as a watched film; and when high start-up or purchasing costs for products are the barrier to entry as with solar panels. Extended-life product service systems describe when an after-sales service such as maintenance, repair or upgrading becomes an integral part of a product’s life cycle, which reduces the disposal or replacement, such as electronic goods or furniture.

Human behaviour and technology trends indicate that “the idea of renting from a person rather than a faceless company will survive, even if the early idealism of the sharing economy does not” (The Economist, 2013). Botsman and Rogers have interviewed business leaders and opinion formers around the world to draw together the many strands of Collaborative Consumption into a coherent and challenging argument to show that the way we did business and consumerism in the 20th century is not the way we will do it in the 21st century (Botsman and Rogers, 2011).

2.1.1. Sharing products and services

In the literature review we were interested in exploring who people want to share what with, when and in what context. We also inquired what the boundaries of sharing are in relation to the idea of the extended self, identity, trust and ownership. We intended to find out how the sharing economy had changed the relationships people have with products that they previously would have owned and now rented, lent or borrowed from service providers and people they know or do not know. In buying a product the owner is committing to a brand, including what that brand extension is and how the brand is perceived. To others the brand communicates the owner’s status in society connected to their perceived lifestyle, financial position, social status and aesthetic preference.

The relationship between physical products, individual ownership and self-identity is undergoing a profound revolution. “We want not the stuff but the needs or

Information and communications technologies have enabled the rise of so-called “Collaborative Consumption”: the peer-to-peer-based activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services. (Hamari, et al., 2015). One of the earliest proponents of open source software, posited that open source technology could mitigate the ‘tragedy of the commons’ - the idea that when we act solely in our own interest we deplete the shared resources we need for our quality of life - through what he termed ‘commons-based peer production’ (Benkler, 2002).

experiences it fulfils, we can show status, group affiliation and belonging without necessarily having to buy physical objects.” (Botsman and Rogers, 2011). Not owning products allows people to have more flexibility of what they choose to use at any one time without being committed to one product or service. They can reflect their identity in various ways for different occasions such as hiring a small vehicle for short trips or a larger one for family excursions or a high-end model for special occasions. Russell Belk’s theoretical review distinguishes between sharing in and sharing out, and suggests that ‘sharing in’ extends ‘the circle of people who can enjoy the benefits of the shared resource’ while ‘sharing out’ is seen as ‘dividing a resource among discrete economic interests’ which doesn’t involve expanding the extended self (Belk, 2010). People are willing to share more, more important and more private things with others whom they consider to be part of their extended self.

“Shared mobility is changing the traditional transportation industry, as it has the disruptive potential to create a shift towards social, environmental, and economic efficiency through the use of technology.”

(Soares Machado, et al., 2018).

2.1.2. Motivations for sharing

We questioned what motivates people to share, perhaps for financial or environmental reasons, or not wanting to be responsible for or feeling burdened by ownership of products, or the flexibility that can be enjoyed by doing so, or desiring to be part of a community. Looking at the literature we found that people have intrinsic motivations for sharing - value or enjoyment related to the activity - or extrinsic motivations - external pressures such as reputation and monetary gain. Phipps et al. (2013) suggests that there are four key motivations, two intrinsic and two extrinsic, which we have listed below:

- » **Sustainability** - “optimises the environment, social and economic consequences of consumption in order to meet the needs of both current and future generations” (intrinsic).
- » **Enjoyment** - autotelic nature of the activity or the enjoyment derived from the activity itself for example: software developers contribute to open-source projects as a result of enjoyment and a feeling of competence (intrinsic).
- » **Reputation** - determining participation in communities and other online collaboration activities, gaining reputation among like-minded people has been shown to motivate sharing in online communities and open-source projects (extrinsic).
- » **Economic** - future rewards, economic benefits, or saving economic resources, saving money and time (there are signs of both positive and negative influences of economic incentives on sharing behaviour (extrinsic).

However, there is a gap between people's attitudes and behaviours in similarly motivated sharing activities (Phipps et al, 2013).

- » Sustainability significantly influences people's attitude but doesn't have a direct association with behavioural intentions.
- » Enjoyment has a significant positive effect on both attitude and behavioural intention to participate in collaborative consumption services.
- » Gains in reputation doesn't significantly affect either attitude or behavioural intention to participate in collaborative consumption services.
- » Gain of economic benefits doesn't have a significant effect on attitude but does have significantly positive direct influence on intention to participate in collaborative consumption.

Our research focused on the real motivations that can drive people to become a shared mobility user who enjoys sharing. Tacit expressions about what they like or not, why they are willing to accept or are against the current sharing systems are the key indicators for us to follow.

2.1.3. Automotive applications

The positive benefits of the sharing economy include: the increased use of underutilised products and resources, a sense of being part of a community, supporting sustainability, a more democratic distribution of access to products and services that previously may not have been accessible for some people. For those employed in sharing economy ventures they can feel more liberated and choose when they want and are available to work. However, there appear to be several negative aspects related to current models of the sharing economy, which include concerns over issues such as changing local infrastructures and cultures caused by platforms such as Airbnb and Uber. From an employment aspect there is the potential for the loss of jobs, lowering of wages, additionally as workers are treated as independent contractors not employees they have less rights and fewer benefits such as holiday and sickness pay. There may be discrepancies in the quality of the service or product due to lack of regulations which is one reason why it has been described as 'disruptive'.

We were particularly interested in the influence these factors may have on existing vehicle sharing schemes and how they may evolve in the future. A significant factor that has contributed to the rise in the sharing economy is enabling technologies and new technological developments. The coordination of big data, platforms that connect people and resources, social networks and geo-tracking have supported and driven this rise. The automotive industry has gained speed on implementing these technologies in producing new vehicles but very few have done so for exploring shared vehicle spaces and services.

We also questioned how mobility sharing and the design of vehicles may develop with the implementation and acceptance of autonomous vehicles. What would the future directions be? Will there be a place for non-monetary, community based systems or services? Will autonomous vehicles operate as shared resources? Will a business-to-business coordination of resources, waste, skills and tools emerge? Will symbiotic relationships be coordinated by a smart platform?

2.2. Shared mobility

We wondered if the sharing economy will happen at scale in the automotive industry and, if so, what impact that will have on the design of vehicles and service innovations. We grouped the relevant literature findings under the themes

of the MORPH project: mobility, ownership, relationship, personalisation and hospitality. This enabled us to begin to build an overview of the current situation that could indicate design directions for the project.

2.2.1. Mobility - the current situation

Individually owned vehicles are often underutilised. Research from Botsman and Rogers states that the average car is unused for twenty-two hours a day, noting that even when it is being used there are normally three empty seats (Botsman and Rogers, 2011). A UK government study shows that 96% is the average proportion of time that a UK car is parked (UK Government Office for Science, 2019). This might indicate a huge potential for a dynamic shift to vehicle sharing. We found data that indicates that the most prominent sharing services are those based around accommodation and cars (The Economist, 2013). Additionally, that carpooling is the second-largest computer transportation system in the United States and accounts for one-sixth to one-eighth of work related trips (Benkler, 2004). Autonomous vehicles are already being road tested. The Economist suggests that the first self-driving vehicle you ride in will be shared, not owned (The Economist, 2018).

For every shared vehicle between nine and thirteen private cars are removed from the roads, either by members selling their personal vehicle or postponed automotive purchases. For some people fiddling with engines is half the fun but for most people the maintenance, cleaning, registration, repair, insurance and parking are an expensive chore. The American Automobile Association estimates that on average Americans and Europeans spend approximately 18 percent of their income (or \$8,000 a year) for one person to drive a medium-size car. That is more money than the average family spends on clothing, health care and entertainment combined. Average car users save an estimated £380 per month when they switch to car sharing (Botsman and Rogers, 2011).

“This new economy is reshaping society creating more decentralized systems, and raising questions about how to build trust within them”

(Sundararajan, 2016)

2.2.2. Ownership - behavioural changes

We looked at the difference between sharing vehicles and the feeling of owning one's own vehicle and found that there is an emerging generational trend that indicates that young people are losing their interest in car ownership as being important to their self-definition. They find car purchase, maintenance, and parking to be prohibitively expensive and increasingly would rather not have the hassle (Belk, 2013).

A behavioural analysis indicates that there is a gap between people's attitudes and behaviour in similarly motivated sharing activities (Hamari et al., 2015). In the 20th century humanity consumed products faster than ever with many

people seeing their car as an extension of themselves (Botsman and Rogers, 2011; Belk, 1988). Furby (1980) suggests that humans develop a stronger sense of self by learning to actively control objects in our environment rather than feeling controlled by them. Control or mastery, creation, and knowledge, are activities that connect humans with objects and to make them part of extended self. Clothing (Solomon, 1986), housing (Jager, 1983) and automobiles are all acquired as a 'second skin' in which others may see us (Belk, 1988). Facilitating the growth of the sharing economy are trust, technology platforms and the trend to avoid the ownership of assets (Standing et al., 2018).

2.2.3. Relationship between user, vehicle and brand

The importance for automotive brands to build and maintain a relationship with their customers in the future of vehicle sharing will be critical to ensuring their longevity. We questioned how the relationship between user-vehicles and user-brands can be reshaped from a user-vehicle point of view. From a user-brands point of view, reputation systems to help services build trust with their customers are vital to sharing models. All sharing services rely on ratings and reciprocal reviews to build trust among their users (The Economist, 2013). Providing a secure platform for financial transactions is critical but creating a trusting community is just as important to attract users (The Economist, 2013). Potential barriers to using sharing services are over-regulation, inconsistent quality of service and the need for recommendation (Standing et al., 2018)

We found that business-to-consumer car sharing companies seek to develop relationships with the cities they operate in to obtain preferential parking spaces at a discount or for free, reduce tolls or to be able to use high-occupancy vehicle lanes (Cohen and Kietzmann, 2014). Belk (2013) suggests that companies should regard changing technologies and environmental trends as bringing opportunities rather than threats; they should be asking themselves "How else can the consumer acquire and use the types of goods or services I currently provide and how might I innovate to capitalise on these possibilities?".

2.2.4. Personalisation - connecting individuals to integrated services

We have already discussed a new generational trend emerging where people do not feel compelled to own possessions to endorse their identity. However, automotive companies still need to connect on a personal level with their users, which could be through the use of personal data. During short-ownership periods there is a connection when the user is active with the vehicle or services, but periods of disconnection when they are not using them. We considered how vehicle design could use personal data to address this.

Location sharing services that allow users to check-in using GPS-enabled devices create a lot of data that can be used to determine behaviour and travel patterns (Chen and Schintler, 2015). Through internet technology development businesses can connect with their users and gather data that they can use to target them in a personalised way. The data collected by companies from the purchase or services people use, allows for products and services to be increasingly 'tailored' to fit the individual context of each

user. There is an increasing resistance among consumers to their data being shared and used beyond their control. A recent survey found that 91% of respondents were concerned about the amount of data that companies can collect about them (Microsoft Corporation 2020:6). Van der Klauw (2019) suggests that lack of trust is the principal barrier to the growth of the Internet of Things, while Privacy International (2019) shows how the economically disadvantaged are at greater risk of their data being illicitly harvested.

As the online brands we used to define 'who we are' and 'what we like', actual ownership becomes less important than demonstrating use or use by association. We can now show status, group affiliation and belonging without necessarily having to buy physical objects. Our relationship to satisfying what we want and signalling who we are is far more immaterial than that of any previous generation (Botsman and Rogers, 2011).

2.2.5. Hospitality - communicating service features with users

We considered how hospitality could influence and encourage people to use mobility sharing services. Roe's research into car clubs conducted expert interviews with service designers in order to evaluate the role service design might play in enticing more people to consider the use of such mobility services in the future (Roe, 2017).

One of the issues is trust for the users in the systems and in sharing with others whom they do not know. For a brand to build trust with their users the experience of the user is critical. This can be enhanced by the development of

experientially transferable design - products that can move between users and users without negative consequences (Baxter et al., 2017). Experientially transferable design considers emotional durability but also the resilience with which a product can be used by multiple people and maintain a positive (or at least neutral) user experience. An example of this is seen in cars which adjust mirrors, seat positions, radio stations and other settings to suit a specific driver helping develop feelings of ownership and personal space (Baxter et al., 2015). This assisted personalisation helps car sharing users have a more pleasant experience

2.3. Project positioning

To explore our themes (mobility, ownership, relationship, personalisation and hospitality) and ideas for the future of shared mobility we investigated the development of mobility services that have been operating in recent

2.3.1. Emerging sharing services

New shared mobility models currently operate using apps and rating systems which were created by technology companies using existing vehicle models. Examples are ride-hailing and car pooling (BlaBlacar, Didi, Uber, UberPool and Zimride), bus-taxi hybrid (City Mapper's 'Smart ride'), car rental club (Zipcar) and peer-to-peer car rental (Turo and Getaround - previously Drivy). Cohen and Kietzmann (2014) discuss existing shared mobility business models to try to establish the optimal relationship between service providers (agents) and the local governments (principles) to achieve the common objective of sustainable mobility.

City Mapper's 'Smart Ride' is a bus-taxi hybrid in London and other cities. The vehicles accommodate eight or fewer passengers whilst the route is free to change dynamically as demand shifts. The eight seater people-carriers are driven by licensed drivers and operate in a fixed network across the city. It is a bus because it has designated stops, and it is a taxi because you can require it to come over at any agreed time.

Turo is a car sharing marketplace where guests can book any car, wherever, from a community of hosts across the

years, additionally how the automotive companies have responded and are responding by creating mobility services and ultimately by designing new vehicles.

US, Canada, UK and Germany. Guests choose from a unique selection of cars in close proximity. Hosts earn money which offsets the costs of ownership.

Getaround rent cars sourced from private owners and fleet managers. Their app allows users to find a car next door, open it with their smartphone and drive away.

Ola is an online transportation network company of Indian origin. It offers taxi services as well as private hire comfort vehicles for up to four people and comfort XL for up to six people.

The Volkswagen Group invested in Gett (previously GetTaxi) which is a transport company that links business clients with ground travel services globally through software as a service (SaaS). The single end-to-end booking platform connects users with on-demand ride-hailing, taxi, chauffeur or limousine services.

The Addison Lee group offers business-class car services, courier services and coaches. Starting as a minicab service in London it has expanded across the UK and globally to over six hundred locations.

2.3.2. Shared mobility services from automotive companies

The automotive brands have responded to this shift in mobility services driven by technology companies by developing their own shared mobility services. They have diversified their offer by providing products and services that support their customers lifestyles, such as; ride-sharing and ride-pooling on-demand (eg. MOIA +6, launched in 2016), ride-hailing, autonomous electric robotaxis (Tesla plans to offer this with all vehicles built since 2016, and Renault plan to offer this by 2022 with the EZ-GO but are already trialling this idea with their autonomous Zoe prototypes), smart, high performance, autonomous electric vehicles rented by the month (e.g. NIO EP9, launched in 2016), mobility as a service (Toyota connected with a car-sharing service called 'Hui' in Hawaii, USA and 'Ha:mo' an ultra-compact EV-sharing service offered in Japan and Thailand) and sustainable urban mobility services such as DriveNow offered by BMW and MINI with a fleet of their latest models.

Ford's 'Chariot' was an app based flexible bus or van service that had variable stop off locations and routes. It operated across a range of cities for 5 years before being discontinued in 2019 after more than three million rides. The company intended that it would reduce congestion, ease commuting and improve the quality of life in cities. MOIA is the newest company in the Volkswagen Group

launched in 2016, which was set up to redefine mobility for people in urban areas. It is an independent company not an automotive manufacturer or a pure-play car-sharing provider; it is a mobility service provider. Its focus is on the in-house development of IT-based on-demand services such as ridesharing and ridepooling.

Renault has invested in the ride-hailing services Marcel, Karhoo (a reservation platform that combines taxi and ride-hailing services) and Yuso which is a fleet dispatch management system. They have also partnered with car-sharing service providers GreenMobility and ZITY. Renault Mobility is a car rental service and Moov'in is an electric car sharing service. Renault is also exploring technical areas through their partnership with Transdev with tests using Zoe vehicles as well as within Paris Autonomous Lab with Zoe Cab.

2.3.3. Shared mobility design

With the shift towards autonomous technologies and the acceptance of shared mobility, an opportunity exists to significantly redesign vehicles especially their interiors and services. Automotive companies are further responding to this trend by developing concept cars that address the potential for different activities to be conducted in vehicles when they are autonomous. Without the need for a driver the interior space is liberated and can be configured to allow passengers such as families or business people to interact in various ways when travelling.

IDEO has designed a four pod sharing self-driving concept car intended to be used by people in the same neighbourhood on their commute. Those who prefer to have quiet time on their way to work would set their interior pod to quiet mode, whilst noise cancelling technology would keep single seats quiet enough for short naps. Acoustic amplification would mean passengers in neighbouring seats could still chat without disturbing others. Imagining the future of commuting the vehicle can be hailed like an Uber through an app.

In 2017 Honda unveiled NeuV a concept car with artificial intelligence that would have the capability to autonomously pick up and drop off other local passengers when the driver

isn't using it. They intended it to offer insight into how the popularity of artificial intelligence and sharing economies will influence the future of the transport industry and how it may influence car ownership. Its AI assistant, called an "emotion engine" by Honda, can learn from the driver and detect emotions based on their actions, subsequently suggesting music based on the driver's mood.

Lynk & Co launched their "ultra connected" sport utility vehicle in 2018 to target the sharing economy. The idea was to allow the vehicles to be accessed through digital rather than physical locks making them more shareable.

Project Vector concept vehicle by Jaguar Land Rover demonstrates the company's vision for an autonomous, electric, connected future for urban mobility. The cabin space allows for different seating configurations for private or shared use and for commercial applications, such as last mile deliveries.

Renault MORPHOZ is a concept car aimed at personal and shared mobility users. It is electric and modular with an interior space that encourages interaction between the users.

Lavieri and Bhat (2019) suggest that “Travel time added to the trip may be a greater barrier to the use of shared services compared to the presence of a stranger”. With an autonomous vehicle future on the horizon the potential to use travel time productively may help overcome this barrier.

2.4. Identifying potential design directions

From the research we identified four areas that offered potential opportunities for vehicle design directions. These are: comfortable sharing mobility spaces, mini sharing mobility spaces, family sharing mobility spaces and business sharing mobility spaces. We then looked to find examples of concept vehicles as well as other modes of mobility, such as airlines and trains, that addressed these areas and which could have transferable design elements.

2.4.1. Comfortable spaces for multi-modal communities

Airlines offer different levels of comfort for sharing travellers, offering basic seating provision and space for passengers in economy, with more luxurious and spacious areas in business and first class. PriestmanGoode's interior cabin design for Air France's La Premiere suites (2014), for their Boeing 777 - 300 aircraft, provides individual suites for travellers within the shared mobility space. These multi-use suites each have a private wardrobe, under seat storage, a comfortable seat and footrest that converts into a bed. Additionally, there is on-screen entertainment, console storage and lighting options.

2.4.2. Mini sharing mobility spaces

In 2019 Citroën showcased their Ami One Concept. It is an ultra-compact electric concept car which could potentially be used by unlicensed drivers as its top speed is only 28mph. It is intended that it would be available on-demand through an app for trips ranging from five minutes to five hours. It has a range of 65 miles and could be charged at home or at charging stations. In 2020 Citroën launched the ami as a production vehicle available to lease, purchase or rent under its Free2Move initiative, where it can be hired by the minute.

2.4.3. Family sharing mobility spaces

Some mobility providers are creating a 'home away from home' such as Renault's concept car EZ-ULTIMO which is intended for shared mobility, is autonomous, connected and fully electric with space for up to three people. The interior is designed to create an intimate cocoon with the passengers feeling like they are in a living room. The exterior is partially composed of diamond shaped facets that work as a one-way mirror, protecting passengers privacy while being transparent from the inside. Similarly, NIO's electric, autonomous concept car 'Eve' is designed as a living space for up to six people that adapts to the passengers' needs and moods powered by Artificial intelligence.

2.4.4. Sharing mobility spaces for business

Mobility providers are designing the interiors of autonomous vehicles as mobile working spaces. IDEO's WorkOnWheels concept vehicle and the redesigned carriages of the ÖBB Austrian Federal Railway consider the design and function of flexible working and meeting spaces in transportation. The WorkOnWheels interior can be reconfigured on request as a hub to accommodate less or more people and for different work activities. The windows can become opaque to provide privacy or can be darkened when screen presentations are being made. The daytime carriages of ÖBB Federal Railway have family and business berths where passengers can sit together, have meetings and work. A restaurant carriage has multi-use areas that allow for bike and ski storage too.

2.5. Conclusions

A variety of shared mobility options are available today that operate either as independent businesses or are affiliated with an existing automotive brand. They mostly use apps and rating systems to coordinate their vehicles with customer demands. A general consensus is that people have trust issues when sharing vehicles with people they don't know although there are several positive reasons for doing so.

Seven key research themes emerged from the Literature Review:

Firstly, ownership is changing and self-identity is moving from the tangible to the intangible. Ownership has been and still is important to self-identity but it is in the process of changing from buying physical objects to having an enjoyable experience.

Secondly, what is the buy-in point for sharing? With whom do people want to share what, and in what context? Trust must be built, trust between the user and the product, as well as among the users while forming temporary and long-term product relationships.

Thirdly, what is a good fit for mobility sharing? There are different models of car-sharing, peer-to-peer, business-to-consumer and business-to-business each model fits a specific group of users best, and often involves specific car models. Studying features of physical sharing spaces in different scenarios can generate knowledge about what the future of car sharing will be like.

The fourth theme concerns the user-brand relationship. The importance of brand relationship increases as value

creation moves away from individual products towards the experience provided. Therefore staying relevant to users and building identity through brand engagement is key in a fast-changing market place.

As mentioned previously, there are intrinsic and extrinsic motivations for users to participate in sharing activities with the economic and enjoyment benefits currently appearing to be the most important.

The sixth theme is that, understanding what affects decision making for different user groups can lead to a better product value proposition. Vehicle sharing started as a non-monetary community activity, and was later adopted for various business models.

The seventh theme is that looking back to the non-monetary models may help identify market niches, and new services that could build on the current customer journey.

The key enablers of the sharing economy are enabling technology, the internet, personal devices and data processing technologies. Data allows products and services to be increasingly 'tailored' to fit into each individual context but do people know or trust this? The use of personal data in terms of providing connection or disconnection during short-ownership periods seems to be an important topic for future sharing services and how the brands maintain and develop further their relationships with the users through data use and the services that they offer. There are opportunities in mobility sharing to explore customisation for the users as well as the use of materials as ways to connect the vehicle and its users.

CHAPTER 3.

METHODOLOGY

The research project includes five phases: literature review and project positioning, online surveys, user enactment workshops, design briefs creation and concept design. Through conducting online surveys we were able to establish a general overview of people's motivations and barriers to sharing various possessions, services and mobility. The Shared Space and Innovative Services workshops gave us a deeper insight into people's views on experiences of sharing. They gave us tangible examples of a variety of situations the participants had experienced with positive feedback as well as aspects that were of concern to them. This gave us sufficient information to create the scenarios and subsequently develop them into the design briefs. These were then worked on by the vehicle and service designers to fully develop and explore the design and service concepts.

3.1. Online surveys

To allow us to gather a wide range of opinions about sharing from people around the world we created and conducted two online surveys. By incorporating the findings from the literature review we formed the survey questions. The surveys were designed to collect information about what things people were willing to share and with whom, what shared products or services people had used and their motivations for using them, as well as the key benefits or barriers people had regarding vehicle/ride sharing services. The survey questions can be seen in Appendix 1.

3.1.1. Survey participants

The first survey was conducted within the Royal College of Art alumni community with 132 participants. The majority of responses were in the 25-34 age category (73%) and female (65%). This survey was a test to collect initial data for further improvement of the survey questions. We

then updated the survey and sent it to randomly selected individuals using SurveyMonkey with an approximately even spread of ages between 18 and 74, with 219 participants. In order to even out the gender imbalance from the first survey we targeted more male respondents (63%). In both surveys the nationality of most respondents was British living in the UK, mostly in Greater London for survey one (66%) and for survey two there was a wider spread of locations across the UK with most living in the South East of the country. Participants in the first survey were from Europe, Asia, North America and the United States of America. In survey two as well as describing their nationality as British we also had respondents who identified as English, Scottish or Welsh as well as from central and eastern Asia and Europe. We additionally asked the income level of the participants.

3.1.2. Use of shared products and services

participants were asked how willing they were to share certain products or services such as journeys (e.g. taxis, public transport), food and drink, tools (e.g. power tools, hand tools), entertainment (e.g. music), facilities (e.g. gyms, swimming pools), electronic devices (e.g. mobile phones), their bicycle or clothing with someone they know. We also wanted to find out what they were willing to share with people that they do not know so we asked them to select from a similar range of things and rate how likely or unlikely they would be to share these with strangers. We asked them when they had last used a shared product or service and what their motivations were for doing so. They

were questioned as to what shared products or services they had used and they could select from categories that included, public transport, recycling services, taxi services, delivery services, recreational facilities, accommodation services or hiring equipment. We then asked what their motivations for doing so were, whether it was convenience, access, low costs, value for money, environmentally friendly/responsible, for fun, being part of a community/connecting with people, being ethically responsible and 'other' which they were asked to specify. The surveys were undertaken before the 2020 pandemic, so responses were not influenced by it.

3.1.3. Sharing with others

In the surveys we asked participants how willing they were to share things with people they know and people they don't know. Things such as - ideas and knowledge, events and experiences (e.g. going to concerts, the theatre etc.), a journey (taxi service, Uber etc.), music, food, tools, drink and electronic accessories. They were asked to rate how likely or unlikely they were to do so. We asked what their top three barriers were that prevented them sharing these things, were they concerned about cleanliness, safety, privacy, not knowing the people they are sharing with, not trusting the people they are renting to, reliability, it being complicated, liability, cost of repairs, lack of availability or perhaps they just want to own it themselves?

They were questioned whether they worried about their personal data when using sharing services and for what reasons. Did they think their data was being used to target them with advertising, or was being shared with other companies, was not secure, that they didn't like feeling monitored or that sensitive information was being made public. For those who were not worried we asked why they were not, was it because they trust the companies that process the data and the legal system to protect them or did they think that they needed to give away data in order to get better service?

3.1.4. Benefits and concerns of sharing vehicles

Participants were asked what benefits they thought vehicle/ride sharing schemes have. Did they consider them to be better for the environment, a better use of resources, to reduce congestion, be more socially responsible, to increase local community cohesion, offer value for money, to be convenient and accessible, to reduce travel time, to allow them access to unaffordable services or because they could select the vehicle best suited to their needs on each occasion? We asked them what concerns they have regarding mobility sharing, were they worried about personal safety, insurance issues, freedom (not having it when they needed it), privacy, reliability, terms of use (having to stick to a set of rules), personal data security, travel time, travel cost, regulation issues, membership or monitoring?

We questioned them as to what circumstances they would trust using shared vehicles with people they knew. Would they do so if the driver had been vetted to high standards, if all users were part of a regulated scheme, if there were interior privacy screens, if they could use an app to track the journey's progress and it was monitored? And, under what circumstances would they feel comfortable sharing a vehicle if they didn't know the other users, would they need more assurances from the service provider? We also asked them if they would trust a shared autonomous vehicle and what circumstances would gain their trust?

In the first workshop we had three male and two female participants as described and illustrated below. JOB-27(age), owns a car, which he regularly ride shares with a colleague he has also borrowed and lent vehicles to. KYP-24, does not own a car but regularly uses car rental and ride sharing schemes. KS-45, also owns her car, which she has shared with friends and family. She has also borrowed a vehicle and lent her vehicle to others. LH-72, has his own car and also has hired vehicles to drive students as well as sharing driving the vehicle with others. TH-41, has a provisional driving licence but does not own a vehicle. He regularly uses taxi sharing schemes such as Uber with his family.

3.2. User enactment workshops

In order to build on the responses we received from the online surveys we wanted to look deeply into people's views on sharing and hear personal stories of their experiences. We had specific aims for the workshops which were to discover patterns of ownership, patterns of sharing in the community, the frequency of sharing activities and what configurations people would like to have in a shared vehicle interior. To do so we held user enactment workshops which were also part of our research into the sharing economy's influence on mobility design, with the aim to create new vehicle related services and designs. The workshops explored the topics of ownership and sharing in the participants' personal life as well as their car sharing experiences. We intended to understand people's motivations and barriers for sharing as well as find out who they would share with and what they were happy to share.

3.2.1. Workshop participants

The 15 participants for all three workshops lived in London, represented different genders, came from a diversity of backgrounds and were aged between 24 and 72 years of age. Some of the participants owned and drove cars, shared their car with others, had a drivers licence but did not own a car, or did not drive but used ride, bike or car rental and sharing services. After the participants had settled into the space and were seated around a table with the facilitator they each signed the consent forms and were given information about the workshop.

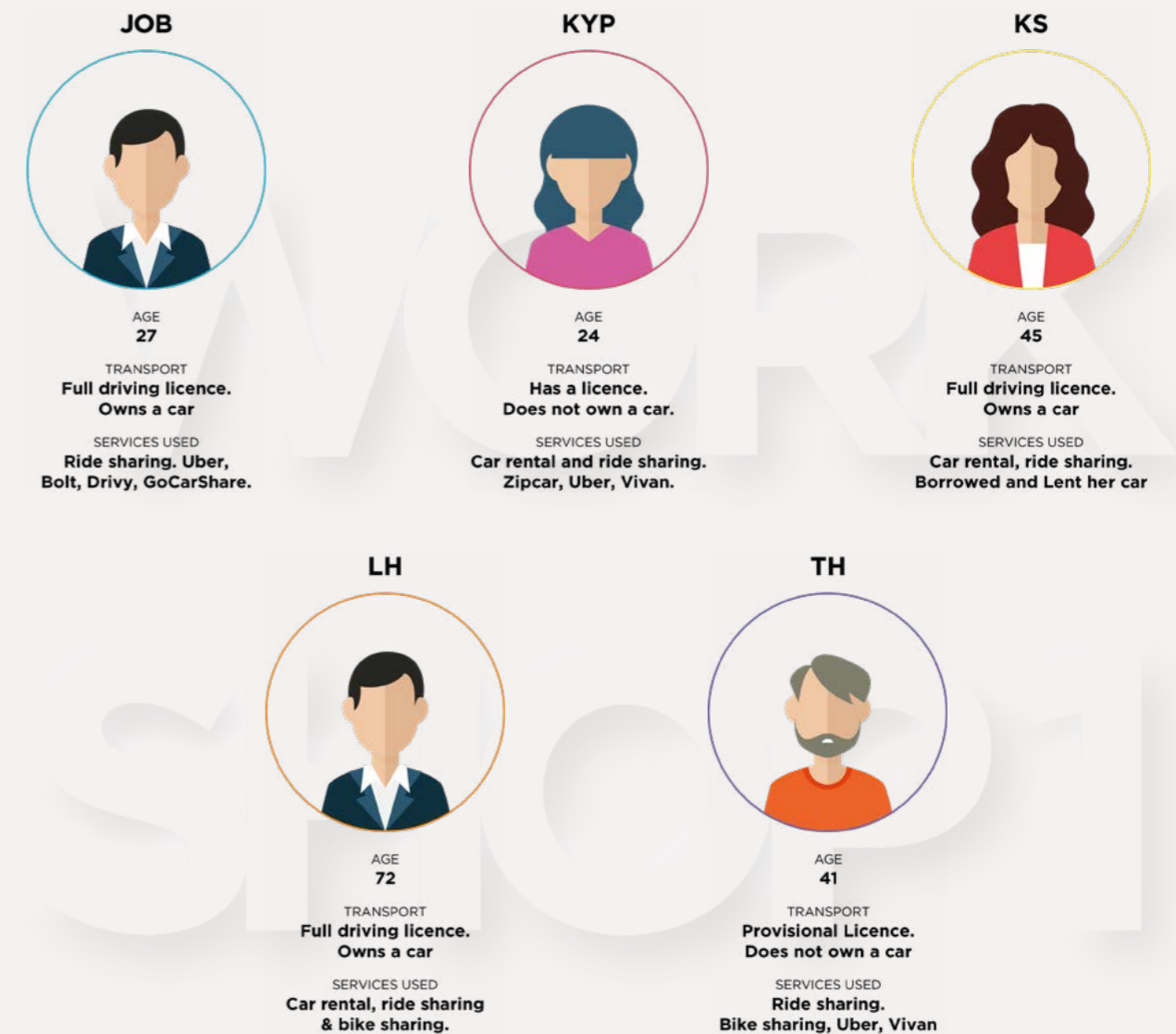


Fig 1. Infographics for workshop 1 participants

In the second workshop we had two male and three female participants. MS-71(age) owns a car which he lends to and shares with his son. In the past year he has used car rental (Avis) as well as bike and ride sharing services such as Uber. LC-39, does not drive, is not learning to do so and therefore does not own a car. She regularly uses ride sharing services and apps such as UberPool and Bolt. She has used bike sharing services in the past year but has never hired a car. PGR-26 owns and drives a car as well as regularly using ride sharing schemes (Zipcar and Uber) and has in the past year used Bolt. She has also used a car rental service during the year and over a year ago she used a bike sharing service. RF-69 does not own a car anymore but has a full UK driving licence. In the past year he has used car rental services (Enterprise) and bike sharing schemes. He has never used a ride sharing service. AR-63 owns and drives her car regularly, she has never rented a car or bike or used ride sharing services.

In the third workshop, there were three female and two male participants. MM-45(age) does not own a car and commutes using Transport for London services. In the past year she has used car rental (Enterprise and Zipcar), ride (Uber) and bike sharing services. AA-41 is currently learning to drive and has a provisional licence, she does not own a car. She regularly uses ride (Uber) and bike sharing services and has used a car rental service (Enterprise) in the past year. She also uses black taxis. KN-25 drives but does not own a car. She shares a car with her mother when she visits her home in Cardiff. She regularly uses ride sharing services and has used bike sharing services in the past year. Uber, Bolt and Kapten are services she regularly uses. IM-66 regularly drives and owns a car. In the past year he has used car rental (Enterprise) and ride sharing (Uber) services. He has never used a bike sharing service. YJ-35 has a full driving licence but does not own a car. He regularly uses ride (Uber) and bike sharing services. In the past year he has used car rental services, Zipcar.

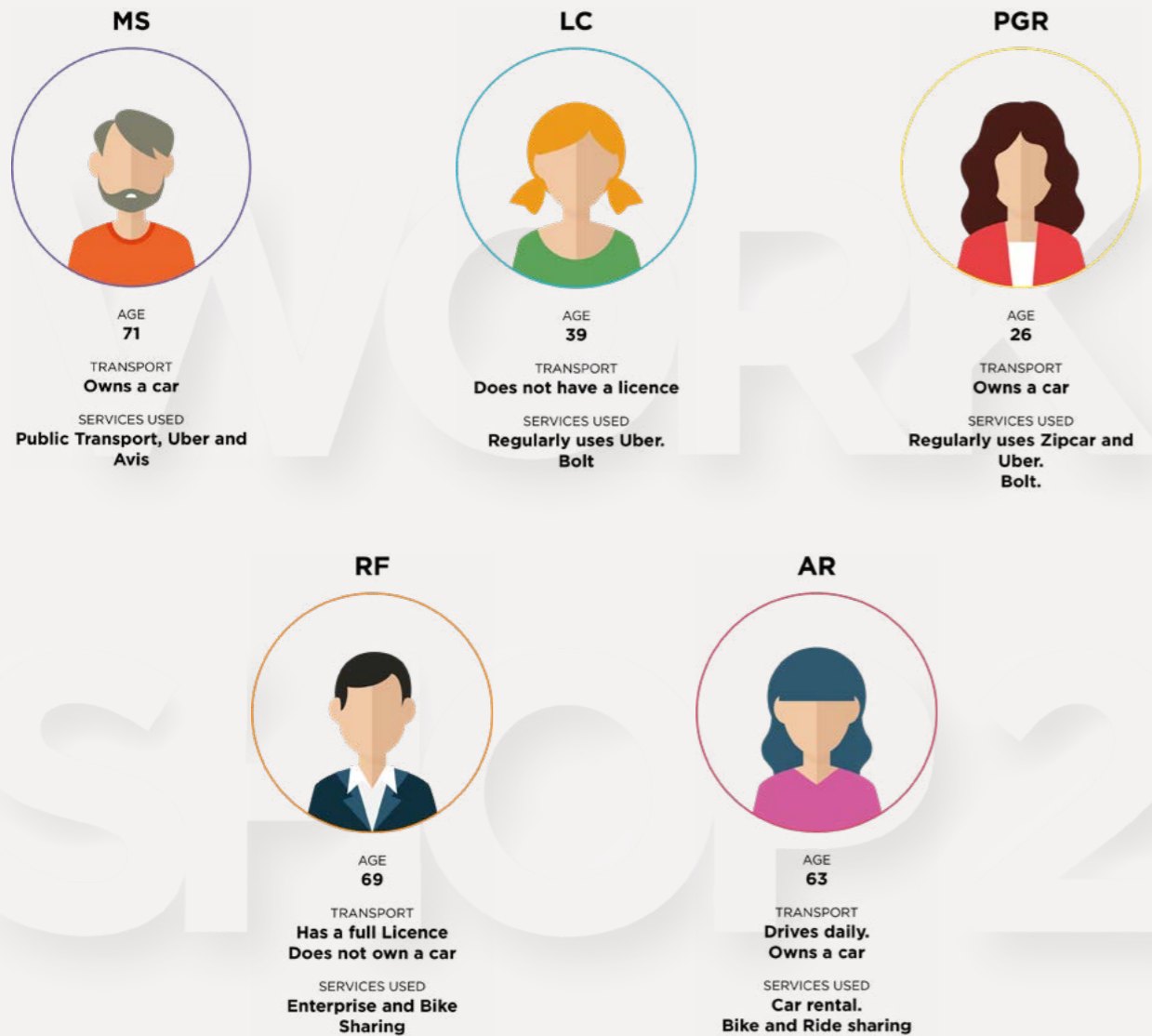


Fig 2. Infographics for workshop 2 participants

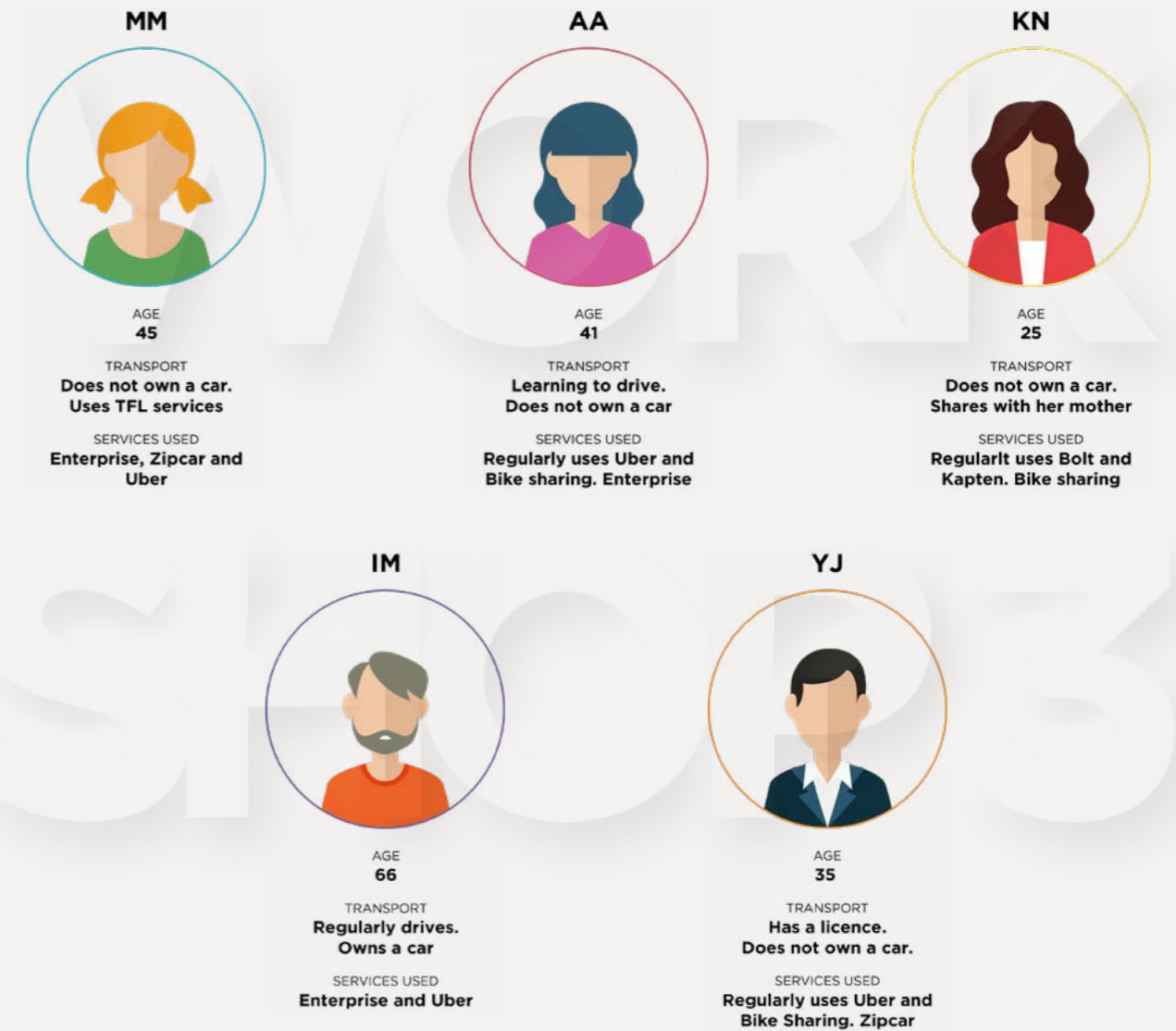


Fig 3. Infographics for workshop 3 participants

The workshops were conducted in two and a half hour sessions, which included open discussion, individual filling in of worksheets and role play. The sessions were audio recorded and notes were taken whilst the worksheets were collected to facilitate further analysis. Each workshop was divided into five sessions which included storytelling, filling in with who and what they are willing to share sheets, making a tribal map, journey mapping and an interactive session.

3.2.2. Storytelling and mapping

As an icebreaker, the participants were asked to share a brief story of a general sharing experience, sharing a commute, sharing as a driver and sharing as a passenger (with each participant choosing or being given a different option).

This was followed by them completing an exercise to find out what things they would share and with whom. We had prepared pictorial icons to represent various possessions to help participants identify, decide and choose the appropriate ones to link with people's roles regarding sharing (Figure 4).

From the labelled pictorial icons representing various possessions we asked the participants to each select five things they would share with someone they know. They were given A3 sheets of paper titled Groups and asked to stick these possession icons, in no particular order, on the five circles printed on the left hand side of the sheets. On the right hand side of the sheets were printed people icons to represent family, friends, neighbours, co-workers and top rated users. They were asked to draw lines to link the possession icon to the person icon showing what they would be willing to share and with whom (Figure 5 & 6).

Music	Drinks	Taxi	Bedding	Washing Machine	Experiences	Food	Books
Tools	Bank Account Details	Services	Lending Money	Shoes	Uber	Personal Computer	Cost of a meal
Knowledge	Fridge etc	Kitchen Appliances	Photos	Holiday Home	Headphones	Sports Clothing	Clothing
Home	Sports Equipment	Mobile Phone	Passwords	Underwear	Toothbrush	Bicycle	Hire Bicycle
Jewellery	Watch	Your Car	Journey	Sleeping Bag	Wallet	Purse	Public Transport
Friends							

Fig 4. MORPH workshop tools: Pictorial icons

Fig 5. An example of a completed Groups A3 sheet

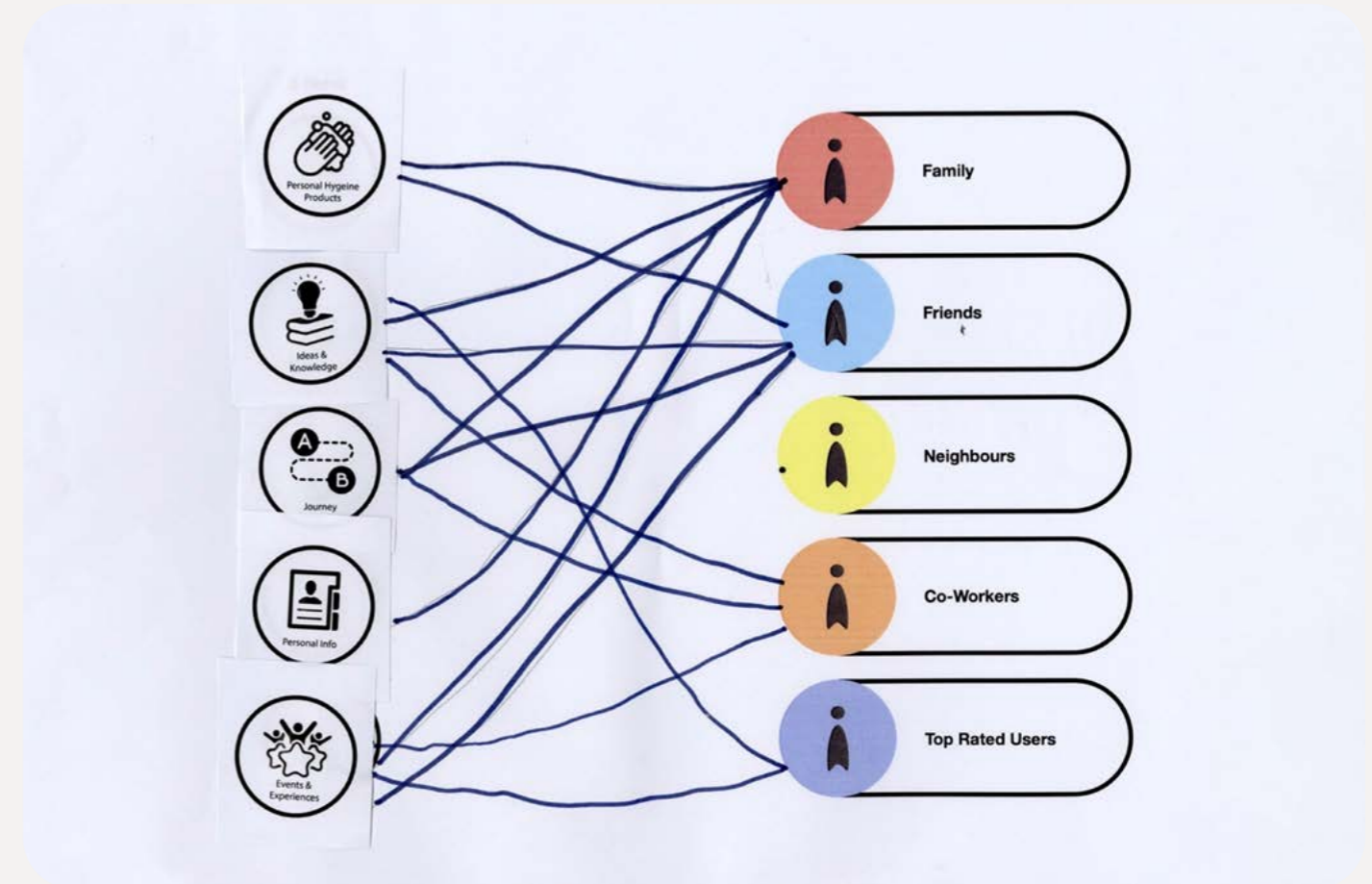


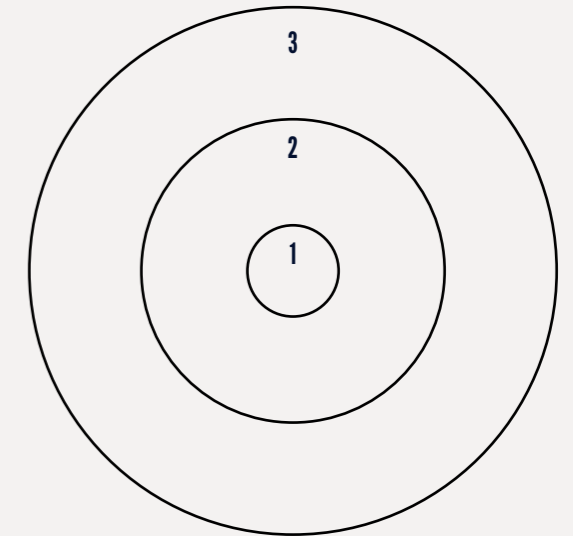
Fig 6. A workshop participant completing the Groups sheet

They were then asked to think about who they share journeys with, how often and what type of trips they were taking. They were asked to base this on the scenario they had outlined in the storytelling icebreaker exercise and to choose from each of the columns in Figure 7 below.

HOW OFTEN	WHO WITH	WHAT TYPE
» Daily	» Family	» A short trip
» Weekly	» Friends	» Driving to work
» Monthly	» Neighbours	» Leisure activity
» Every few months	» Co-Workers	» Holiday
» Annually	» Top rated users of a sharing service	» A long journey to a familiar destination
» Occasionally	» Strangers with monetary exchange	» A long journey to an unfamiliar destination
	» Strangers with some kind of exchange	» Other?
	» Nobody	

Fig 7. Sharing journeys chart

TRIBAL MAP



The participants were again given the people icons which they were asked to place on a tribal map (Figure 8) which had three concentric circles printed to indicate the relationship distance to sharing between themselves and others. At the centre, circle 1, represents Me, or the participant, the closest one can be to oneself. The next outer circle, circle 2, represented a less close proximity to themselves in terms of sharing with others. The furthest, circle 3, was still more distant. The participants also used beyond the circles over the outer part of the sheet for people categories they felt they least wanted to share with (Figure 9).

Fig 8. Blank Tribal Map

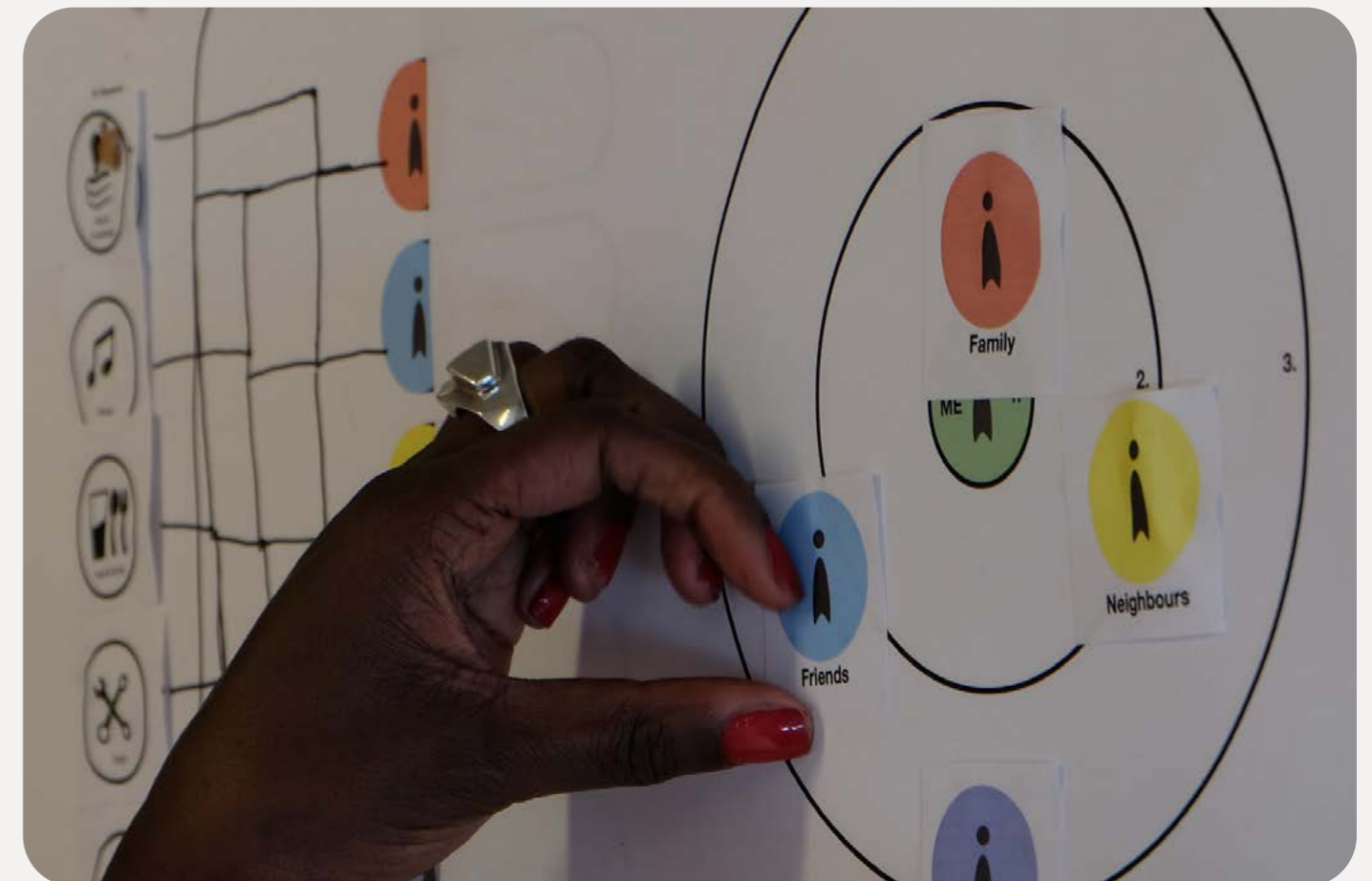
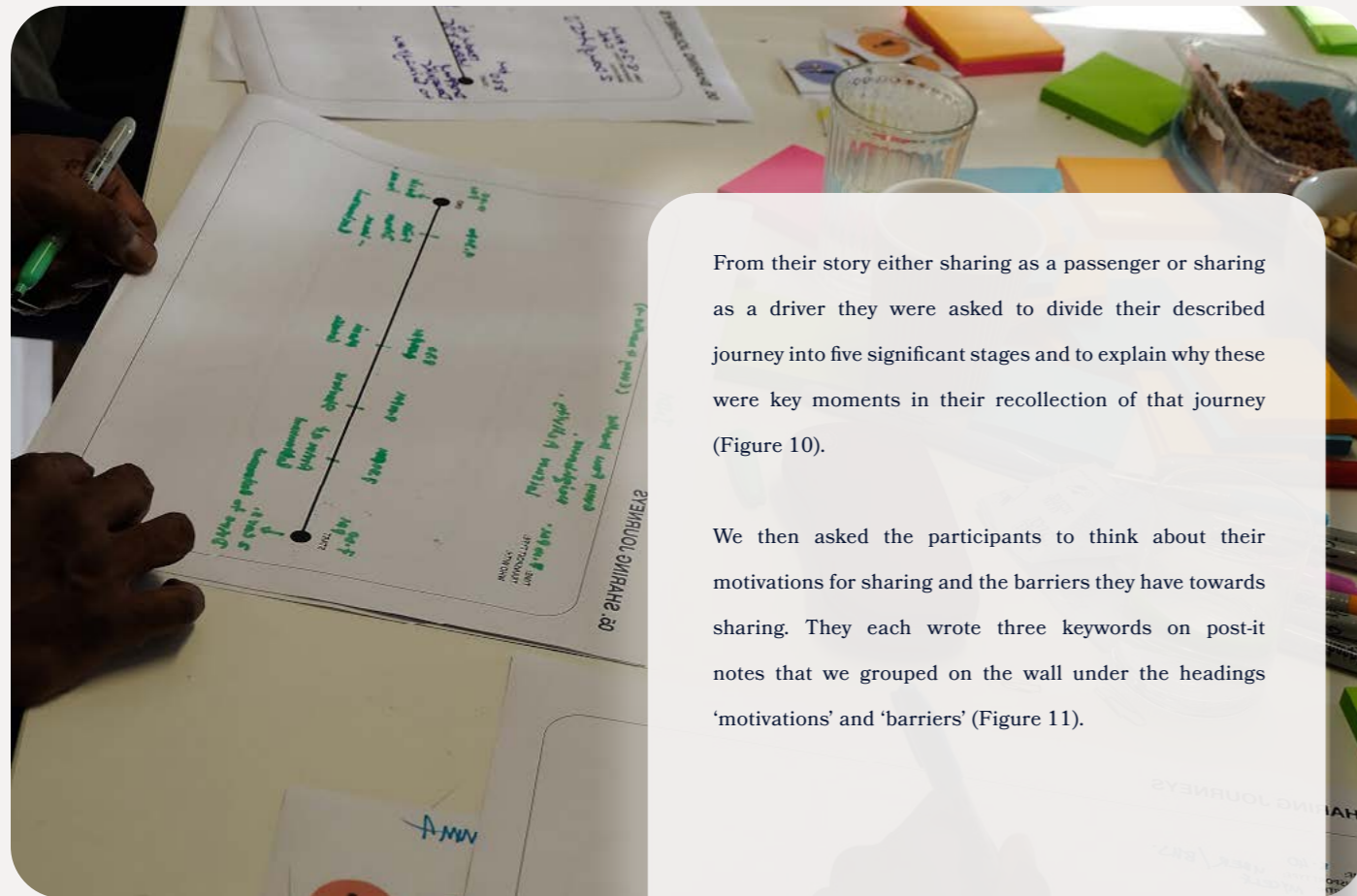


Fig 9. Making a tribal map

Fig 10. Workshop participants completing their journey maps



From their story either sharing as a passenger or sharing as a driver they were asked to divide their described journey into five significant stages and to explain why these were key moments in their recollection of that journey (Figure 10).

We then asked the participants to think about their motivations for sharing and the barriers they have towards sharing. They each wrote three keywords on post-it notes that we grouped on the wall under the headings 'motivations' and 'barriers' (Figure 11).



Fig 11. Discussion about motivations and barriers to sharing

3.2.3. Interactive Session

At the next stage of workshop one we gave each participant an A3 sheet of paper which was printed with a basic aerial view of a car outline. We provided cut out paper shapes representing different vehicle interior components as props, for example fixed seats, fold up seats or a steering wheel that we asked them to place on the vehicle outline, as well asking them to draw other components to illustrate the layout of the vehicle during the journey each participant had described using Figure 12. They were then asked to repeat the exercise on a blank vehicle outline to indicate their preferred layout (Figure 13).

In workshops two and three we asked each participant to enact the journey they had described using the other participants to act as their companions on that journey. We had printed a full-scale basic aerial view of a car outline which we had placed on the floor (Figure 14). We asked them to position and then sit on chairs on the outline and talk through the journey describing anecdotal information about it. We then discussed with them if they would like the interior to be differently laid out and to demonstrate in what way.

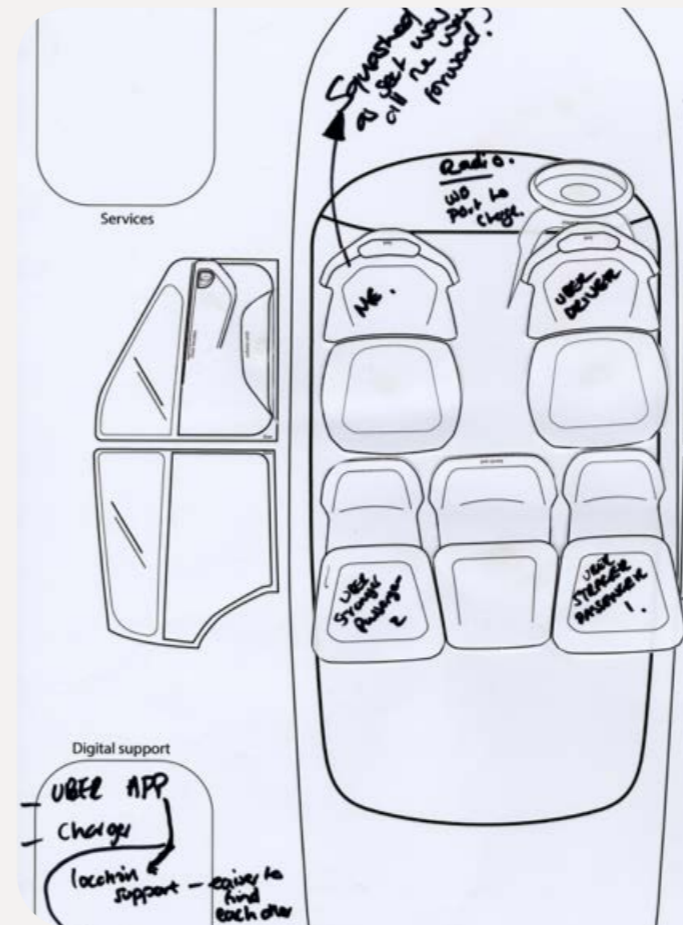


Fig 12. Current car layout



Fig 13. Preferred car layout

3.4. Concept design

When we reached this stage we involved four vehicle designers and briefed them with the design briefs and blueprints as well as the service design scenarios that detailed the personas, their sharing lifestyles, in-journey actions of both the user and the service provider, plus considerations and the needs of the user. We then asked them to think about possible design elements they could use to solve the problems related to each persona and scenario.

The first stage of their design process was to find visual references that related to the vehicle typology for the concepts they were designing. They were asked to find three keywords that described the main focuses of their concept. Next they created moodboards with inspirational imagery in relation to their respective theme. Following this they began sketching either with pens and paper or by creating computer imagery. Storyboards were then

used to integrate the scenarios with their design ideas and illustrate them. The designers next worked on more detailed, refined designs and drew the interior layout of these mobility shared spaces. During the concept design stage the service designers proposed services to accompany the visual designs. Further details of service touch points were designed such as an animated interface for a premium vehicle service and an app animation for family members to share a vehicle.

For the final results we asked the vehicle designers to select three key images showing the layout design and to make a poster that summarised in the vehicle space design and relevant services. Lastly, we asked them to create a roadmap from the present to 2060 with two milestones in between (see the Transition Roadmaps in Chapter 5 Design Concepts in 5.1.5, 5.2.5, 5.3.5, 5.4.5).

3.5. Conclusions

The online surveys were a tool to give us information about people's views on sharing products and services in general as well as mobility sharing. Conducting these with a wide range of participants from different age groups, genders, nationalities, locations and cultures meant we could draw conclusions about people's preferences from different groups. Also, we could see patterns of what they were willing to share and with whom, as well as what they didn't want to share and who they wouldn't share with, and how often participants were utilising shared schemes. They gave us insight into the perceived positive benefits and the concerns people have when using shared products and services. The surveys were also designed to indicate what the motivations and barriers to sharing people have. Importantly, the surveys helped us gather information about people's attitudes to mobility sharing, what they thought the positives were and what concerns they had as well as who they would share a vehicle with and under what circumstances. Additionally, they allowed us to gather data regarding their views of shared autonomous vehicles.

The user enactment workshops were designed so we could collect more detailed information about people's sharing habits and views. Having a diverse mixture of participants from different age groups, backgrounds, genders and ethnicity as well as drivers and non-drivers meant we had a wide range of views and experiences. Telling their stories of using shared services, products and sharing vehicles was a method to relax the participants and open up points for discussion. The exercises about what possessions they would share and with which groups of people were to help us determine if there were any patterns to people's sharing behaviour, which would perhaps be further confirmed by the participants completion of the tribal maps. Referring back to the sharing stories and then completing the

sharing charts based on their stories indicated to us what types of journey participants had shared, who with and how often they did so. The journey mapping session was developed to ascertain what elements they would identify as important and show us if there were any notable stages that were prioritised in their sharing mobility experiences.

The interactive sessions were devised to get the participants to detail the interior layout and components that were in the vehicle on the trip they had described. By doing this they would be more able to visualise their journey and remember details of what they liked or disliked about the car interior. Asking them to think about things they would like to change in the vehicle and why was a way to find if their responses would give any suggestions for future design directions.

The online surveys followed by the user enactment workshops were methods to inform the next stage of our process, developing scenarios. This would help us envisage and identify challenges in mobility situations from the perspective and needs of different users, building these would help the designers visualise the user and their journey.

Research through design uses design as a tool to reach conclusions from the research - using the methods, practices and processes of design with the intention of generating new knowledge. The concept design stage is intended to draw together all elements of the research from the literature we had read, the online surveys, the user enactment workshops and the design scenarios into tangible services and vehicle designs, building on the findings. This stage would culminate in rich visualisations of how the future of shared mobility could be.

CHAPTER 4.

FINDINGS

The data collected from our online surveys shows that people are more willing to share possessions, services or vehicles with people they spend time with and know rather than strangers. Individuals indicated that they trust vetted, regulated systems as well as those rated by other users, especially if the systems have internal or external monitoring methods. When sharing a vehicle with strangers participants emphasised the need for adequate space between the users, some felt that screens or dividers could separate them and provide privacy, whilst others expressed the desire to have the opportunity to interact with others in the vehicle and socialise. The workshops enabled us to gain insight into people's general sharing experiences as well as their mobility sharing experiences both with people they knew, such as family, friends, colleagues or neighbours and with strangers. The findings indicate that family is the most trusted, then friends, co-workers, neighbours with the least trusted group being top rated users (those that are highly regarded by the service or others).

4.1 Online survey findings

The data collected from our online surveys shows that people are more willing to share possessions, services or vehicles with people they spend time with and know rather than strangers. Individuals indicated that they trust vetted, regulated systems as well as those rated by other users, especially if the systems have internal or external monitoring methods. The main motivations people have for using sharing services are primarily convenience and access followed by value for money and low cost. Barriers to sharing were their concerns regarding cleanliness, personal safety and privacy. Regarding shared mobility, participants' answers indicated that they perceived the

key benefits to vehicle and ride sharing schemes are that they are better for the environment, use resources more efficiently, are cheaper, reduce congestion and are more socially responsible as well as offering value for money. When sharing a vehicle with strangers participants emphasised the need for adequate space between the users, some felt that screens or dividers could separate them and provide privacy, whilst others expressed the desire to have the opportunity to interact with others in the vehicle and socialise. A full summary of online survey results can be found in Appendix 2.

4.1.1 Use of shared products and services

From the participants' survey responses about what products or services they had used in the past, the most popular answers from survey one were AirBnB and Wikipedia (both 85%) followed by Uber (84%). The respondents in this survey were younger in the 25-34 age range with the most being female. In survey two the highest proportion of respondents selected public transport (83%), followed by recycling services such as charity shops, carboot sales etc. (62%) and taxi services such as black cabs, Uber, Kaptin etc. (58%). There was a more even age-spread in this survey but the majority were aged between 65 and 74 and male. Only a single respondent had never used shared products or services.

Their main motivations for using a service or product were convenience which received the highest responses in both surveys (70% survey one and 63% survey two). Value for money, access and low costs were also important

to their motivations. Another popular reason was being environmentally friendly, being part of a community and connecting with other people which was slightly more important to those in survey two where 15% selected this, with a lower number (6%) in survey one. Possibly this was a result of the respondents mostly being older in survey two. Participants selected entertainment (such as theatre visits, amusement parks etc.) as a motivation with 10% from survey one and 5% from survey two. This may be a result of generational preferences. Being ethically responsible motivated fewer of those taking part in survey one (3%) whilst 9% of survey two chose this, perhaps because most were older in this survey. In survey two we added another motivation which was charity which 9% of respondents selected.

4.1.2. Sharing with others

When questioned what they were willing to share with people they knew, a majority from survey one would be very likely to share ideas and knowledge (73%), events and experiences (59%), a journey - taxi service, Uber, etc. and music (55%). This could reflect the younger age of most participants in this survey. From the answers given in survey two participants were most likely to share tools - power tools, ladders, paint brushes etc. (46%). Many in survey two similarly answered about being likely to share a journey, food and drink and entertainment (37%, 35% and 33% respectively). Regarding 'sharing with people they don't know' several participants in survey one were likely to share a journey with strangers (49%), events and experiences (47%) and ideas and knowledge (44%). We had different categories for this question in survey two and in the analysis we found that participants responded that they were very unlikely to share entertainment (58%), food and drink (50%), facilities (45%) and a journey (46%) with people they don't know.

4.1.3. Benefits and Concerns of Sharing vehicles

The key benefits of vehicle/ride sharing schemes perceived by participants in survey one were that it was better for the environment (71%), a better use of resources (70%), low cost (65%) and reduced congestion (55%). In the second survey the main advantages were the same but in different priorities, as follows: low costs (51%), better for the environment (40%) and reducing congestion (37%). The different order of priorities may be due to the gender and age differences of the majority taking part in the separate surveys. Being more socially responsible was important to participants as well: 41% of respondents in survey one and 30% in survey two thought so.

The top three barriers to sharing in both surveys were cleanliness (survey one 72% and 47% survey two), safety (63% in survey one and 46% in survey two) and privacy (60% from survey one and 45% from survey two). A majority also expressed concerns over the use of their personal data when using sharing services (72% in survey one and 69% in survey two). Most were worried their data was being used to target them with advertising, shared with various companies, some of them were worried because they do not know what would happen to their data in the future, some thought that it was not secure, or they were being monitored and watched (58% survey one and 35% survey two), or that sensitive information was being shared in public (48% in survey one and 45% in survey two). For those participants who were not worried about their personal data most answered that it didn't impact their life and that they trusted the legal system and the companies to protect them.

The concerns people have about using shared mobility schemes are mostly about personal safety. In both surveys this was the highest worry at 60% in survey one and 59% in the second. The concern of not having a vehicle when they needed one was the next highest concern in survey one (38%) and the third in survey two (44%). Second most concerning for those in survey two were insurance issues (44%) possibly because most were older, whilst in survey one the third factor was security of their personal data (34%). Perhaps this was due to the fact that most taking part were younger. The majority of participants said they would trust using a shared vehicle with people they know

(73% survey one and 62% survey two). The second highest response was that they would trust it if the driver was vetted to a high standard (70% survey one and 46% survey two) and if the other users were part of a regulated scheme (61% survey one and 33% survey two).

In the surveys a higher number of respondents on survey one said they would have trust if they could use an app to report any concerns to the regulator whilst travelling (54% and 18% survey two), if they could also use an app to track their journey's progress in real time (survey one 51% and 23% survey two) and if the journey was monitored by the regulator (survey one 49% and 25% in survey two). The higher percentages from survey one as opposed to the second could be explained by the fact that most respondents were female.

When asked 'under what circumstances they would feel comfortable using a shared vehicle if they didn't know the other users both surveys showed that the most important factor was having enough space between them and the other users (72% survey one and 54% survey two). The opportunity to interact with others on the same journey was more important to participants in our first survey (35%) and less so for those in our second (26%). The

higher response level from survey one possibly reflects the majority of people being younger whereas in survey two most taking part were older. People taking our second survey preferred to be separated from the other occupants by interior screens or divisions (31%) compared to 23% of those in our first survey perhaps due to generational differences.

Lastly, we asked if they would trust a shared autonomous vehicle. The majority of people in our second survey responded that they would only have trust in a shared autonomous vehicle if they were sharing with people they know (47%). Fewer people were concerned with this in our initial survey (29%); again this may well be because most of those taking part were older in the second survey. Similar to their concerns about sharing a vehicle with strangers, people would trust an autonomous vehicle if the service provider monitors and supervises the journey with enabling technology (56% survey one and 31% survey two), if users are part of a regulated scheme vetted by the service provider (53% in survey one and 31% survey two) and if the interior was configured to provide personal space and privacy for each passenger (35% survey one and 18% survey two).

4.2. Findings from the user enactment workshops

The workshops enabled us to gain insight into people's general sharing experiences as well as their mobility sharing experiences both with people they knew, such as family, friends, colleagues or neighbours and with strangers. Some participants gave their perspective as drivers while others who don't drive shared their passenger experiences instead. The small groups in each workshop allowed each participant to share their wide-ranging stories with us and the others present. Their general sharing experiences included sharing accommodation, subscriptions and equipment.

They described regular, short journeys where they shared a vehicle such as a commute, which they shared as either a driver or as a passenger. Others spoke about using Uber or UberPool. Some participants described sharing journeys with family, friends and sometimes co-workers for less frequent longer trips they take for holidays when they use their own or one of their companions' vehicles to familiar or unfamiliar destinations. There were stories of unusual experiences that included adventurous journeys abroad, trips to unknown destinations as well as travelling to familiar places. Positive as well as negative experiences were described and participants spoke about how they felt on their journeys. Good feelings included community spirit, sociable, fun, entertaining and less agreeable feelings arose from disagreements and conflicts, weight of responsibility, feeling tired or not being comfortable.

In general people were inclined to trust people they know when sharing more personal possessions but would widen the pool to others to share less personal items. This was expanded even wider with experiences, events, ideas and knowledge. The completion of the tribal maps confirmed this further with family the most trusted people for the

participants, then friends, co-workers, neighbours with the least trusted group being top rated users (those that are highly regarded by the service or others).

After the participants had described their sharing journeys we asked them to map significant points of the experience on a journey map. The responses fell into two groups - those whose shared journey experience was as a passenger and those who were the drivers. All the passengers who either used Uber or UberPool started their journey by checking prices, booking and waiting followed by meeting the car and driver, taking the journey, arriving at their destination and then rating the driver. The driver's starting point on their journey maps was when they loaded the car or got in the car. Many then picked up passengers who were friends, family or co-workers, drove to the destination sometimes stopping for refreshments or petrol.

The interactive sessions at the end of the workshops were very creative with those in our first workshop plotting their car layouts with paper icons representing interior parts (steering wheels, seats etc.) and in-vehicle accessories (satellite navigation etc.) as well as drawing and writing on their sheets. Workshops two and three were fun as the participants role-played for each other as passengers on their described journey and they entered into the spirit of the session. We found that there were minor changes that they would like in Uber vehicles such as a phone charger and charging pads, children's booster seats, digital support, ability to select the route and open passenger doors. For those who owned their own car they spoke of wanting to upgrade to a more premium vehicle, or improved satellite navigation systems, whilst some were quite content with their car's current layout.

4.2.1. Storytelling and mapping

In asking the participants to share a story of their experiences of sharing, a general account of sharing things and various vehicle sharing memories, we gathered a wide range of examples illustrating diverse events. They also discussed what they liked or didn't like about their particular sharing event which helped us to identify positive and negative themes connected to their stories.

A SHARING EXPERIENCE

AR-63(age), described her work sharing experiences at her upholstery classes which involve sharing equipment with others in the workshop. **YJ-35**, shares subscriptions, such as Amazon Prime and Netflix and uses UberPool and rents his flat via AirBnb when travelling.

The difference in the age of these two participants probably explains why their examples were so different. AR's was based on a practical and physical experience of sharing, while YJ's were centred around using technology and app based sharing

SHARING A VEHICLE ON A COMMUTE

TH-41, described travelling in a jeepney in the Philippines with a friend and approximately twenty other people when it became stuck and nearly tipped over. The occupants had to wait for the vehicle to be pulled out and shared food, drink and conversation whilst they waited. He described

it as a community spirited occasion with the passengers supporting each other as well as it being an unforgettable experience.

MS-71, is a retired chef who uses London Underground to get to and from his work at a hospital. Sometimes he gets a lift with a neighbour and he also uses Uber to get to and from there. He spoke of a weekly trip he takes with a neighbour who drives him and also works at the hospital where he volunteers once a week. His neighbour needs to be at work on time so there is a punctual pick up at 8:30; he is ready and waiting. They greet each other but mostly travel without speaking or listening to the radio for the 25 minute journey or they talk about mundane things. They know each other quite well and have shared things like tools for over 15 years so he doesn't feel like he needs to talk to his neighbour. He stretches his feet out and puts his seat belt on; at that time of morning he doesn't want to talk too much. He jumps out around 50 metres from the hospital entrance and his neighbour carries on to the car park.

IM-66, shares his commute to work with a colleague to save money. They try to talk about work en-route as they do similar jobs. On a good day it's a 40 minute journey, the worst day it was a three and a half hour commute. They have been doing this for around three years sharing their commute around twice a week. They sometimes fall out after they "disagree about some things".

MM-45, has 'always been a driver' for over 20 years. Since she sold her car, her usual commute now is via the London Underground (Central Line). She prefers taking the tube to getting the bus. Sharing her daughter's car is not always a good experience as her daughter tells her off for talking too much.

AA-41 usually takes a bus to get to work however on this occasion she had to take an Uber as she was running late due to a school drop-off. She didn't look at the driver's rating before she got in the vehicle. Her habit is to always sit on the curbside rear seat. She was annoyed that the driver would not use a different route as there was a lot of traffic and she didn't want to be late. For navigating the route the app she prefers them to use is Waze so if they are using Google Maps she will ask them to change the app; if they don't have it she will give them her phone. On this occasion the driver refused to switch apps. After approximately 20 minutes of the journey she asked if they can use a different route, which he ignored. Suddenly, the driver said "I know London" then "You need to be quiet". She asked him to stop the car as they were not progressing well; he refused, telling her that this is why she doesn't have a husband! She felt intimidated when he wouldn't let her out as she had decided to leave the vehicle after this exchange from the driver. She is usually a relaxed passenger. If other people get angry or irate in the car, she just has a nap. Drivers have told her off in the past for not keeping them company during the journey.

PGR-26, described an Uber trip she had taken in the daytime that took 20 minutes from her home to her workplace. She booked it online, after she had typed in her destination, the app gave her information about the

driver, (however, she wouldn't reject one if they seemed bad) and then she clicked to confirm. From the perspective of safety, before the car arrived she looked at the driver's rating and saw the image sent of the vehicle that was to pick her up. She also checked the number plate when the car arrived to check it was the correct vehicle. She always sits in the back seat furthest away from the driver so she can keep an eye on them. Being a driver herself she likes to ensure the driver is not distracted and is driving correctly. These observations form the basis of how well she will rate the driver after any journey. On this trip the driver took a wrong turn, which she questioned and he stated it was a shortcut, she said she would rather be asked or the driver would tell her if they're taking a quick route. She was slightly concerned but did not feel threatened as the door was unlocked. Sometimes she is in the mood to talk at other times she is not; over-friendly drivers can be irritating. However, she does like to be acknowledged by the driver when entering the vehicle; afterwards she is happy to entertain herself. Over approximately three to four years she has only had one female Uber driver and was surprised by this, initially thinking she had got into the wrong car!

These examples show that sharing a vehicle whilst travelling to work can be a social experience connecting people to the community either through conversation or the shared experience. But in the case of AA-41 using a shared mobility service her experience was not enjoyable. Uber users like PGR-26 are often careful to make sure the driver is highly rated (although AA-41 didn't on the occasion she talked about) and to be certain they are getting in the correct vehicle.

SHARING A VEHICLE AS A DRIVER

LH-72, a retired teacher, told how he hired a vehicle and drove several students overnight from London to Scotland for them to take part in the Duke of Edinburgh Award (a youth achievement scheme). He found the experience social with a community spirit. However, he also felt a great responsibility driving others in the dark on unfamiliar roads. He also described going on holiday and taking a journey to a familiar destination with friends and co-workers, which he does every few months. He goes on walking holidays with four companions, one friend and three co-workers. He talked about how they load the car, chat and drive for a couple of hours before they have a break. They drive from West London to Pembrokeshire in the southwest of Wales where they walk about 10 to 12 miles a day for four days.

KS-45, described how, when she had hired a car to take friends to a mansion party, the journey itself was a social event. They played nostalgic music, chatted and had an enjoyable time. She described it as fun to drive a different vehicle from her usual one.

JOB-27, described a daily drive to work with a colleague/co-worker in which he uses his own car. It is a 15 minute trip during which he chats with his co-worker. After arriving at work he parks his car and then gets ready for work.

RF-69, described a journey when he hired a car from Enterprise (a car hire company). His wife sat in the front seat and his son-in-law and daughter were in the backseat. The vehicle was an economy model which was not very spacious and had little leg room. The journey took about three hours as they went across the country and did not use motorways to avoid traffic. Their individual satellite navigation systems displayed different routes which caused some disagreement between them. His wife prefers using a physical map to be able to see the directions clearer. To diffuse the situation, they stopped to get some food and he swapped the driving with his wife to stop the argument. Their journey activities included talking about the scenery; they had no music playing as they had forgotten to bring any CDs for the player in the car.

PGR-26 is an avid shared experience user who described an occasion when she took herself and four friends to Alton Towers (a theme park in the centre of England). She is used to motorway driving but her friends kept on asking to stop for comfort breaks and to get food. In the morning she was fine as it was daylight, but on the way home it was dark and she felt tired. She wanted people to stay awake with her but they fell asleep.

AR-63, described an occasion when she was driving her old VW Polo with three female friends who were all familiar with their destination, so the journey was relatively easy. Before they started out it was important everyone was ready on time, with just their handbags, which they placed by the seats. They played music CDs that they had chosen beforehand as they enjoy the same music and they ate the prepared snacks as they travelled. They talked about current affairs, such as the possible implications of Brexit. When they arrived at the location she parked her vehicle. At the exhibition they registered, collected their badges then went around the stands collecting brochures, samples and goodybags. However, the first thing they did before looking around was to have coffee. After the exhibition AR and her friends loaded the material samples and brochures from the trade fair into the boot of the vehicle, before driving back. They made sure that they left before rush hour traffic started but there was quite a lot of traffic because of the exhibition. Each person sat in the same seat as they had done on previous trips. The front passenger took responsibility for the music, handing food to the driver and for satellite navigation, whilst her friends in the back talked about the samples they had collected.

MM-45, described a trip she made to Birmingham to take her daughter to university. Luggage was placed in the back of the car and her eldest daughter helped with loading the boot. They loaded three suitcases, plus bedding, pots and pans and other sundry items into the vehicle, which was a Mercedes GLC. They folded one seat down to make more room in the car for her daughter's possessions. The younger sister was still getting ready so she didn't help with packing the car. However, she asked to sit in the front and used bluetooth to play music on her phone after they stopped listening to the radio. The eldest daughter, who 'doesn't do motorways' complained about the music being too loud.

IM-66 described a time when two couples were driving to dinner. The two men sat in the front whilst the women sat in the back. The journey was 15 minutes to a public house. The guys like to talk about cricket and couldn't wait till they reached the pub. The seating arrangement wasn't planned but because his friend is tall he prefers to sit in the front of the vehicle so he has more space. IM drove to the public house and his wife drove back. They all know the journey so there's no need to use satellite navigation. When they arrive he hands over the car keys to his wife as he gets out of the vehicle because he is worried about losing them. Over a drink they discuss a letter that they are going to send to the council about a neighbour's dog.

KS-45, talked about a long journey that she takes to a familiar destination with family, every few months, with her as the driver. The trip is from London to Peterborough, eastern England. She always travels with her daughter and grandson, leaving in the morning to visit her mother. They drive on the motorway for about two hours stopping for petrol on the way. When they arrive in the town they go to the supermarket to buy flowers for her mother. She stays for the day and leaves early in the evening to drive back to London. Her daughter and grandson are staying there overnight so she always checks to make sure they have taken all of their luggage and possessions from the car.

YJ-35, described a long journey to an unfamiliar destination he made with a friend. He hired a Toyota hatchback from Hertz at the airport in Reykjavik then drove for six hours straight without swapping drivers. He picked up his friend and they had Thai food for dinner. They put the friends' luggage in the back of the car and bought some food for the journey. His friend had some time off and had already been travelling for a month so he wanted to come along for

a week with him. On the first day, YJ wanted to catch up with his friends' news, but he was on a mission to get to the Airbnb they had rented before it became completely dark. They predicted it would mean driving until 01:00am. There were no street lights in the area so they were relying on the moon for light. As the passenger his friend's main task was to keep him awake. They didn't pass many cars, one every couple of hours and it was raining, so the windscreen wipers were on full. He was hoping his friend was going to ask to swap driving but he didn't, he'd had a beer at dinner before they left so it would have been unwise to do so. On other days, they would stop at a landmark and then swap over driving; his friend wasn't that proactive when it came to offering to drive, so he had to ask him to do so. There was no satellite navigation in the rental car, he used his phone to work out the route to take, which was placed between his legs so he could see the screen. They would also use their phones to play music as well as to check the route.

Drivers tended to feel responsible for their passengers in terms of driving safely especially at night. They mentioned friction over not agreeing on the route, the demands of their passengers and feeling isolated as others slept. On a positive note, several spoke of the social enjoyment of being with others, enjoying conversation, listening to music everyone liked.

SHARING A VEHICLE AS A PASSENGER

JOB-27 described an experience when he was a passenger in a hired minibus with about sixteen friends going to Royal Ascot (30 miles west of London) to watch horse racing. It was a social event and a shared experience for him.

KN-25 has a strong dislike towards driving and prefers being a passenger. This has made her more nervous when she does have to drive. She likes to be in charge of the music, which she plays from her phone. Her friend who does not drink offers to be the designated driver when travelling to Cardiff (the capital city of Wales). In the car there are usually four people plus the driver. She also described an Uber ride that she took with friends of her friends, whom she had not met before. She was joined by them, a male and female, to go to a bar at around 23:00. She got into the front seat because she likes to chat with the driver, it also means she can put her music on and she will give the driver a bad rating if he doesn't let her. She doesn't like the idea of a quiet car so prefers to make conversation. She didn't book the Uber, her friend did and sent the car to collect her friends. She sits in the front most of the time. If she's sober she will sit in the back on the curb side so she can keep an eye on the driver.

KYP-24 owns her own car. She described a sharing experience when members of her family hired a minivan to drive to Wales. It was a long drive with her uncle driving and they had a stop-over on the way there.

KYP-24 uses UberPool for short journeys as she considers Uber prices are too high. She checks the app and books her trip. Thinking about one occasion she has used this service she described getting into the front seat because there were passengers in the back seats, so she had no choice in where she sat. She felt a bit cramped because her seat was already pushed fully forward but didn't feel she could ask the other passenger if she could push it back, which indicates that she was not entirely comfortable in asking strangers to move their seat to better accommodate her even though there was small talk between them.

LC-39 who does not drive, described a journey when she used an UberPool vehicle from a conference venue in Peterborough (a city in eastern England) to go to the main train station. She described how she looked at the app on her phone and saw that it was cheaper to use UberPool. After booking a car and driver she was sent the vehicle's number plate so she could recognise the one she had

booked. Whilst she was waiting, as an afterthought, she looked at the driver's rating which was 4.8 stars (5 stars is the highest). The UberPool arrived and she put her case in the boot and sat in the back of the car behind the driver. They were driving for about ten minutes whilst she looked at her phone as she wasn't sure of the route. On the way the driver picked up another passenger who sat in the back with her and placed his bag on the floor between them. They briefly acknowledged each other when he got in the car but after that they gave each other space and looked at their respective phones. She didn't feel uncomfortable with the other person there, she is used to sharing transport with strangers as she takes the London Underground after work. However, she doesn't like talking to strangers while travelling, such as the driver or other passengers; she prefers time to herself; her phone allows her to create a barrier between them. LC wouldn't use an UberPool at night. After the journey she rates the driver and checks the cost so she doesn't have to do so when she next makes a journey.

TH-41 uses Uber regularly with his family for a short trip that they take twice a month to visit his parents in Ealing, West London. Firstly, he checks the app, then books a car, five minutes later he meets the driver and talks to him. He then installs the booster seat for his one-year-old, puts the child in it and then puts his five-year-old into the car too. Passengers spoke of the enjoyable social aspect of sharing a journey with family or friends, being able to enjoy shared music tastes with others and being able to rest if others in the car were disagreeing. However, sharing with strangers was a less comfortable or enjoyable experience with LC-39. not wanting to interact or converse with the other passenger (nor he with her) on their UberPool journey. Using a shared mobility service vehicle meant that there was not everything he needed to accommodate his children for TH which means he has to supply his own booster seat and fix it into the car for every trip they take.

POSITIVE THEMES THAT EMERGED FROM THE STORYTELLING SESSION

The **experience** of sharing public transport in the Philippines is an unforgettable memory for TH as it became an out-of-the-ordinary event when the bus became stuck, resulting in him sharing more interaction with the local people than before while they waited outside the vehicle for assistance. Sharing a commute can have positive **economic** benefits for those participants who travelled to work with a colleague or neighbours as well as for those using public transport and taxi services. The **social** side of sharing a vehicle as a driver and as a passenger was enjoyed by several participants as they described spending time talking with friends, family and students, listening to nostalgic music, sharing food as well as the journey, and that they felt part of a community.

POSITIVE

Here we highlight some distinctive positive experiences taken from the accounts above:

A SHARING EXPERIENCE

[A general non-vehicle experience]

AR-63(age)'s positive view of her experience of sharing equipment at her upholstery classes led her to describe how she felt it enabled them to share ideas, make progress and form friendships. YJ-35 thought that sharing subscriptions, using UberPool and AirBnB was productive, caring and made economic sense.

SHARING A VEHICLE ON A COMMUTE

[Transportation]

TH-41 described the positives he felt from his experience sharing a jeepney with a friend and locals were that it was cheap, out of the ordinary and he felt a sense of community.

MS-71 feels that his commute either on the London Underground, taking an Uber or getting a lift from his neighbour is easy, convenient and frequent.

IM-66 who shares his commute with a colleague thinks it is a relaxing, money saving and environmentally considerate trip.

MM-45 who now travels to work on the London Underground said she felt the positive thing about her journey was caring about others.

SHARING A VEHICLE AS A DRIVER

[Vehicle]

LH-72 finds driving others to be a good shared experience, he felt a sense of achievement from doing so especially as when driving the students to Wales it was in the night so the roads were traffic free.

KS-45 found hiring a car with friends to go to a mansion party was exciting, like being with family and nostalgic as they played their favourite music from the past bringing back memories.

PGR-26 described her trip with friends to Alton Towers theme and waterpark as enjoyable, fun as they cruised along motorways.

RF-69's memories of his trip across the country with his family are focused on the problems they had on agreeing on a route but he described the positive aspects as being passengers' joy when they found the route and resolved the issues they had with conflicting satellite navigation directions.

SHARING A VEHICLE AS A PASSENGER [VEHICLE]

JOB-27, described the positive aspects of being a passenger when he travelled in a hired minibus with several friends to watch horse racing, as being a useful, reliable and efficient way to get them to their destination.

LC-39's UberPool journey from a conference venue with one other passenger, unknown to her, was a cheaper way of getting to the train station, with a quicker pick up and it

was an opportunity to make friends although she chose not to on this occasion.

KYP-24's experience when members of her family hired a minivan to drive to Wales she remembered as being exciting, spending time with her family and having feelings of nostalgia as they were all together again like old times.

POSITIVE DRIVER THEMES THAT EMERGED FROM THE STORYTELLING SESSION

Participants who had told a story when they had driven others spoke about the experience such as it being out of the ordinary, exciting, a shared experience, enjoyment, fun, some felt feelings of nostalgia and described it as an achievement. They also described it as being convenient, familiar to them, meaning they felt confident and comfortable. They additionally enjoyed the social aspects, having time with their family, friends, they could share driving, perhaps have someone navigate for them, engage in conversation, have company, choose their own entertainment, making the time pass quickly and feel a sense of community. When discussing sharing a journey

they spoke of comfort, convenience, it being quicker, efficient, easy, reliable, productive, reduced traffic and good for environmental reasons. There were also economic benefits as they saved money by sharing costs. Participants also said they felt relaxed, safe and emotionally happy. In general the participants felt sharing their drive made them feel less stressed, however they did care about the passengers and were concerned about their safety and were cautious as they drove. There were also economic benefits as they saved money sharing costs. Participants also said they felt relaxed, safe and emotionally happy.

POSITIVE PASSENGER THEMES THAT EMERGED FROM THE STORYTELLING SESSION

As passengers on a shared journey they also commented that sharing a vehicle is cost effective. It was considered to be stress free as they could relax, even sleep and not have to concentrate. Same as drivers, passengers also thought that there was a benefit to the environment when they shared a journey with others. They mentioned the social benefits of sharing the interior space with family and friends, enjoying having company, conversation, fun, as well as feeling safe and being happy. They felt that their

journeys were easier, time passed quicker, meaning they felt more productive, and several mentioned that they felt cared for.

See Figure 16 that shows three keywords each participant chose to describe their positive thoughts on sharing.



Fig 16. Positive thoughts on sharing.

NEGATIVE DRIVER THEMES THAT EMERGED FROM THE STORYTELLING SESSION

Some participants spoke of negative social behaviour experiences when talking about their shared journeys such as minor disagreements about things and being told off for chatting too much. Drivers felt responsible for their passengers and that they were relied on. There was a physical and mental toll including tiredness, needing to concentrate, it was hard work and isolating for them from the others in the vehicle. They also said that they were not in control of others, their time-keeping causing delays and making them late, it was time-consuming as there were too many stops and drop offs, people wanted to leave at different times making it difficult to coordinate everyone. Participants said there were issues with music preferences, passengers being noisy, even contentious and talking non-stop which they found distracting. Some felt there was a lack of privacy and that there was an intrusion on their personal space.

NEGATIVE PASSENGER THEMES THAT EMERGED FROM THE STORYTELLING SESSION

The negative aspects of car sharing with a service provider from a passenger point of view were similar. There were safety concerns regarding the trustworthiness of both the driver and service and the risks associated. Not being in control was cited by participants in relation to reliability of the service, the poor time-keeping of the driver therefore having to wait consequently being late, bad driving, conflict over the route, congestion and traffic delays, hygiene, having to rely on others and no choice with in-vehicle entertainment such as music.

Social concerns were expressed regarding communication and compatibility with the other passengers, such as possible anti-social behaviour, too many others in the vehicle, disagreements, moody non-social passengers, others opinions, no choice with other users, selfish users, too much conversation or a lack of conversation and having to make small talk. These issues resulted in some participants feeling it was inconvenient, annoying and not relaxing.

See Figure 17 that shows three keywords each participant chose to describe their negative thoughts on sharing

NEGATIVE	
A sharing experience [a general non-vehicle experience]	
AR-63	Time Wasting Space Not Enough Equipment
YJ-35	Unreliable Risky Inconvenient
Sharing a vehicle on a commute [transportation]	
TH-41	Uncomfortable Dangerous Delayed
MS-71	Crowded Hot Expensive
IM-66	Cannot Sleep Time Disagreements
Sharing a vehicle as a driver [vehicle]	
LH-72	Tedious Scary Responsibility
KS-45	Long journey Fearful Tiredness
PGR-26	Lonely Dark Tiring
RF-69	Confusing Conflict Dangerous
MM-45	Unnecessary Annoying Ridiculous
Sharing a vehicle as a passenger [vehicle]	
JOB-27	Lazy Boring Annoying
LC-39	Dangerous Journey Longer
KN-25	Late No Control Congestion
AA-41	Selfish Annoying Lazy
KYP-24	Long Tiring Traffic

Fig 17. Negative thoughts on sharing table

4.2.2. Tribal mapping

In completing the exercise to find out what possessions the participants would share and with whom, each of them indicated (Figure 18 - 32) that they trust Family and Friends with their five chosen possessions. The infographics illustrate each participant's sharing patterns. There is a common factor within participants who would trust neighbours with their Tools. There is no correlation between age and trusting co-workers. All but one of the participants would share Ideas & Knowledge with Top-Rated Users. The more personal the possession, the less likely someone is to share with people they do not know. People trust Co-Workers, Neighbours and Top Rated Users. This gives credence to the fact that people are less likely to trust those they have less face-to-face experience with.

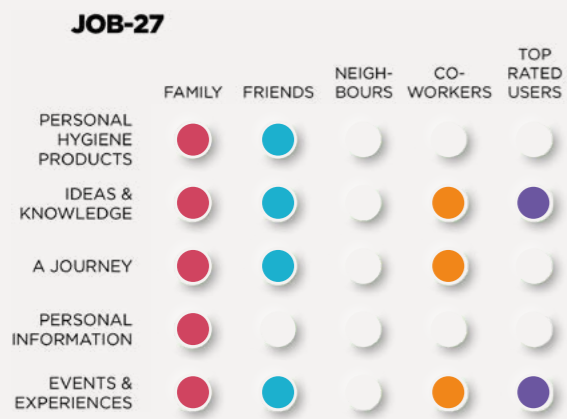


Fig 18. JOB-27's sharing chart

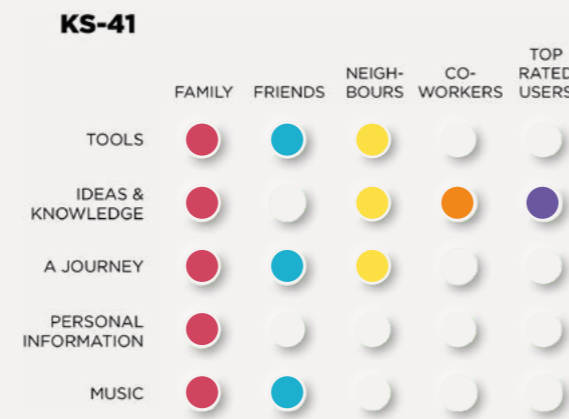


Fig 19. KS-41's sharing chart

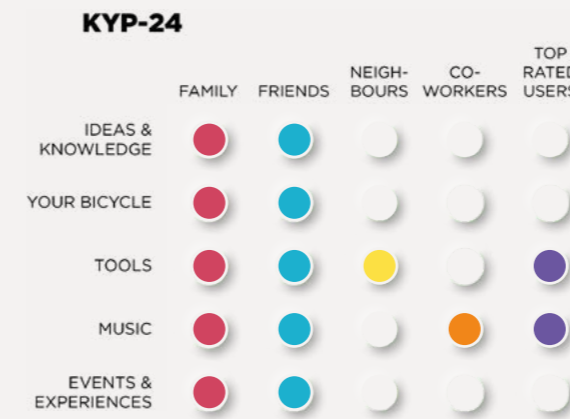


Fig 23. KYP-24's sharing chart

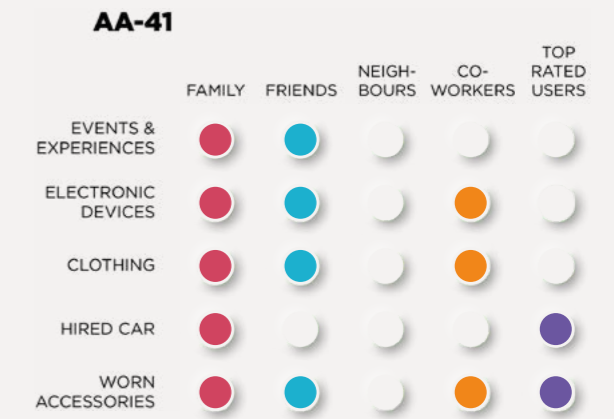


Fig 24. AA-41's sharing chart

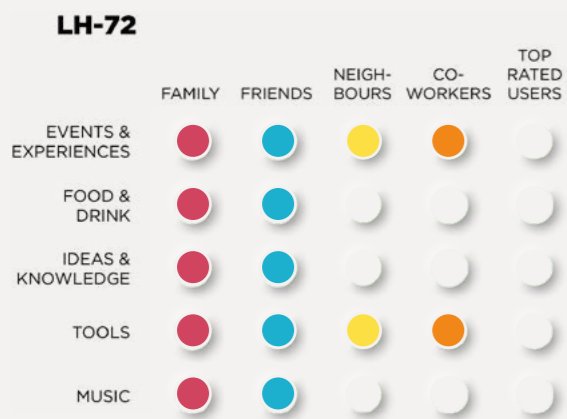


Fig 20. LH-72's sharing chart

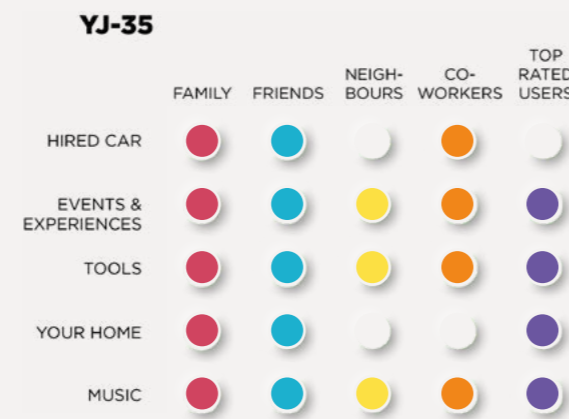


Fig 21. YJ-35's sharing chart

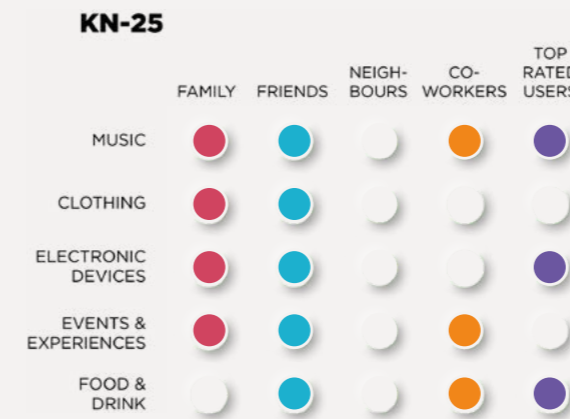


Fig 25. KN-25's sharing chart

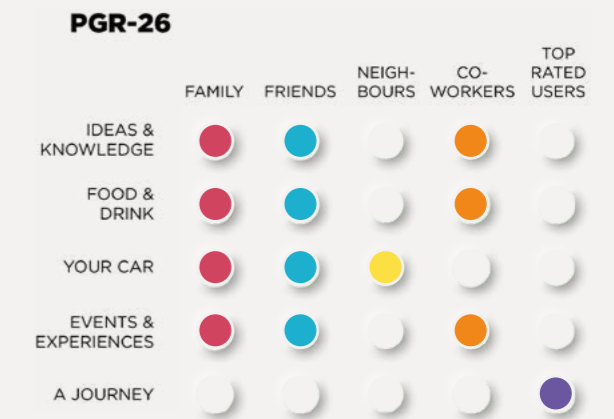


Fig 26. PGR-26's sharing chart

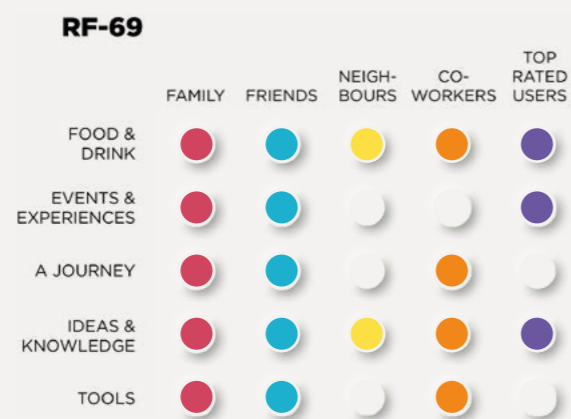


Fig 22. RF-69's sharing chart

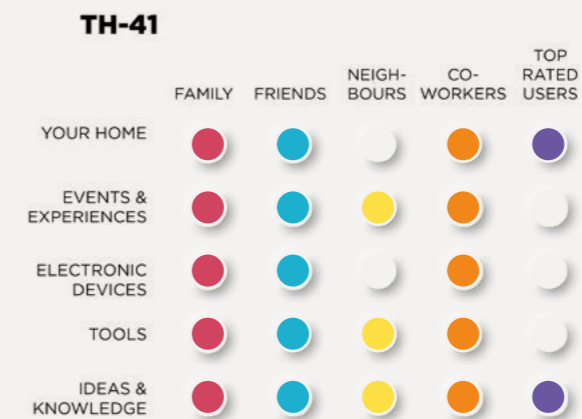


Fig 27. TH-41's sharing chart



MS-71

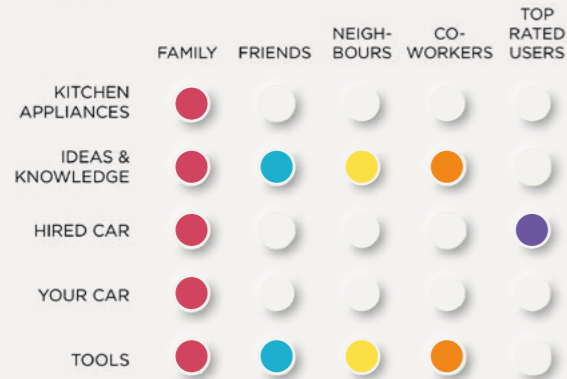


Fig 28. MS-71's sharing chart

AR-63

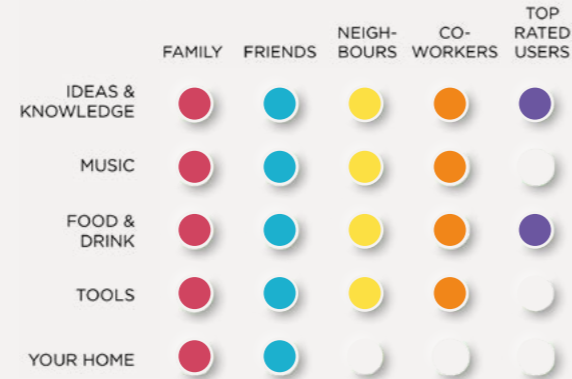


Fig 29. AR-63's sharing chart

MM-45

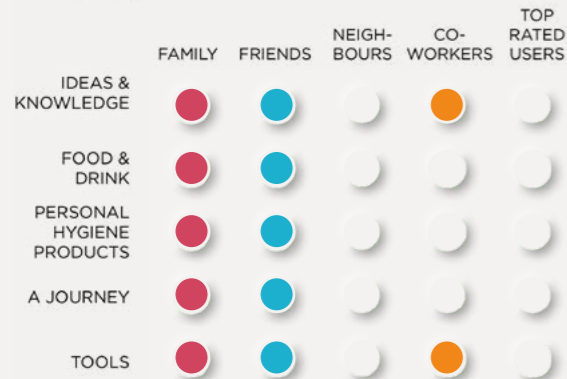


Fig 30. MM-45's sharing chart

IM-66

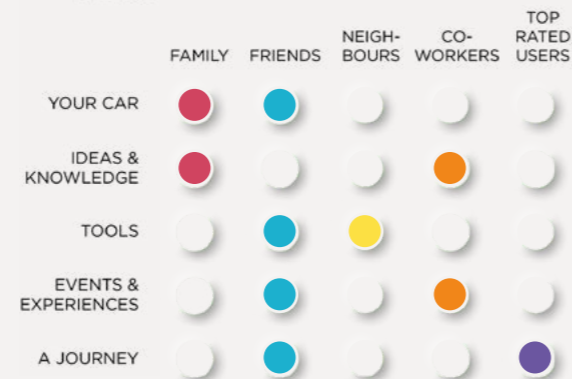


Fig 31. IM-66's sharing chart

LC-39

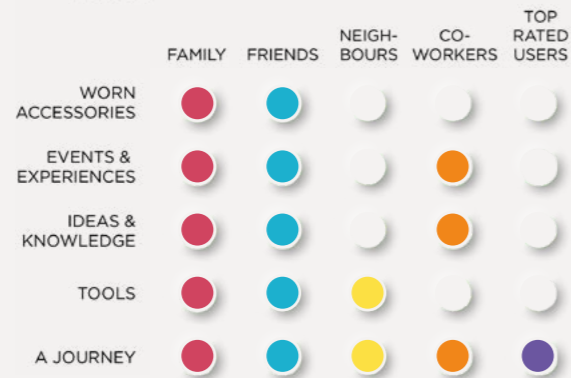


Fig 32. LC-39's sharing chart

Next the participants mapped their sharing journeys chart, marking, for the journey they had described how often, what type of journeys they had shared and with whom.

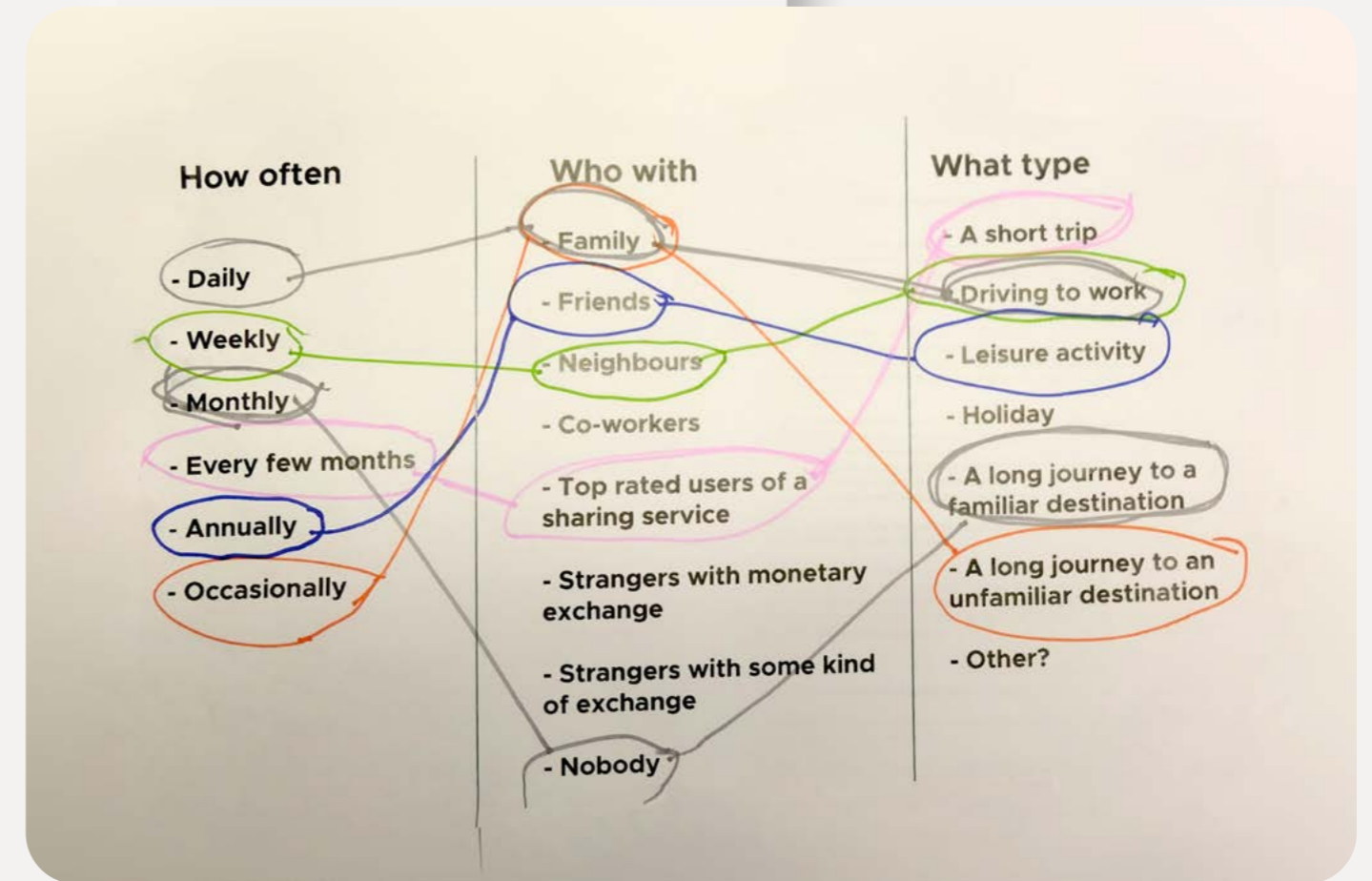


Fig 33. Journey sharing patterns - each colour highlights one participant's choice for talking about their journey sharing experiences

In completing the tribal maps, shown in the infographics, participants uniformly placed family and friends within circle 2 (Figure 35). All the participants unanimously placed the top rated users outside their trust circles. Neighbours and co-workers were placed towards circle 3 or outside. The tribal circles confirm the findings from the last section, when they grouped what possessions they would share and with whom, that people trust in the order that one would expect: family first, followed by friends then co-workers, neighbours and lastly top rated users.

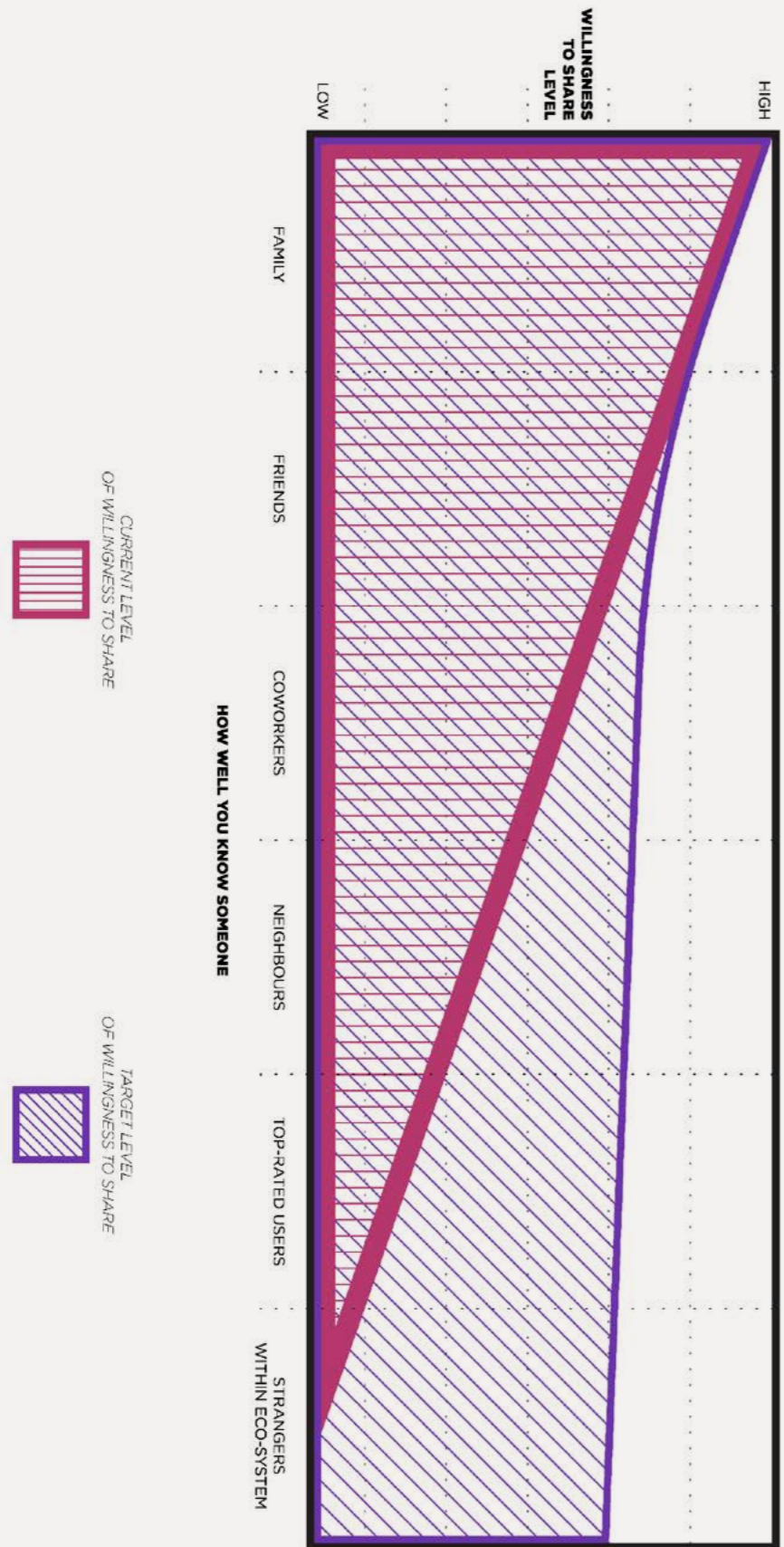


Fig 34. Current vs Target levels of willingness to share

TRIBAL MAP

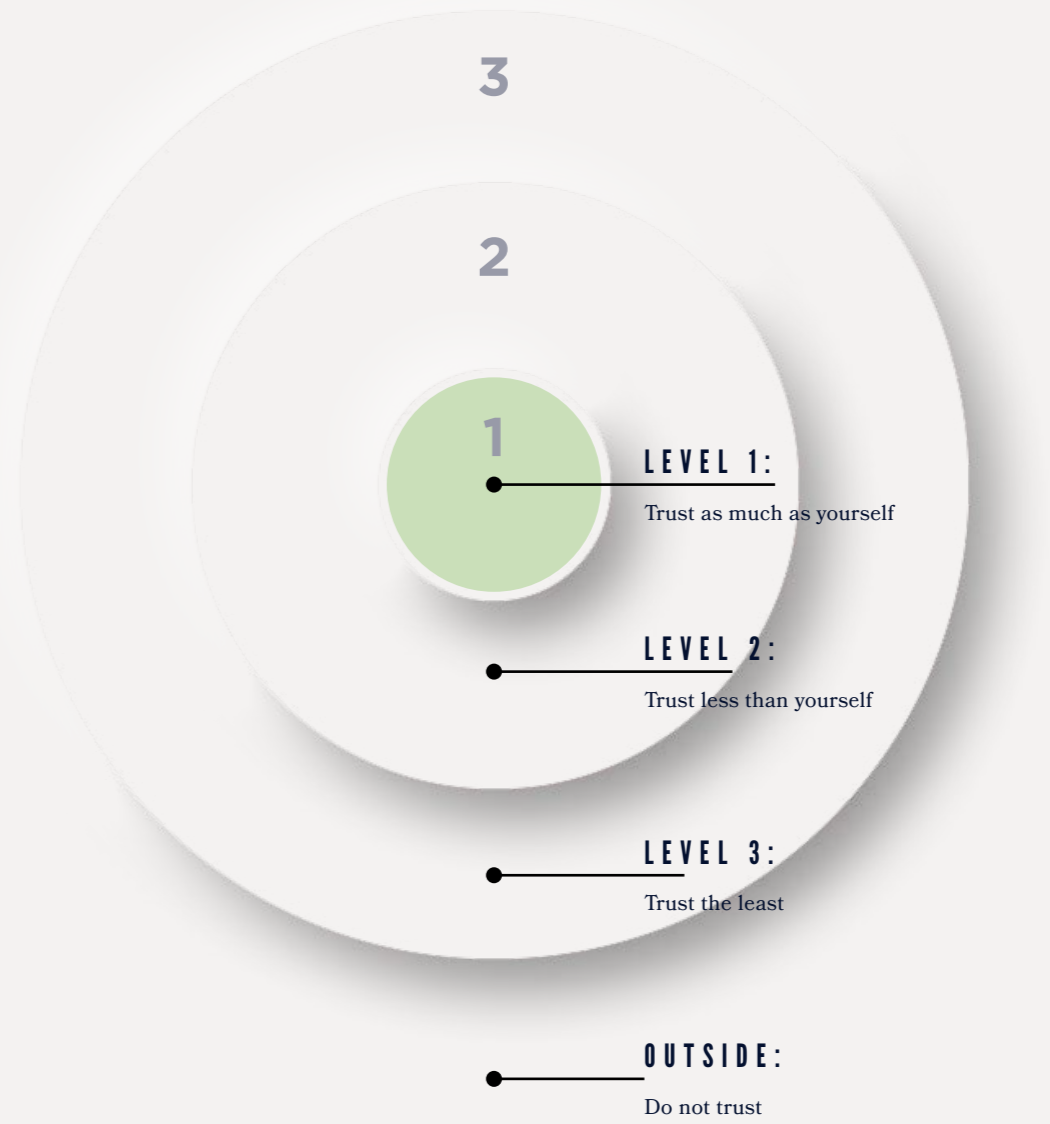


Fig 35. Tribal map anatomy



Fig 36. JOB-27 Tribal Map

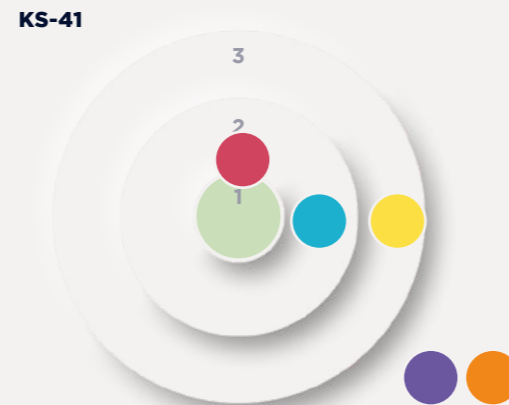


Fig 37. KS-41 Tribal Map

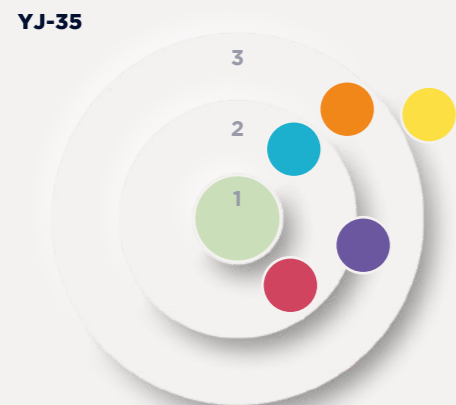


Fig 38. YJ-35 Tribal Map



Fig 39. LM-72 Tribal Map



Fig 40. RF-69 Tribal Map

“There is a facebook group for the block of flats, but there is not much interaction. I don’t stop to talk to people on the stairs as I am not keen on them” - JOB-27

“Get the top rated users out of there. Neighbours are futher away from co-workers and I wouldn’t know who lives six doors down” - LH-72



Fig 41. AR-63 Tribal Map



Fig 42. IM-66 Tribal Map



Fig 46. AA-41 Tribal Map

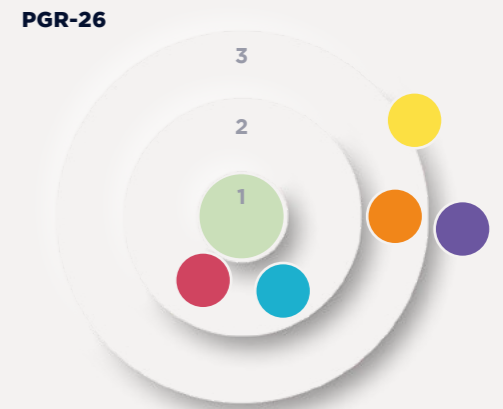


Fig 47. PGR-26 Tribal Map

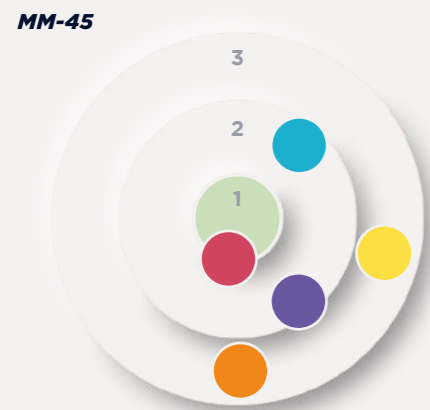


Fig 43. MM-45 Tribal Map



Fig 44. LC-39 Tribal Map



Fig 48. KN-25 Tribal Map



Fig 49. TH-41 Tribal Map

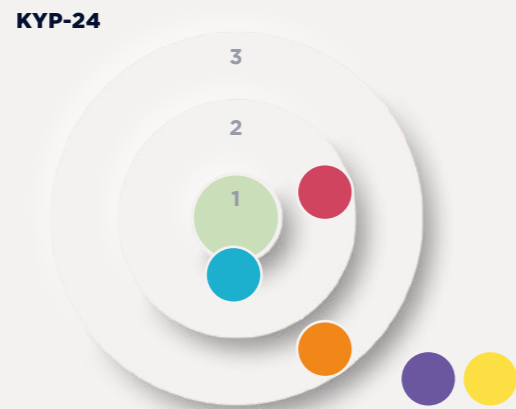


Fig 45. KYP-24 Tribal Map



Fig 50. MS-71 Tribal Map

KS-41 is part of a facebook group with her neighbours to share resources. “Family are my number one. Friends are also my number one” - KS-41

TH-41 would not describe his neighbours as a community but they will look out for each other, for example by taking in each other’s post.

4.2.3. Journey mapping

When mapping their journey into five key stages as a passenger in a shared vehicle service such as Uber or UberPool the participants’ journeys began by checking the apps for prices, comparing them, finding the availability of a vehicle and then booking it. These stages were separate key points on their map or combined as the first action as well as waiting for the car to arrive. The driver arriving, getting in the vehicle and being in it on their journey are key stages as well as arriving at their destinations, rating and tipping the driver on the app. One participant had a disagreement with the driver over the route and marked this as a stage. Those who mapped an UberPool journey had smalltalk with, or the picking up of, other passengers as a stage on their journey.

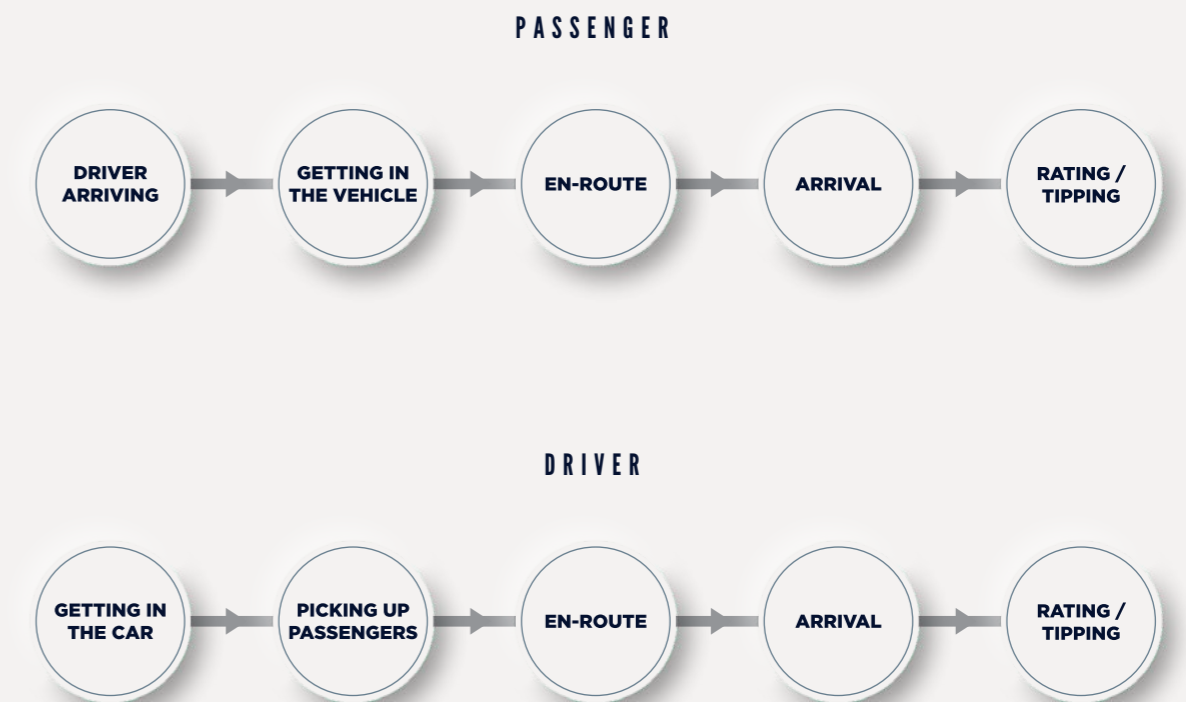


Fig 51. Journey map for passenger and driver in using shared vehicle services

Those who mapped their journey as a driver marked similar stages to those using sharing mobility services but without using apps. They generally started with getting the car ready, getting in it, then picking up or meeting at their homes, family, friends or co-workers followed by conversation. Those on longer trips stopped en-route for petrol or refreshments and marked this stage, others taking leisure pursuits such as dining out, holidaying or visiting exhibitions marked points around these activities. Arriving at their destination was nearly always marked as the last key point of their journey.

The participants then wrote three motivations for sharing and three barriers to sharing that they each felt were important to them. We spent some time discussing these.

Those who were thinking about being a passenger felt barriers to sharing vehicles were not knowing who was going to be in the car with you and whether you would get on with them. But what motivated them in general was that you could relax and not have to concentrate on driving.

Those who were thinking about their experiences as drivers sharing with others generally thought that the barriers were: being responsible, having to concentrate on driving and not having the same opportunity to interact with the passengers as they could; the passengers could also sleep and leave the driver the only one awake. Thinking about their motivations, drivers felt that they could help and support others by taking them to work, or on leisure trips out to places.

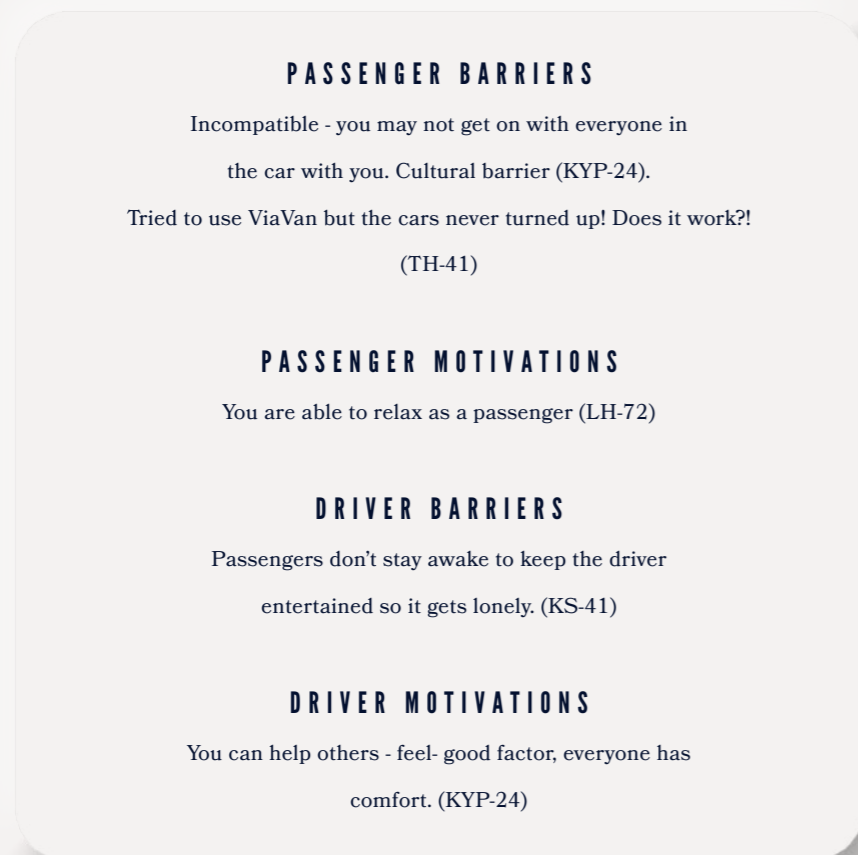


Fig 52. Passenger and driver barriers and motivations in using shared vehicle services

4.2.4. Interactive session

SHARING AS A DRIVER

JOB-27's current car has two seats in the front and three in the back, all forward facing. He has no digital support. For his drive he does not need much. He works for a telecommunications company, keeping some items in the boot that he uses for his job and sports gear for when he visits the gym at lunch times. He doesn't use his car on days off, but he needs it to be reliable, he describes it as a classic runaround car. He enjoys the current layout of his car so he would not make any changes regarding the layout. He shares his vehicle mainly with his co-workers as he uses it mainly for his job and to go to the gym. That's why he would prefer a vehicle with a larger boot capacity. He also would like to add a radio on the dashboard. Additionally, he would like to add a charger for his phone as well as heating in the car seats.

KS-45 would like the "same but bigger". In her current car's layout, a Honda CR-V, there are two seats in the front and three in the rear, with a child's seat on the rear left hand side, for her two year old grandson. There is also a sunroof,

an upgraded radio for DAB and USB ports to charge phones. The car has a big boot for luggage and a pushchair. She explains her preference of layout as Lexus RX 450 4x4 eco hybrid with white exterior and cream leather interior which she would own outright. She believes that an 'eco hybrid vehicle' would be a more sustainable choice. She would prefer to own a vehicle that was more spacious and luxurious. The car would have televisions in the back of the front passenger's and driver's seats. She believes it would be safer to have controls on the steering wheel. She would add speakers, central locking and control points.

YJ-35 said that not having satellite navigation and the lack of an internet connection was an issue. He thought that a wifi connection would be helpful as well as being able to use hand gestures to turn features on and off. So, more technology to assist with driving and navigation.

LH-72 once owned a Renault which had controls on the steering wheel. Currently, he owns a Honda Jazz which has luggage or storage space at the back. It has a conventional layout with all the seats facing forwards, two in the front and two in the back. The digital support in his current vehicle is satellite navigation, DAB radio, fuel gauge and speedometer. He would like the radio and satellite navigation controls on the steering wheel. Additionally, he would prefer a larger storage space in the rear of the vehicle. LH did not change the seating layout but added a sunroof. When talking he was thinking of a black taxi layout for Uber vehicles. He also likes the idea of someone else driving.

SHARING AS A PASSENGER - UBERPOOL JOURNEY

KYP-24 likes having a charger for her phone in the UberPool car and digital support that makes it easier for the passenger and driver to find each other. From the app you can see which passenger is being dropped off first. She likes the radio to be playing in the vehicle. She has found it odd that a stranger drops you off at home and therefore knows where you live. Her preference is to sit in the back of the vehicle and in an UberPool she likes to choose her own seat so she prefers not to share with others if possible. She would like individual seats in the back and a panic button

MM-45 Referring to her car she said that it is comfortable: "it's fine". On the journey they didn't use the satellite navigation instead they used google maps to work out their route. She prefers the language on Google Maps and finds it simpler to use, so she would like Google Maps in the car instead of the current satellite navigation.. She puts her phone in the cup holder, which falls out every now and again.

IM-66 would prefer a narrower car instead of an SUV because it would be more manoeuvrable down the narrow road.

on the app or an alarm bell for safety so each passenger can call for help if necessary and more space would be nice especially if she is in the front seat. She would also like to have chargers in the back seats and wifi. She would like the flexibility to choose to talk or choose to have private space and time in the vehicle. This could be an opportunity for the service providers to have an option on the booking app to reserve a seat then passengers could choose where they sit in the vehicle.

SHARING AS A PASSENGER - UBER JOURNEYS

AA-41 would change the driver and have someone who knew their way around London! She wouldn't change anything physically about the car interior and didn't like the idea of screens between the driver and passengers. She didn't think a panic button would work and she already has her phone which she could use in an emergency. She did think that passengers should be able to open the doors when in the back of the vehicle because drivers can put the child lock on. This suggests that there could be a shared app offered by the service provider, used by both the driver and passenger, to agree a preferred route before starting the journey that could be updated in real-time if there were any delays.

KN-25 said that she didn't want much more than a place to play her music.

This shows that there are other services and considerations that could be offered by the service providers to their customers. They could additionally store data about their customers needs and preferences so that the car that was sent when they booked the service was fitted with everything that they needed for a safe and comfortable journey.

SHARING AS A PASSENGER - A COMMUTE

MS-71 Sometimes he adjusts the seat, puts on his seatbelt but otherwise he thought the layout was fine. His neighbour's car is a KIA saloon.

PGR-26 spoke about the interaction with the Uber driver rather than the interior layout. She wants to be acknowledged by the driver when she gets in and leaves the car but doesn't always want to talk during the journey. She prefers to have her headphones on and watch Netflix.

TH-41 thinks the layout is perfectly functional. In the current layout, there is a childproof lock at the door next to his five year old child. He is satisfied in terms of Uber's digital support, which he finds particularly useful for getting information of the arrival time at the destination and the route planning feature of the app. As an improvement he would like the service to provide a baby or child's seat. Also, a charger for his mobile phone and charging pads in the car. He likes having a driver and is not keen on the concept of driverless vehicles. Childproof locks he considers are an important security feature.

4.3. Conclusions

One of the recurring issues concerning shared mobility was **trust**, both in the service provider's systems and in people they don't know in the vehicle. Users felt less secure about getting an Uber at night, but only women vocalised this. Regarding **regulation**, users questioned if the providers are regulated or are part of a scheme and wondered who is responsible legally and what legislation is there to protect them in the event of a problem? Participants expressed that their **freedom** to use the vehicle could be compromised as the service may not be immediately available when they need it. They were also concerned about reliability and the inconvenience of locating the vehicle or being picked up at a designated point some distance from their location. In addition, to access these services people have to share their **personal data** with the provider and there were concerns raised about **data security** and how their data was used. Participants expressed a desire to be in **control** and were uneasy about not having control. They were also concerned about their personal safety, this meant they were cautious and thought there were elements of risk associated with shared mobility.

Interior **space** was another issue and users wanted enough space between themselves and others, they wanted to be able to sit where and how they preferred but felt uncomfortable asserting themselves with strangers especially if they were already in the vehicle. Some participants said that they want to have **privacy** inside the vehicle, their own 'bubble' or personal space without the intrusion of others' preferences such as entertainment or feeling obliged to **communicate** with others. Others preferred interaction with other people and thought there were opportunities to be social and interact with others. A barrier, even a psychological one such as having headphones on or looking at a phone, distances a user from those around them and can create the illusion of seclusion, taking away the senses to create a psychological detachment from those around them. Not being able to see, hear, smell and touch those around them creates a psychological bubble - creating personal space when there is none. Depending on their mood people wanted to socialise or be private. More issues arose or were vocalised on trips with people the participants knew. This is probably because people are more willing to interact with people they know. Whatever the journey type, basic

levels of human interaction are needed for people to feel comfortable such as greetings and farewells. Other passengers' habits such as cleanliness as well as concerns over hygiene and the temperature in the vehicle were also worries that were expressed.

Communication is also important between the passengers, the driver and with the system that operates the service. The driver needs to communicate with both the passenger(s) and the system. Unfamiliar routes created a sense of anxiety in the passengers and doubt in the service provider or driver. This was increased when various apps gave different data points, creating confusion and conflict. Could there be an app or service where journeys are shared with all participants?

We found that there are common motivations for sharing vehicles. Being able to **access** the vehicle best-suited to their needs depending on the occasion, as well as being able to choose a model that may be unaffordable to purchase, was important to them. Convenience, more choice and ease of access were key motivations for the participants. They also cited **economic** incentives because sharing with others lowers the overall cost as well as **environmental benefits** from reduced use of fuel and less traffic congestion.

These insights and people's concerns led us to think about the design directions we could take to explore and potentially resolve such a wide range of issues. What we found interesting from the results of the literature review, online surveys and user workshops was how vehicles could be designed to better accommodate different stranger-sharing scenarios and support the diverse requirements of family members at different stages of their lives.

CHAPTER 5.

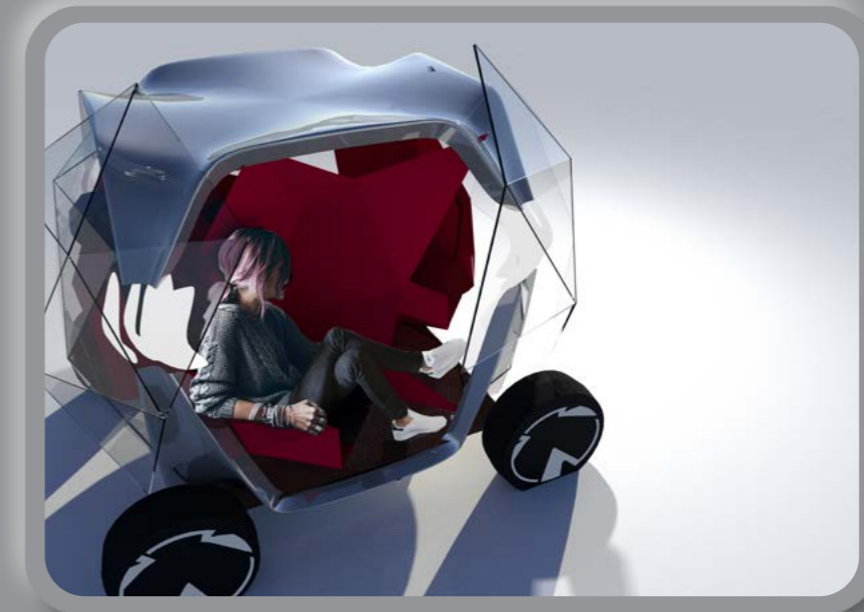
DESIGN CONCEPTS

In the literature review, surveys and workshops we identified three main themes that were the core concepts of our design briefs: Sharing, Trust and Choice. These core themes developed into scenarios with personas to help the designers visualise the users needs, their journey, and to identify associated mobility design challenges.

Since mobility has such a wide range of focus, an early decision was to identify key areas that affected the majority of people. These key shared mobility spaces were: Small, Business, Family and Multi-Staged journey. A team of service and vehicle designers split up to take a brief each, researching, creating moodboards, deciding on hard and soft design points, identifying unique sharing mobility challenges that were specific to their brief, and collaborating to enhance their ideas.

NANO

SHARED VEHICLES, SAFE SPACES



5.1.1. Introduction

Project 1 is called NANO and the challenge was to design an open shared vehicle safe space for 2060 and service from booking to arrival that encourages users to feel comfortable on a shared journey with strangers lasting under one hour. The users should have options to interact and communicate with others on the journey if they choose to, they should feel safe and confident at all stages of the journey. The concept is of a four seater taxi service with secure morphing interior design which takes care of the passengers transportation, emotional and physical security needs. The materials that enclose the passenger and the flexible interaction modes improve the users trust of the vehicle, service and brand. The three keywords for NANO are control, safety and reassurance. The question was how can you use a brand lifestyle/ecosystem to improve accessibility and trust? The theme being one company with a variety of services that complement their mobility service.

5.1.2. Persona and scenarios

The persona created for NANO is Hannah who is a London-based, 35 year old corporate employee who is shy and introverted with mild social anxiety. She prefers sharing rides to using public transport for economic reasons and convenience. The scenario describes Hannah on vacation abroad where she has never previously visited. On this day she is taking two trips on the system, one in the daytime from the airport to her Airbnb house and one in the late evening from the house to a bar where she plans to meet a friend for drinks. She has used this system in her home city regularly but is anxious using it in a new city where everything is unfamiliar to her. She is especially concerned about the ride at night and is double-checking the safety and emergency features of the vehicle she will be taking then. When at the next stop a passenger gets on who makes her feel threatened, she can't wait to get off the ride.

5.1.3. Service design work

We developed Hannah's journey split into day and night which explores her positive and negative emotions during both journeys and the actions that she took throughout (Figure 53).

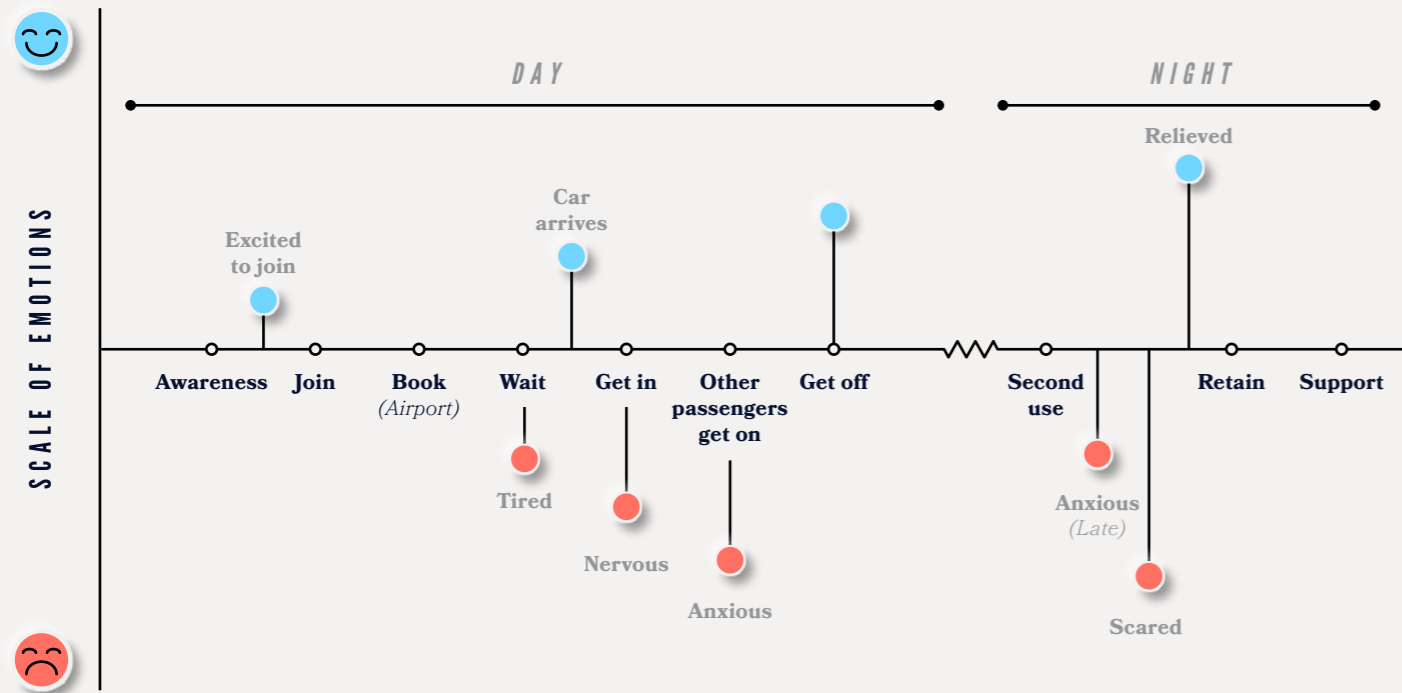


Fig 53. Hannah's Emotional Journey

We also mapped on the journey timeline Hannah's requirements on these trips which were, firstly, that she needs a level of privacy when she is sharing the ride with a stranger with options to interact and communicate with others as she travels if she wishes to. She also needs to have easy communication with the car and the system about her situation if necessary as well as needing visibility and access to a sign of authority or regulation in the car as reassurance. Key considerations were identified as: how the brand can better attract users by increasing accessibility and trust, what kind of communication can be encouraged, how can it be more ecosystem-orientated (rather than a one-off service), and what are the unintended consequences of this open shared transport system?

The service blueprint (Figure 54) we developed firstly concerned awareness, decision and use in the daytime. It identified the physical touchpoints on her personal device before deciding to and during booking and through the in-vehicle settings such as interior seats and customer

service. User actions are: travelling to a new city, checking notification, deciding to use, booking, getting in the vehicle, communication with the vehicle and system. Frontstage actions are: the provision of automated notifications for a change of cities or countries, options for choosing the vehicle and service provisions to include basic information about the trip (route, duration, price, car etc.), booking confirmation and detailed information about the vehicle. Other frontstage actions are an artificial intelligence (AI) conversationalist and asking about a future journey. Backstage actions are to gather locational information, adjustment of the booking settings to the user's preference (service provision), a global positioning system to get the nearest and most appropriate vehicle, and to analyse the user's behaviour and adjustments. The support process was to retain the user's profile on record and for the vehicle designers to consider the interior configuration to adjust to the user's preference.

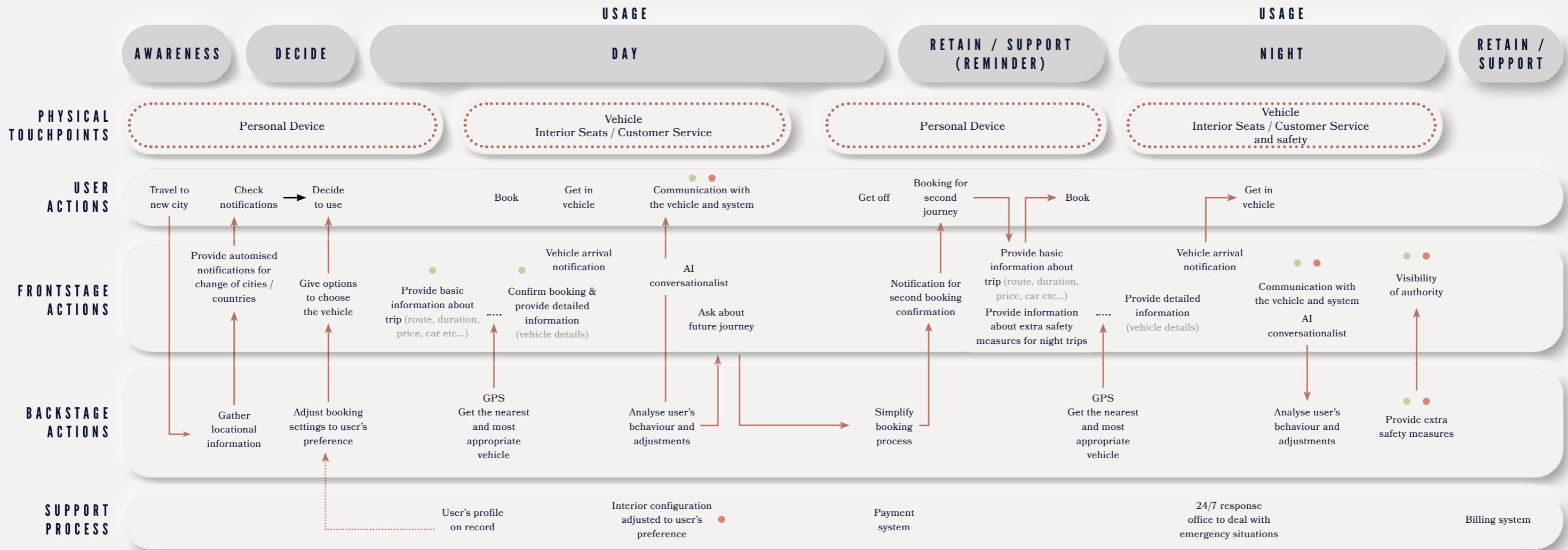


Fig 54. NANO Service blueprint

KEY

- Vehicle design output
- Service design output

The night section of the service blueprint was concerned with retaining and supporting. The physical touchpoints were as before - her personal device, the vehicle interior, especially the seats and customer service to ensure safety. User actions began with getting off the first vehicle, booking the next journey, getting in and lastly getting out of the vehicle. Frontstage actions begin when Hannah asks about her next journey, then receives notification confirming her second booking, provision of basic information about the trip and information about extra safety measures for

night trips, the provision of detailed information about the vehicle and lastly vehicle arrival notification. They continue with frontstage actions for the service and vehicle designers which are: communication with the vehicle and system, AI conversations, and the visibility of authority. The support process is the payment system, 24/7 response office to deal with emergency situations and the billing system.

The overview of potential outputs from the service designers was to develop a booking system that adjusts to the user's preferences (route, duration, price, car etc.) and for the vehicle designers to configure an interior that adjusts to the user's preference. Both sets of designers were to consider the visibility of authority, extra safety measures at night and communication with the vehicle and system.

There are three parts to the key services that we designed for this brief (Figure 55). The first service is for users to join and use. Hyundai would be the primary service provider for users to manage their preferences. The second service would be focused on two safety measures, basic and extra. Basic safety features involve the user adjusting the light and seating based on their mood, operated by their gestures. Extra safety features use AI cameras to track emotions, helping the user feel secure by monitoring their gestures and generating an automatic emergency response if the system thinks the user is in need of assistance. The final service is a reward system which would use a Hyundai card as a promotion. In this scenario, if the user takes 10 trips, they get the next one for free.

KEY SERVICES

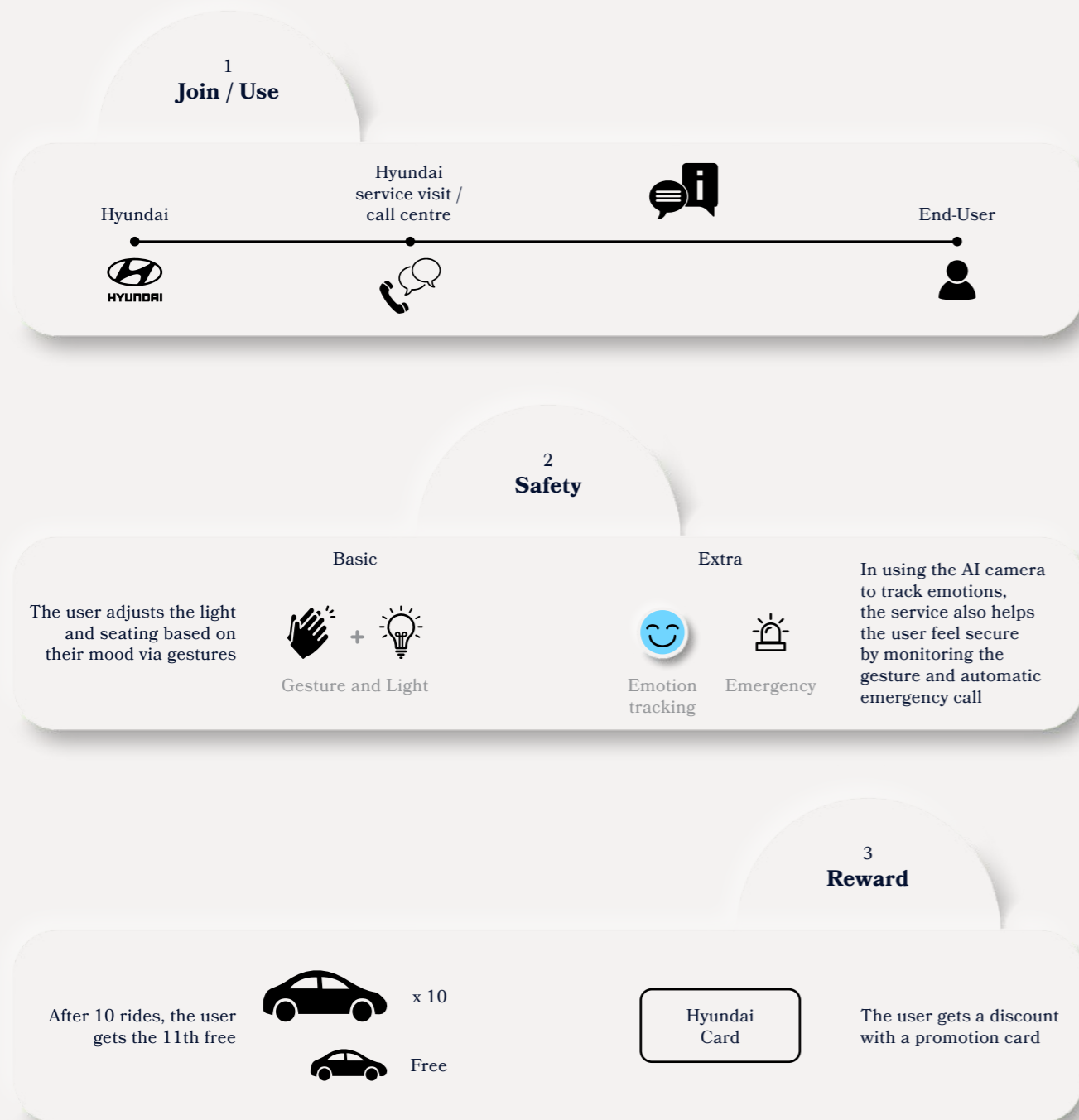


Fig 55. Key services of NANO

FINAL SYSTEM BLUEPRINT

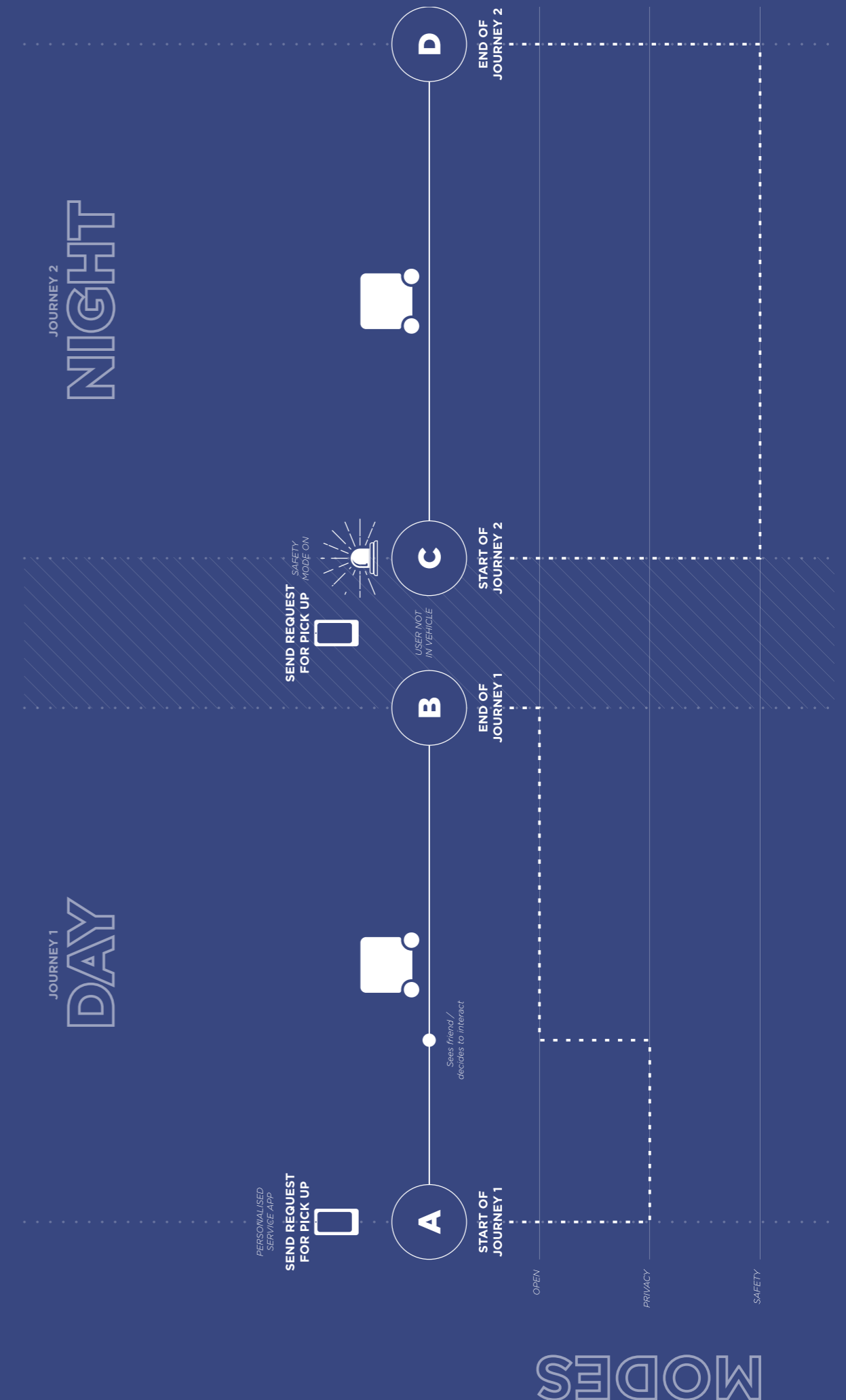


Fig 56. Final systems blueprint for NANO

Figure 57 is an example of a potential User Interface (UI). It shows how the user can suggest what they would like to be doing whilst using the service, as well as their route, follow up information (Figure 58).



Fig 57. NANO UI explorations: landing page

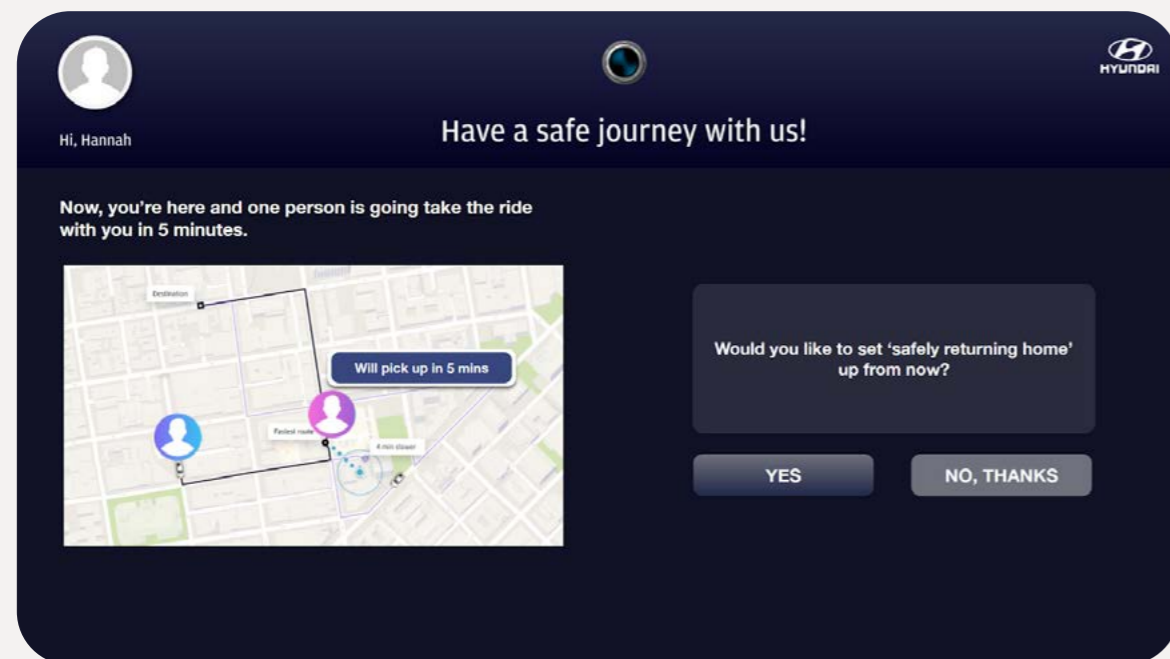


Fig 58. NANO UI exploration: on-board and follow up information

5.1.4. Vehicle design work

With the core ideas for the brief set out, we moved on to create moodboards, exploring materials, spaces and researching products that have previously existed (Figure 59), all based on the core themes of control, safety and reassurance.

Fig 59. Moodboard inspirations for NANO

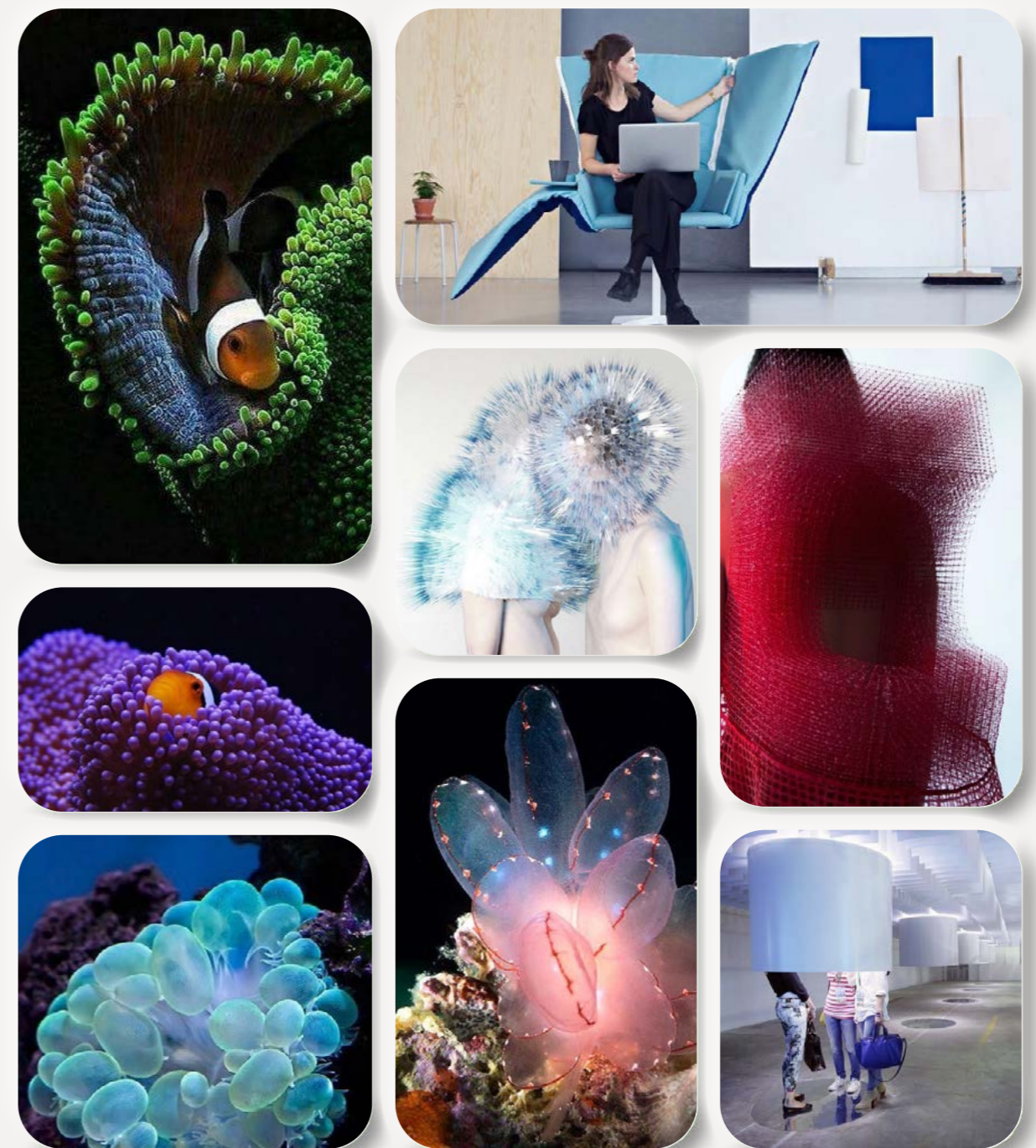




Fig 60. NANO storyboard for day scenario

A key part of the design process was creating a tagline for each brief. This tagline was to be a point of reference that the designers can keep in mind during the later stages of the design process. The tagline for NANO was "Sharing with Strangers". This emphasises that sharing is not only a focus here, but more of a theme to start from. Sharing with strangers has very different design challenges than sharing with known people that the user is comfortable with, which the design team kept in mind throughout the design process.

The next stage was creating basic storyboards that are based on the service design timeline and outputs. The storyboards, similar to the key phrase, are a visual cue to the designers. They help the design team to find and identify which points of the scenarios are key for the design process, such as interactions between users and/or the vehicle. We created two storyboards for this brief, Day and Night, since they have separate design challenges and outputs. The day's storyboard (Figure 60) focuses on Hannah waiting for the vehicle, entering, focusing on some work and then realising there is someone she knows in the next section. She moves her seat so as to socialise for the remainder of the journey then exits once the vehicle arrives at the destination. The night's storyboard (Figure 61) is slightly different, wherein Hannah feels less safe and activates the safety mode. Visual safety precautions are on display for Hannah and her seat is locked in the focus mode for the duration of the journey.

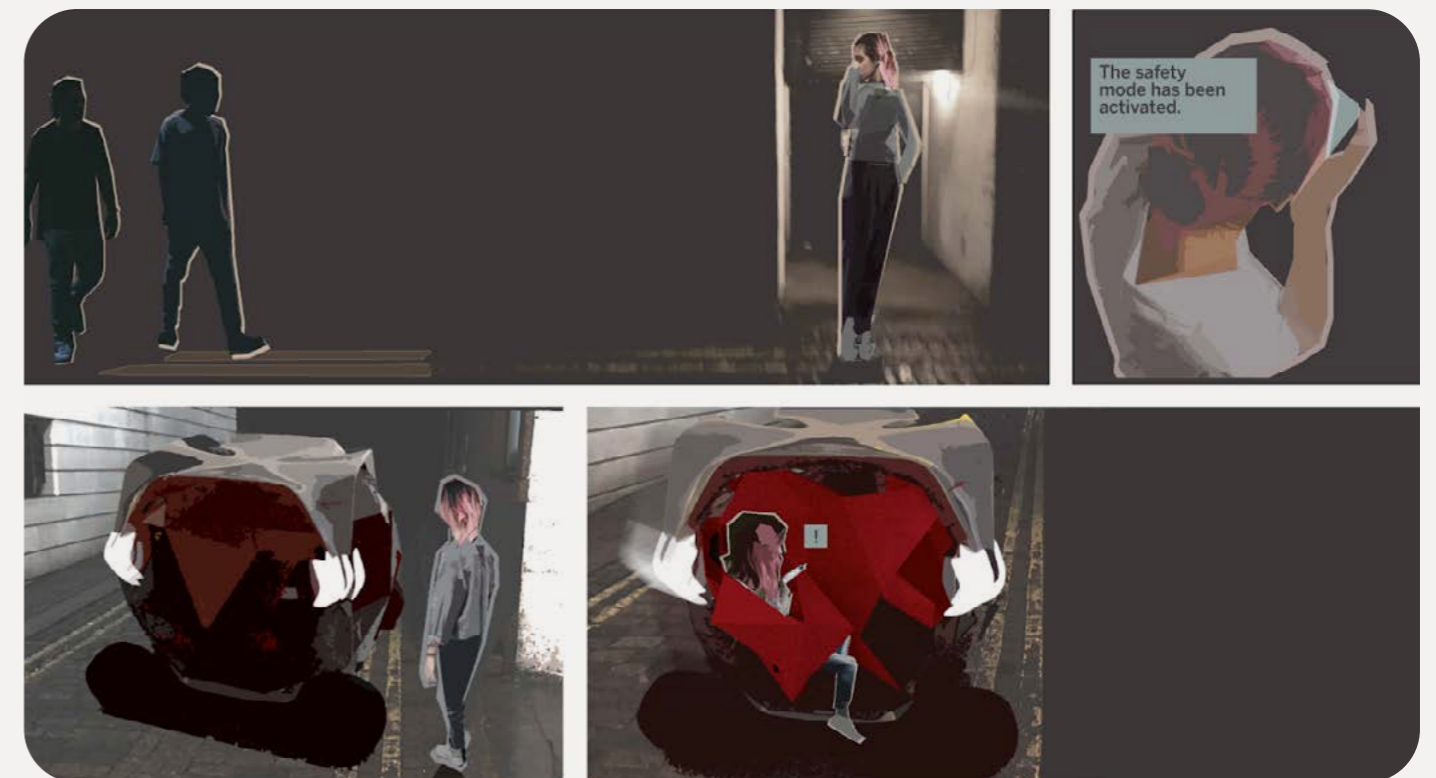


Fig 61. NANO storyboard for night scenario

Fig 63. Equality in a shared taxi

During the research stage, it was found that people using a shared vehicle preferred sitting in the front seat, since it offered them a separate entrance and secluded seat. This is a feature that was identified by the design team as a must for this project. As shown in both storyboards, focusing on

safety, having an entrance per seat means the user is in control at all times. This design feature also works well for the scenario of a small taxi, since 4 identical entrances will create a relatively small vehicle (Figure 62).

SQUARE CAR FROM A CUBE

As the vehicle started from the square layout its exterior shape started from a cube. One of the biggest inspirations for that form was Hyundai front graphic design of the recent models. Lights in the corners of the opening are underlining the overall shape of the frame while acting also as communication to the passengers.

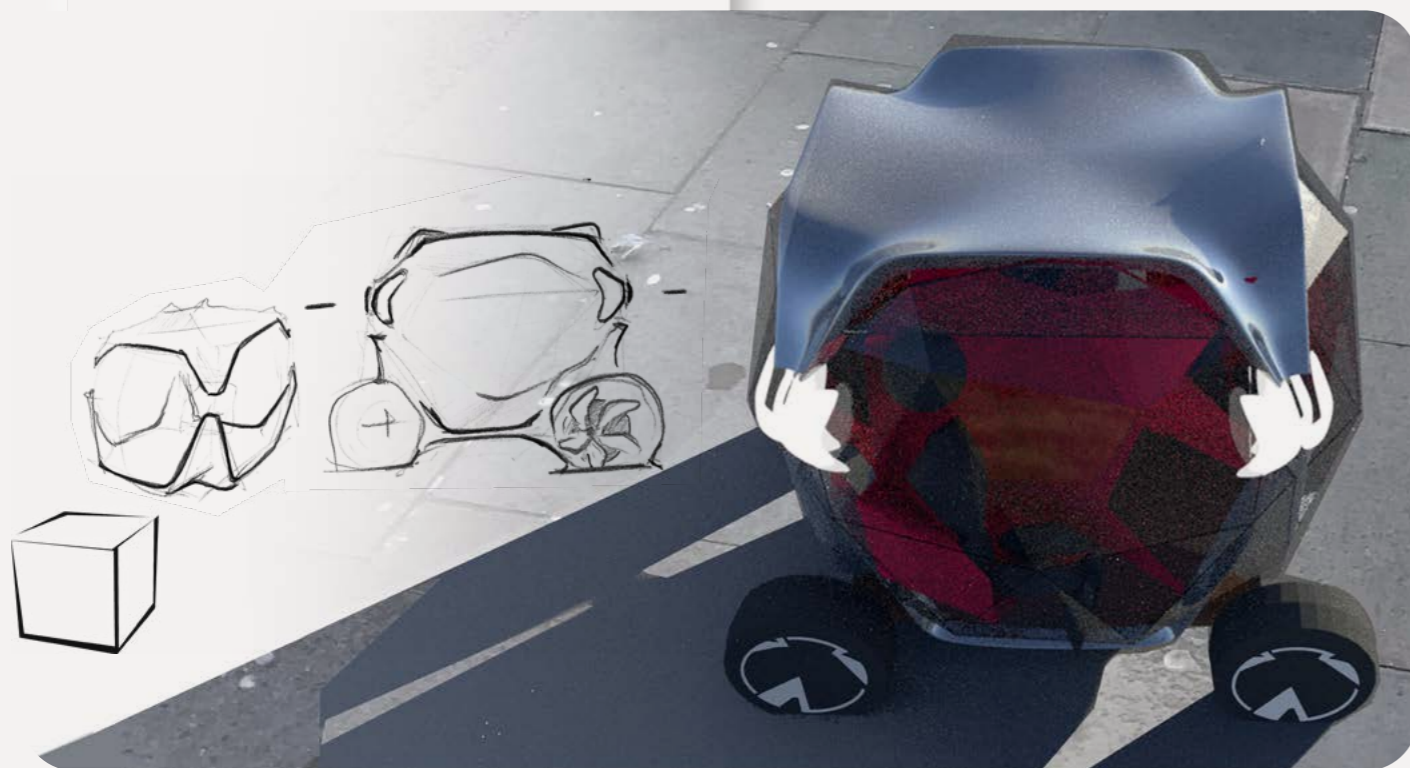
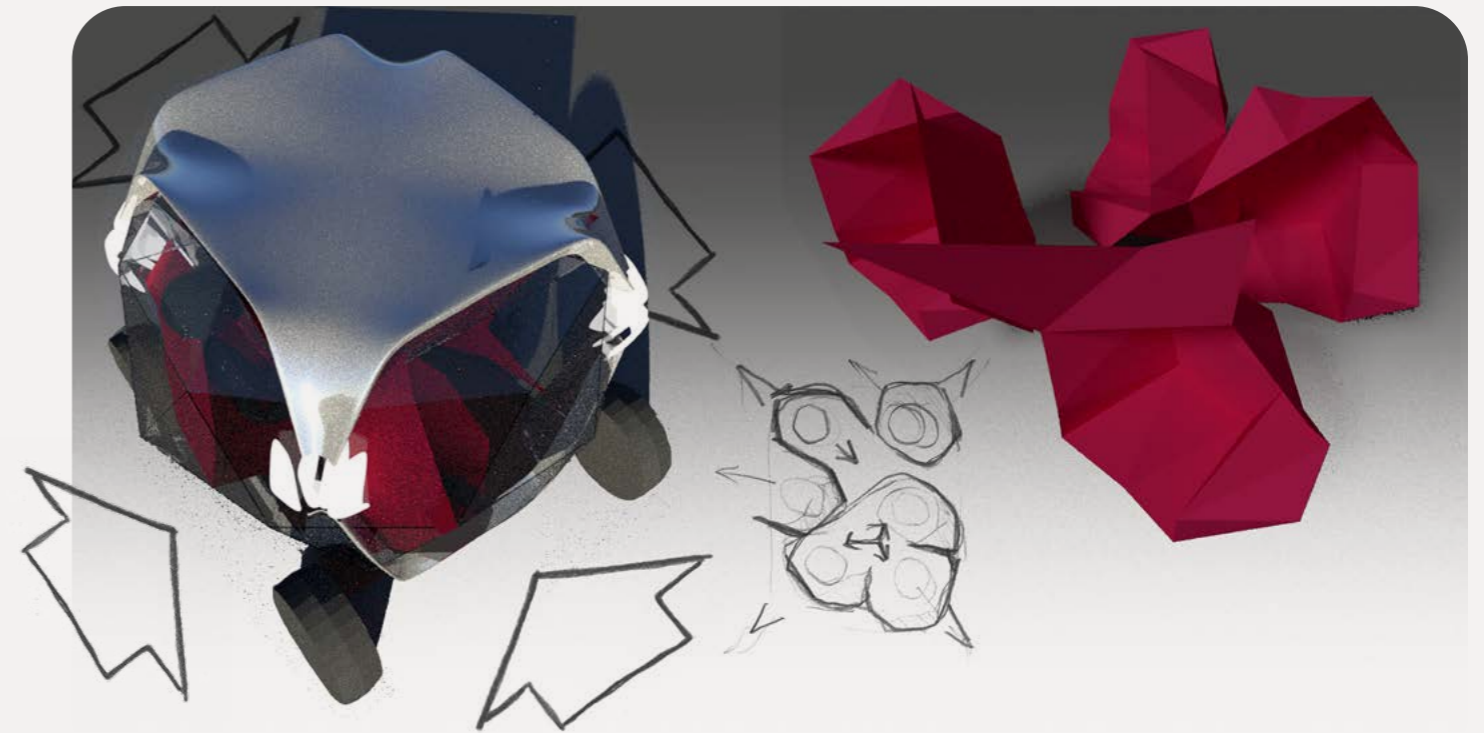


Fig 62. The ideation process for a cube shared vehicle



EQUALITY IN A SHARED TAXI

The layout of the vehicle was dictated by the need to share. To make everybody feel comfortable within such a small space the equality element is very important. For this reason the package is central symmetrical. Trying to use the size of the vehicle to maximise the capacity there are three rows with first and last passenger between the wheels.

EASY ACCESS

Nano can rotate as its wheels are in each corner. This allows it to adjust the position for every entering passenger making it easier and safer to use the system. Additionally, the lights in corners work exactly like lights in the nowadays taxi and can indicate the correct side of the vehicle to the user for entry.

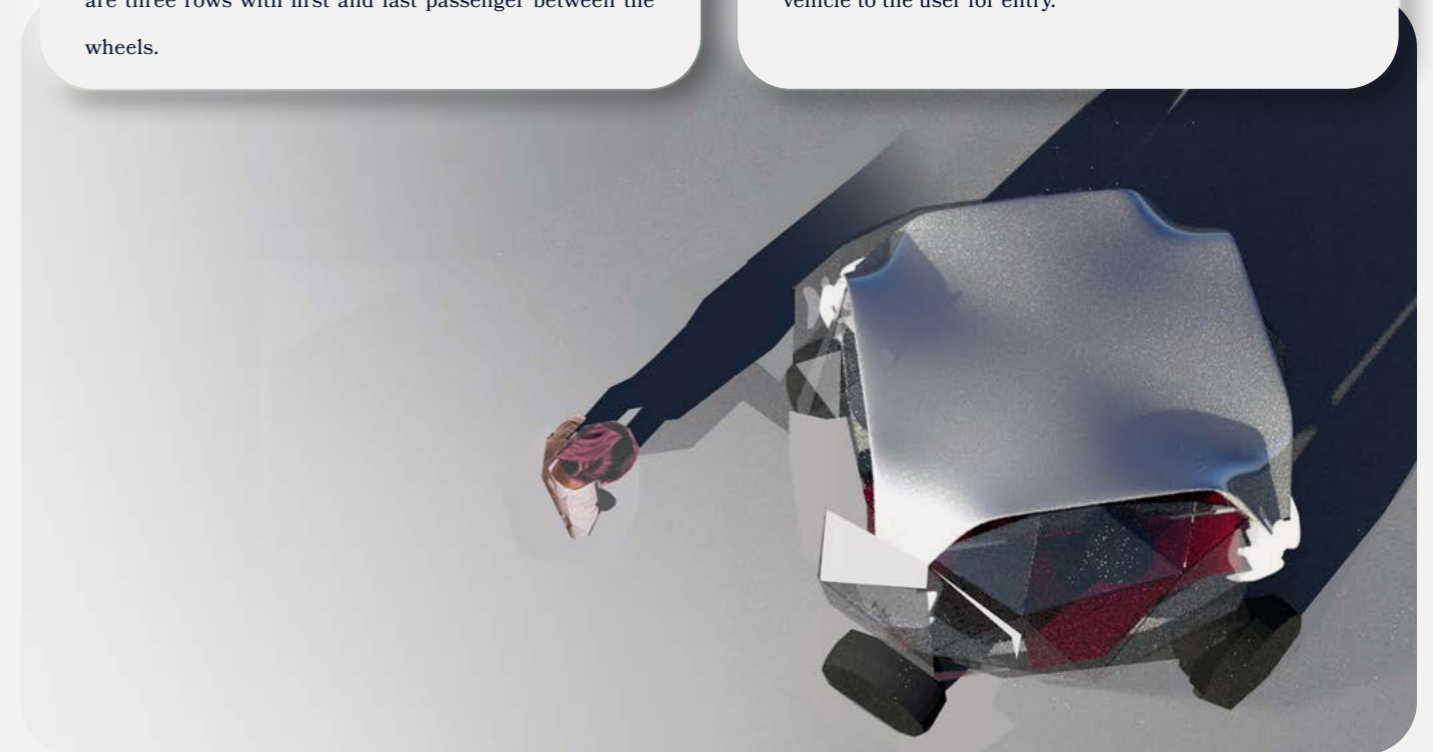


Fig 64. Easy Access

Based on both storyboards and the interactions explored, one of the main design challenges was to design a seat that allows for a choice between privacy and interaction with other passengers. Exploration of a variety of enclosures gave an insight into how the seat styling could work. These enclosures included concept phone booths, folding seats,

private windows for confidential information, wearables and many others (Figure 66). The research also included a material that was lightweight and semi permeable, but also solid enough to sit back on and create privacy when required (Figure 65).

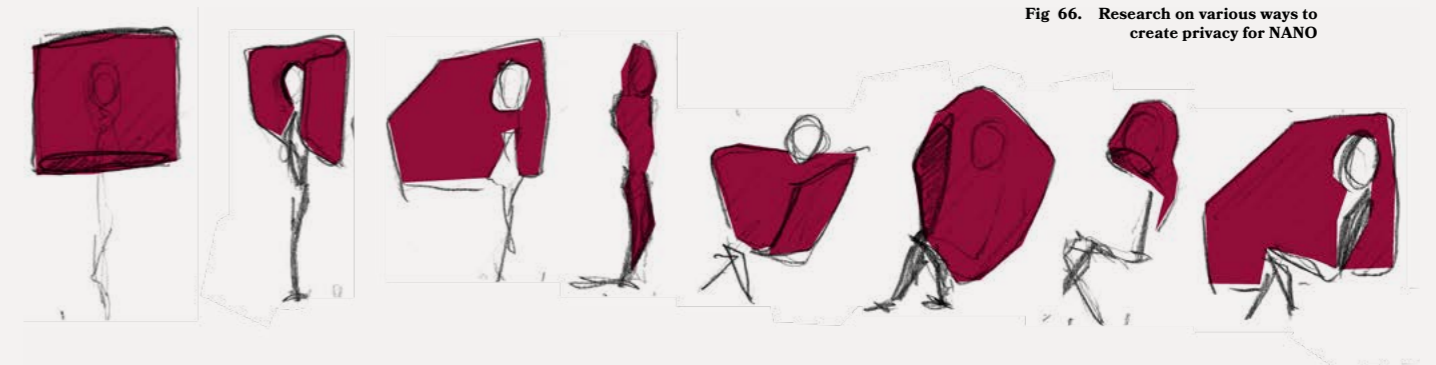


Fig 66. Research on various ways to create privacy for NANO

HOW DO WE HIDE?

A simple wall or a shutter between the passengers seems like a good idea but we wanted to understand how we like to enclose ourselves. Very often we don't want to be closed in a small box and we play with our privacy. Thanks to that on the market there are a lot of solutions with directed function and these are just a few of them.

NEXT LEVEL OF PRIVACY

The seat textile would create another level of control with the use of a special changeable transparent textile. Thanks to the material made out of little rubber tubes normally semi-transparent that could be pumped with air creating an opaque barrier multiplying the effect of an open yet private space.

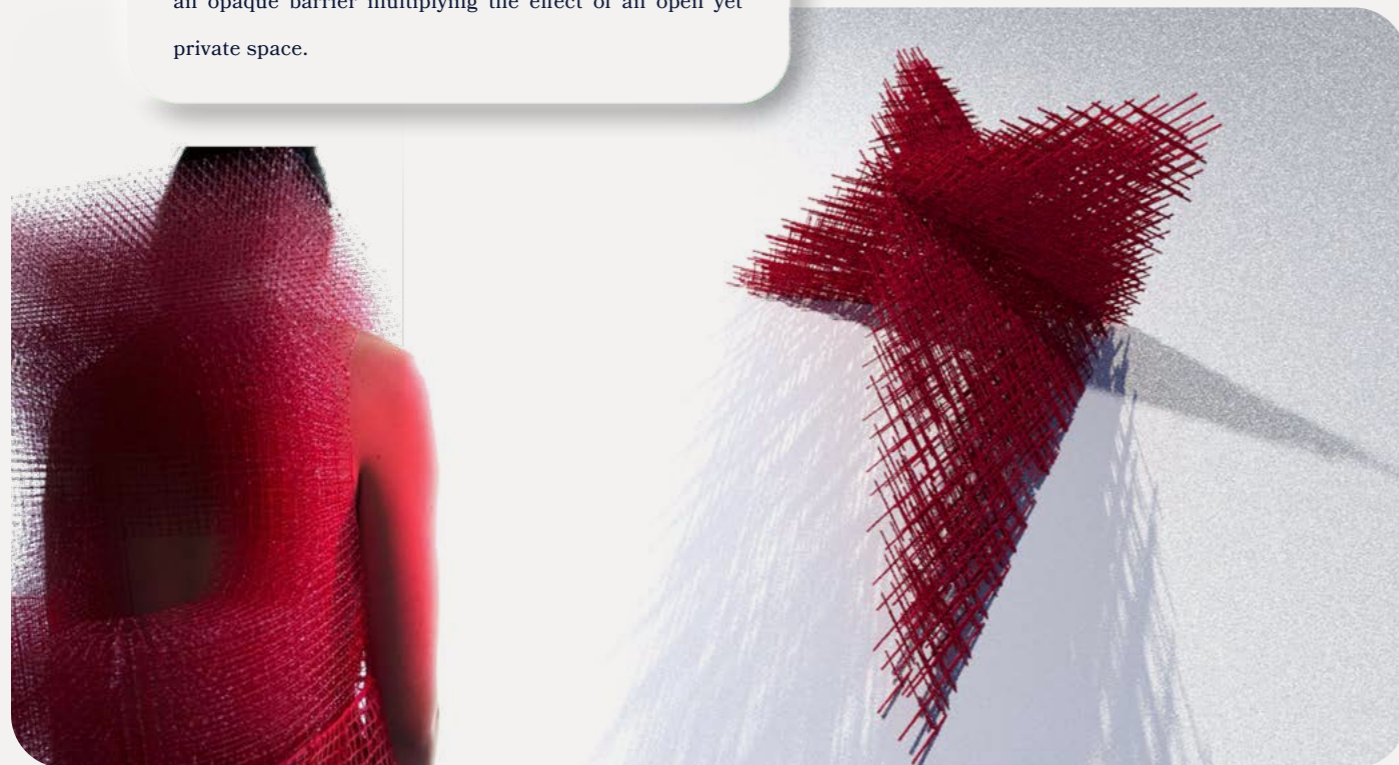


Fig 65. Controlable transparency material

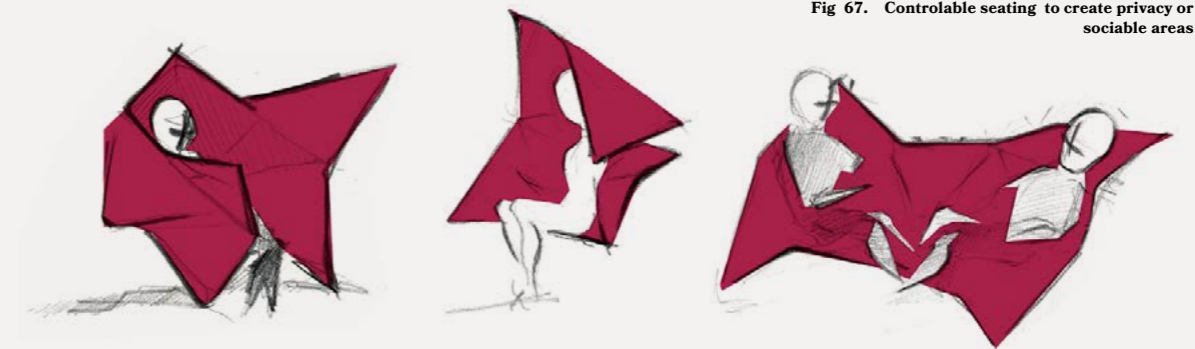
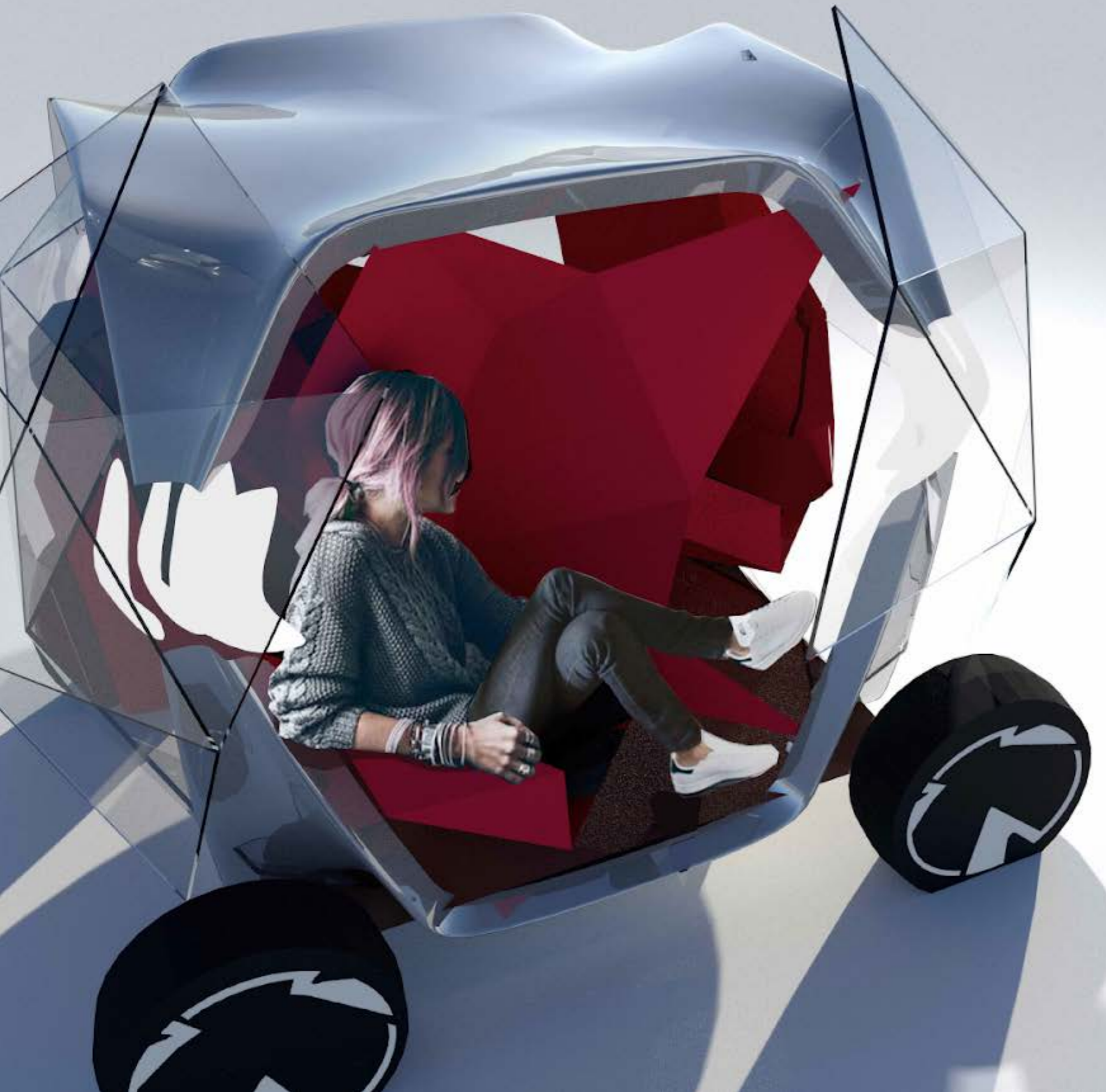


Fig 67. Controlable seating to create privacy or sociale areas

COVER WHAT YOU WANT

The foldable geometric style of the seats allows passengers to be in control of their own space. They will cover or open themselves to the other passengers, creating a nearly coral-reef like environment where they can use their surroundings in various ways. Additionally, there is a possibility to connect the spaces together, if travelling with a friend.



Finally, the designer chose two hero images to show how the proposed vehicle exterior and interior design work. Figure 68 shows an entrance-per-seat design feature by indicating how the passenger gets in and out of the vehicle and the look of the possible solution of the door. Figure 69 on the next page illustrates how the morphing seat dividers could be folded up and down to suit the settings of private and interactive spaces.

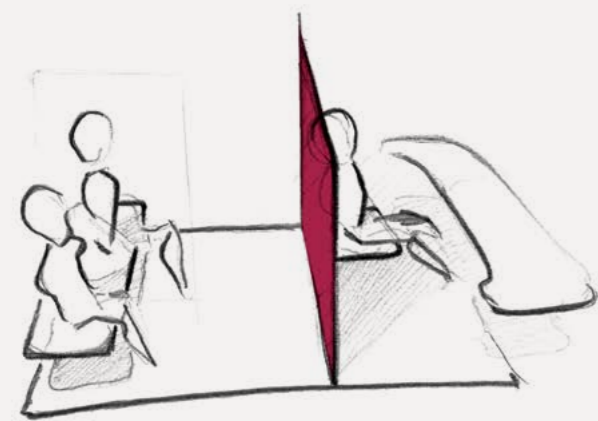
Fig 68. NANO final render of how a user enters the vehicle



Fig 69. NANO final render of the interior showing users interacting with each other or keeping the space private to themselves

5.1.5. TRANSITION ROADMAP

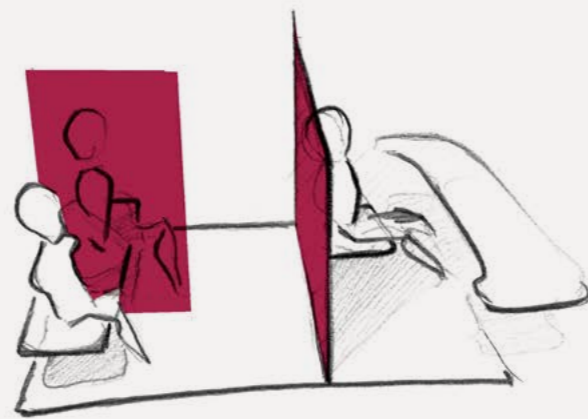
The transition roadmap takes us through milestones from today (2020) to 2060. Each milestone is an example of what could happen to lead up to the end result that is NANO. The first milestone in 2025 shows a fixed wall that separates passengers as well as the driver. The next milestone assumes there will be at least level 5 autonomy, where each passenger has a fixed space to sit in. The last milestone is a shared space where the passengers can choose to be isolated or social.



2020

WALL BETWEEN PASSENGERS AND THE DRIVER

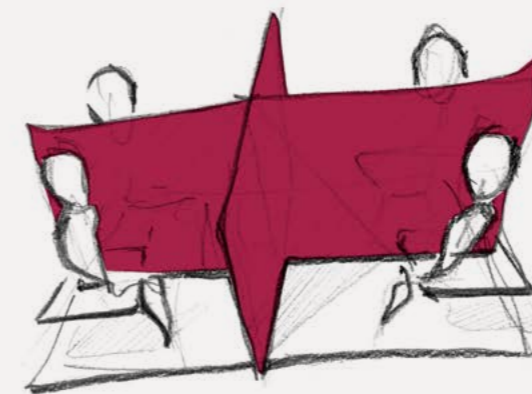
A transparent wall in the modern taxi vehicle, that also exists in some limousines, is a perfect example of our attitude to barriers within the vehicles that we know. Unfortunately, the world of commuting is changing and as the vehicle types will change, that barrier will evolve in time.



2025

WALL BETWEEN PASSENGERS IN A SHARED VEHICLE

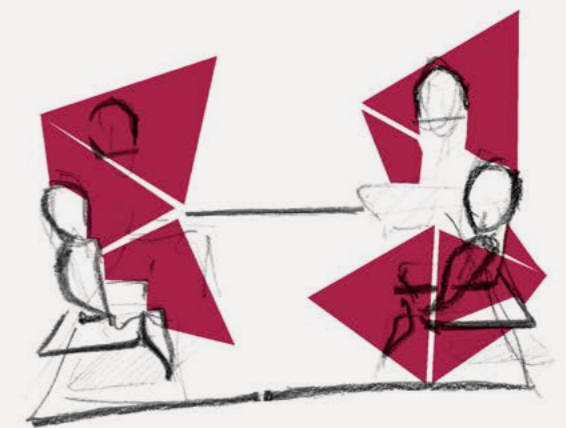
The first transformation will happen quite early as more companies are looking into ride sharing. With giants like Uber introducing the possibility of sharing our journey, the barrier between strangers could be introduced to provide comfort and safety within the system.



2040

AN AUTONOMOUS SHARED VEHICLE WITH PRIVATE SPACE

With the introduction of autonomous vehicles within the big cities, the interior packaging will evolve. In a shared mobility vehicle, the only element to dictate the future interior, besides the layout, will be a barrier. Vehicles will provide a private space for passengers, with limited possibilities for interaction.



2060

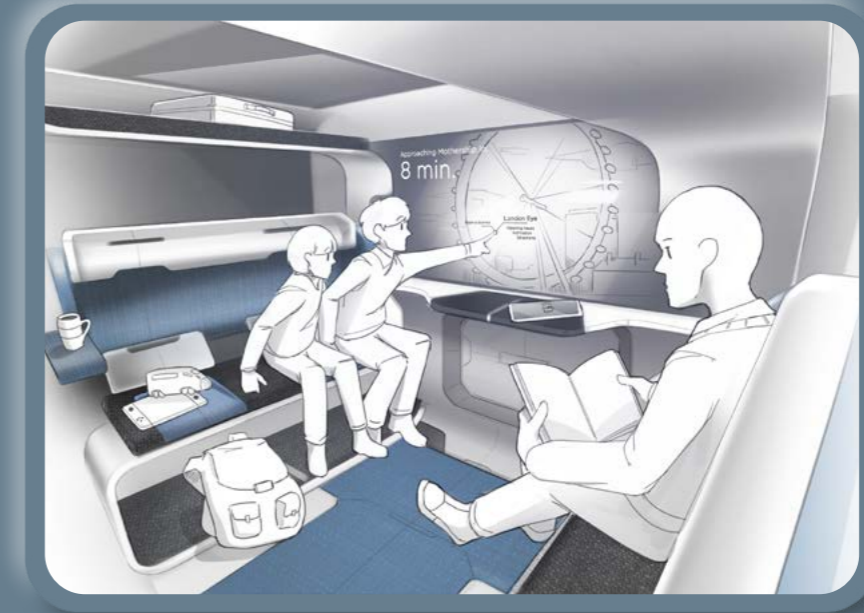
FLEXIBLE WALLS IN A SHARED COMMUTING SYSTEM

With the continuous development of commuting systems, flexibility of the interior needs to be introduced. Friends and families travelling together will have the choice to connect their spaces. Individual passengers travelling in the vehicle could also open up the space if they wanted more room.

Fig 70. Transition Roadmap 2020 - 2060

MOSEY

COMMUNITIES ON THE MOVE



5.2.1. Introduction

Project 2 is called MOSEY, with the challenge of designing a multimodal mobility solution for 2060, which creates a sense of community and is primarily for intercity travel. The user starts and ends their journey using the same low speed interconnected pod, which docks onto a high speed mothership, creating a door-to-door service. The pods are available as one or four seaters, giving the user flexibility as to whether they want more privacy, have a larger party or are happy to ride-share with strangers. The high speed mothership contains amenities such as a bar, seating areas, observation platforms and social zones. The interior design is followed through from pod to mothership, with flowing

lines that guides the user to various zones. Onboard service bots can deliver food and drink in a non-invasive manner, to seating areas within the mothership and private areas in the pods. The option to have a private compartment or access to social areas links back to the core concepts of sharing, trust and choices. The three keywords for MOSEY are flexibility, interaction and convenience. The question was, how can you increase convenience within a system serving a multi-travel purpose? The main theme for this project is centered around community.

5.2.2. Persona and scenarios

There are two sets of personas that were created for this brief, as there are two seat variants for the first and last mile pods. Each persona set shows how different individuals' needs and wants will inform the design process, with different design challenges that must be addressed across a wide range of users.

The first persona is Sam, who is going to an annual event in another city. The journey is around three to four hours long but he is really excited about going as he enjoyed previous visits there. He hopes to meet friends on his trip and do some activities in the car to spend while away the long journey. He gets in the car, hoping for a scenic road trip.

The second persona is Nick, a 67 year old retiree, who is also travelling three to four hours with his two grandchildren to take them to their parents. He prefers being alone and takes this trip quite regularly. Whilst waiting for the car, a stranger (Sam) says Hi to him. He seems friendly but Nick wants to have his own space and some privacy. During the trip, he feels very tired because of his age and minding the two children. When he gets out of the car, although he feels rested, he doesn't enjoy having to do another short trip to finally get to the parent's house with the luggage.

5.2.3. Service design work

The service designers developed two emotional journeys for each persona set, showing before, during and after the multistage journey, along with the actions taken throughout (Figure 71 & 72). Some considerations that came from these included: What kind of interaction / services might meet different expectations and needs? How can we create a synergy of various lifestyles or an exchange of values? And what are the service opportunities open at either end of the journey to create truly end-to-end service? Some of the needs through the journey include: a system to take care of their passengers' bags and luggage, seating arrangements that are flexible and fluid with the passengers' movements, and travellers expecting to have some refreshments on the journey.

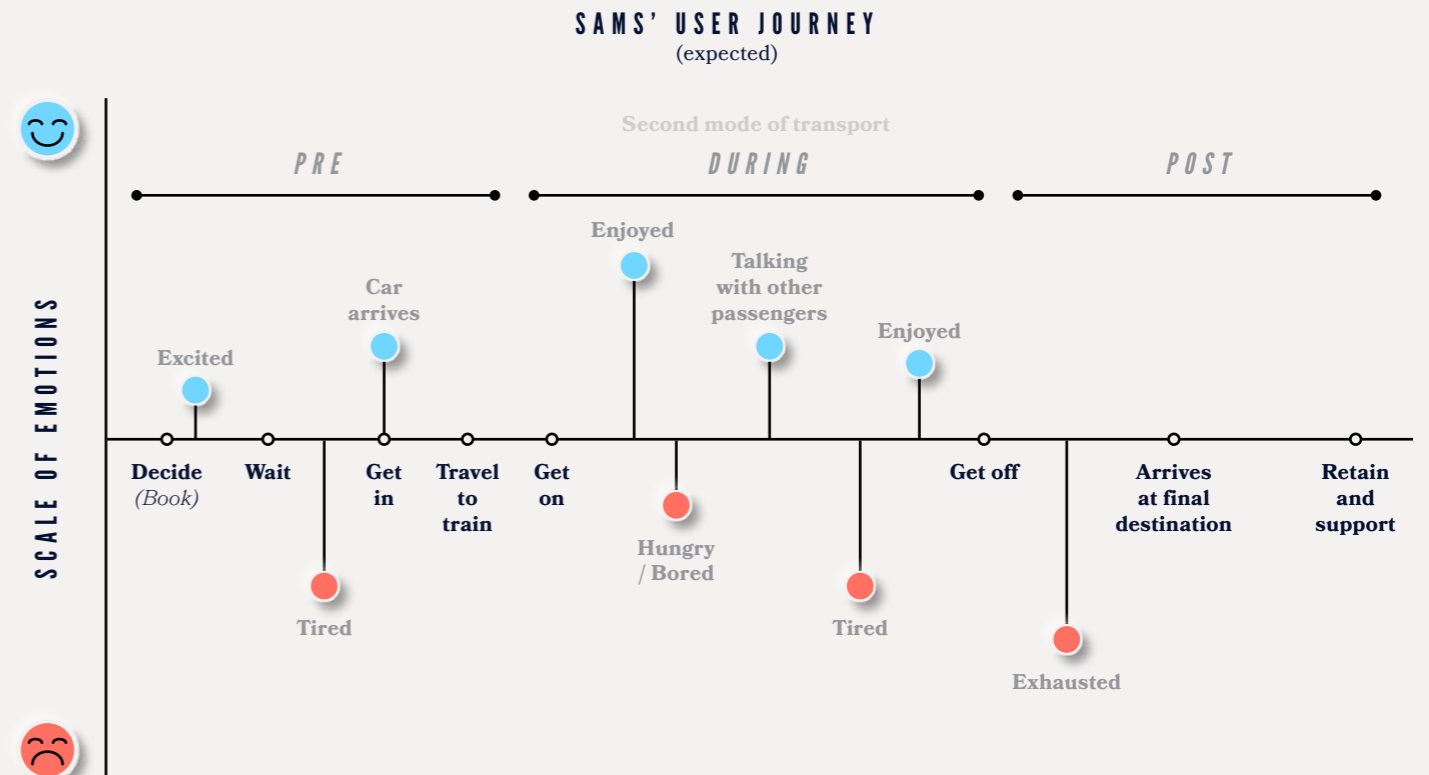


Fig 71. Sam's emotional journey

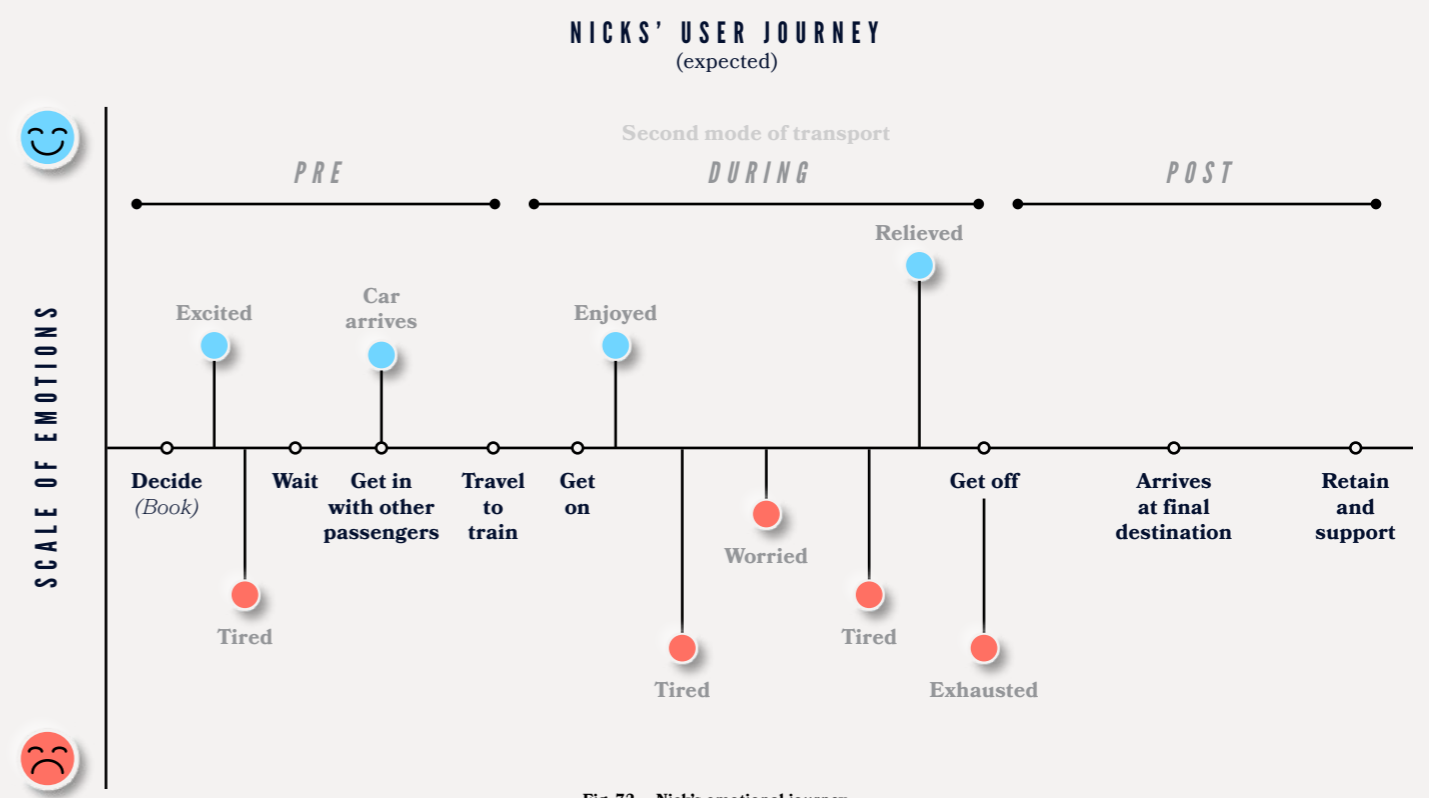


Fig 72. Nick's emotional journey

Next, we mapped what both personas would go through using a journey timeline, showing what each user needs and wants are, and the design challenges that need to be addressed. Sam prefers meeting friends on his trips and doing activities whilst en-route to make a long journey seem faster. Nick, who will be travelling with his two grandchildren, prefers to have his own space and some privacy whilst on the journey.

Key considerations we identified were: how to have a convenient multi-staged journey that is seamless, designing a space that can be both private and social, without compromising on either, and how to create a community space where everyone can feel comfortable and relaxed. Figure 73 & 74 show the 'needs' and 'considerations' service designers identified on the journey map with both sets of passengers.

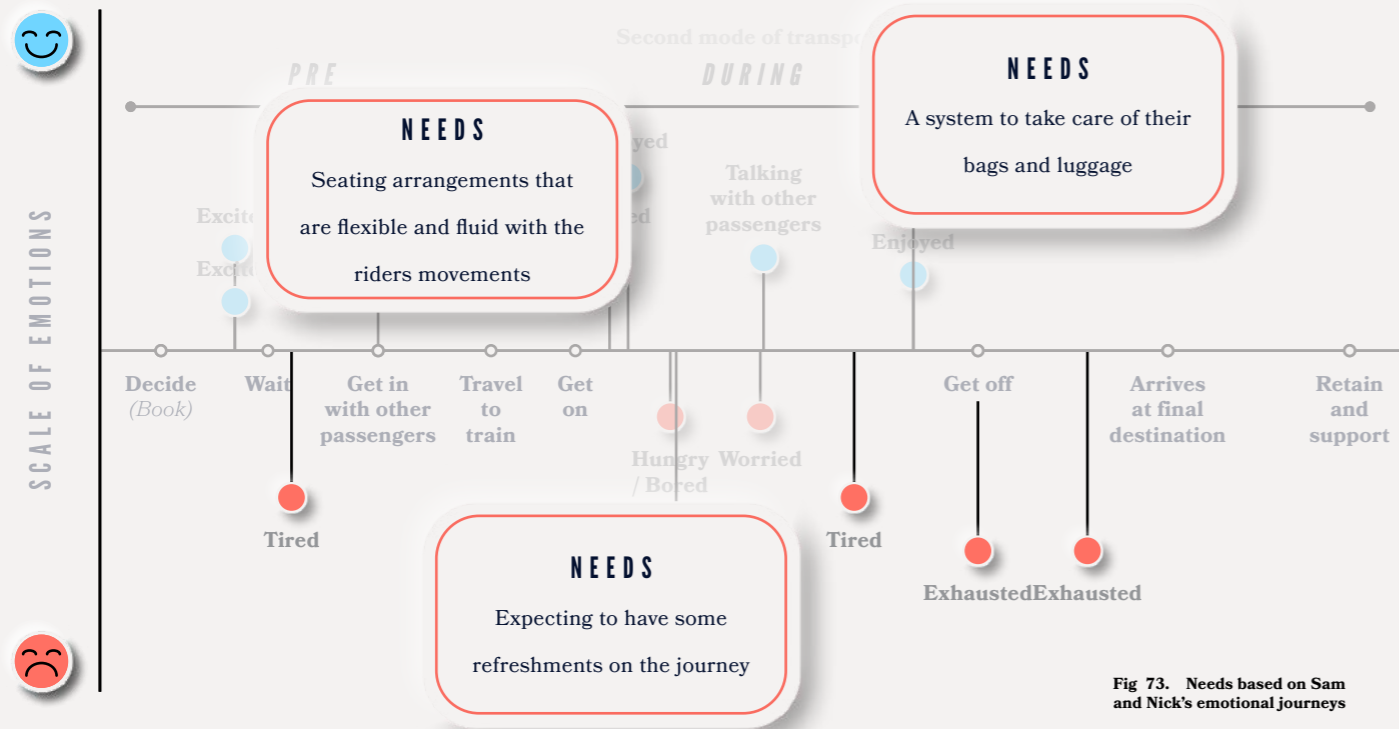


Fig 73. Needs based on Sam and Nick's emotional journeys

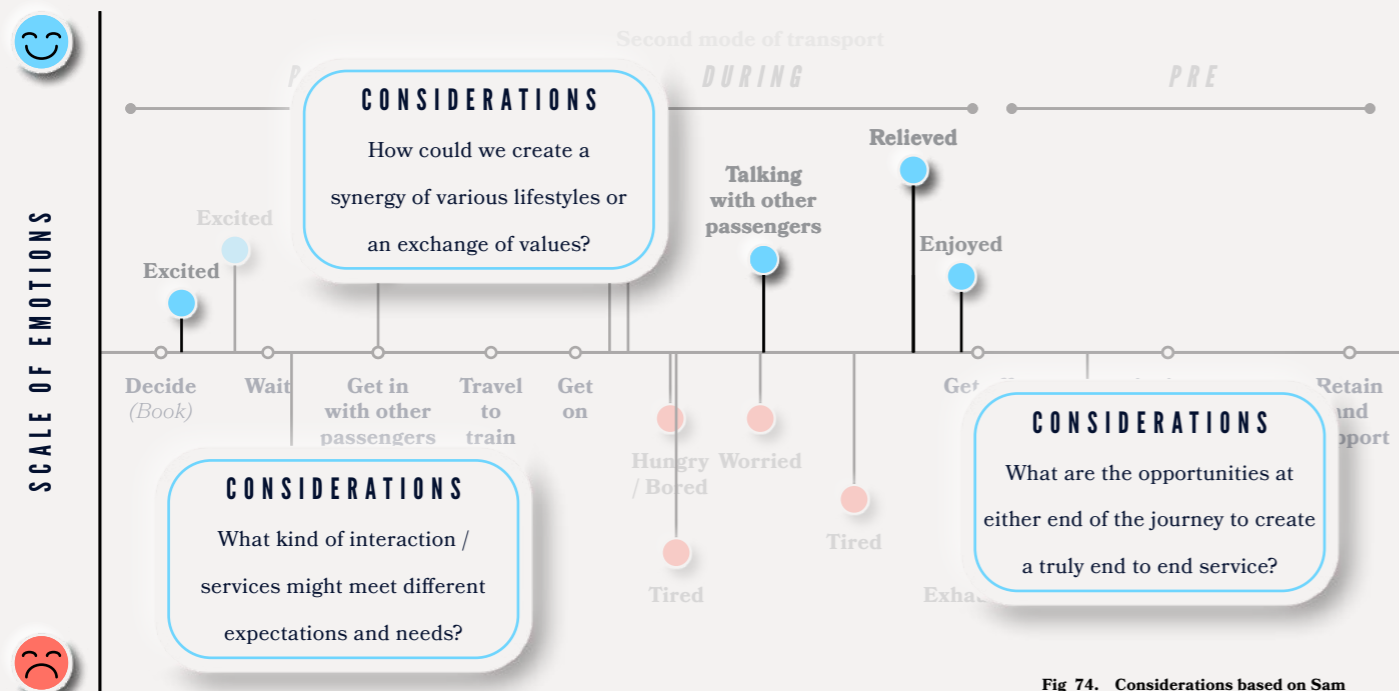


Fig 74. Considerations based on Sam and Nick's emotional journeys

The service blueprint (Figure 75) shows that the first part of the journey is joining the system and becoming a new user. Once this is done, the system will show the optimal routes for the searched journey, creating and refining depending on the variables on the user's profile. After confirming the pick up and drop off locations, the system will save the profile and route to speed up the process in the future. After booking and paying, a seat is allocated to the user, based on their preferences, such as whether they want a more private or social space. All the actions prior to the next step are performed on a personal device. On the day of the journey, a notification is sent to the user, informing them of the pick-up and any changes that have been made. In Sam's journey, a single seat pod has been sent, whereas Nick and his two grandchildren are picked up in a four seater pod. Both pods travel on their respective routes, until they platoon, then travel

together to seamlessly dock with the Mothership. Inside the pods is a flexible interior configuration, to provide a tailored experience for each user. Once docked with the mothership, the users can leave their pod and experience the amenities onboard, or stay in their pod for a more private journey. The physical touchpoints through the journey include the users personal device, the pod interior and sections within the motherships interior. Prior to the mothership entering the next city, a notification is sent to each user, informing them of the imminent arrival. This gives the user ample time to return to their pods, which will undock from the mothership, taking them the rest of their way to their respective destinations. The system will create and refine different routes, depending on the users' demands and feedback. The user's membership and data will be stored for future trips to create a more personalized and seamless experience.

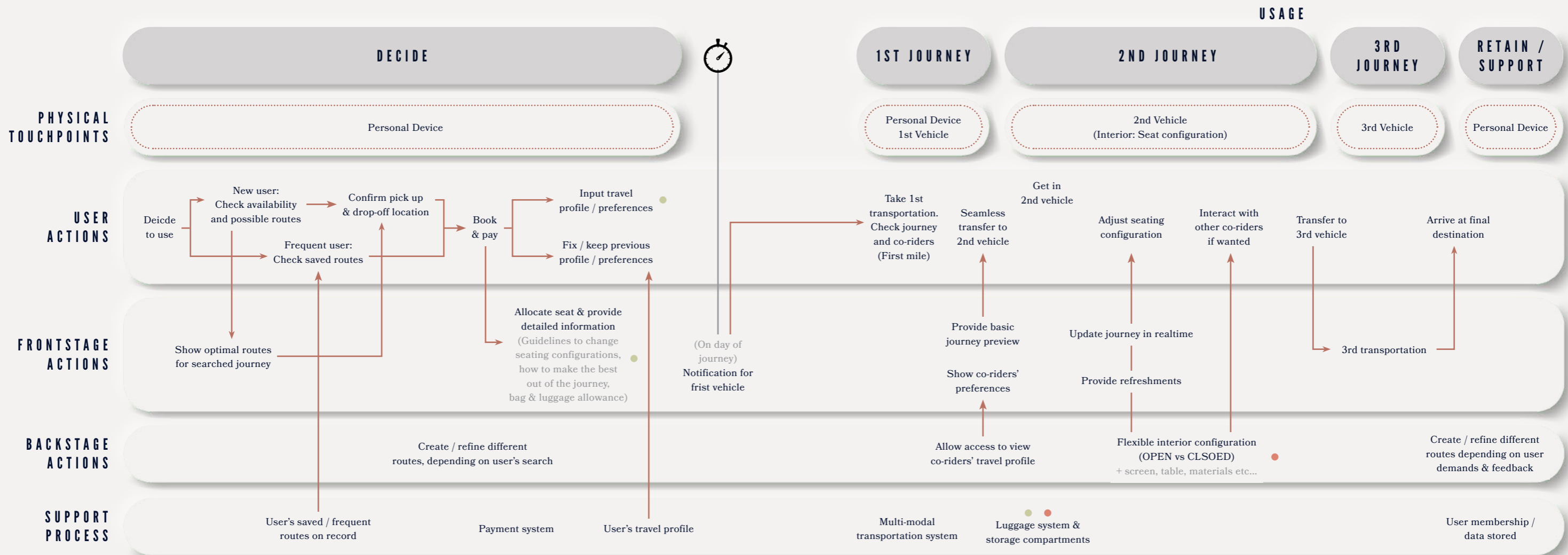


Fig 75. MOSEY service blueprint

KEY

- Vehicle design output
- Service design output

The overview of potential outputs from the service designers was to develop a luggage and storage system within compartments, the input of travel profile and preferences, and allocating seats plus providing detailed information (guidelines to change seating configurations, how to make the best out of the journey, bag & luggage allowance). The vehicle designers' potential outputs include developing a flexible interior configuration that can be open or closed and a luggage and storage system within compartments.

Figure 76 on the following page shows the final service blueprint and how the users and their pods interact with each other.

Freedom from the monotony of long journeys

FINAL SYSTEM BLUEPRINT

INTERCITY

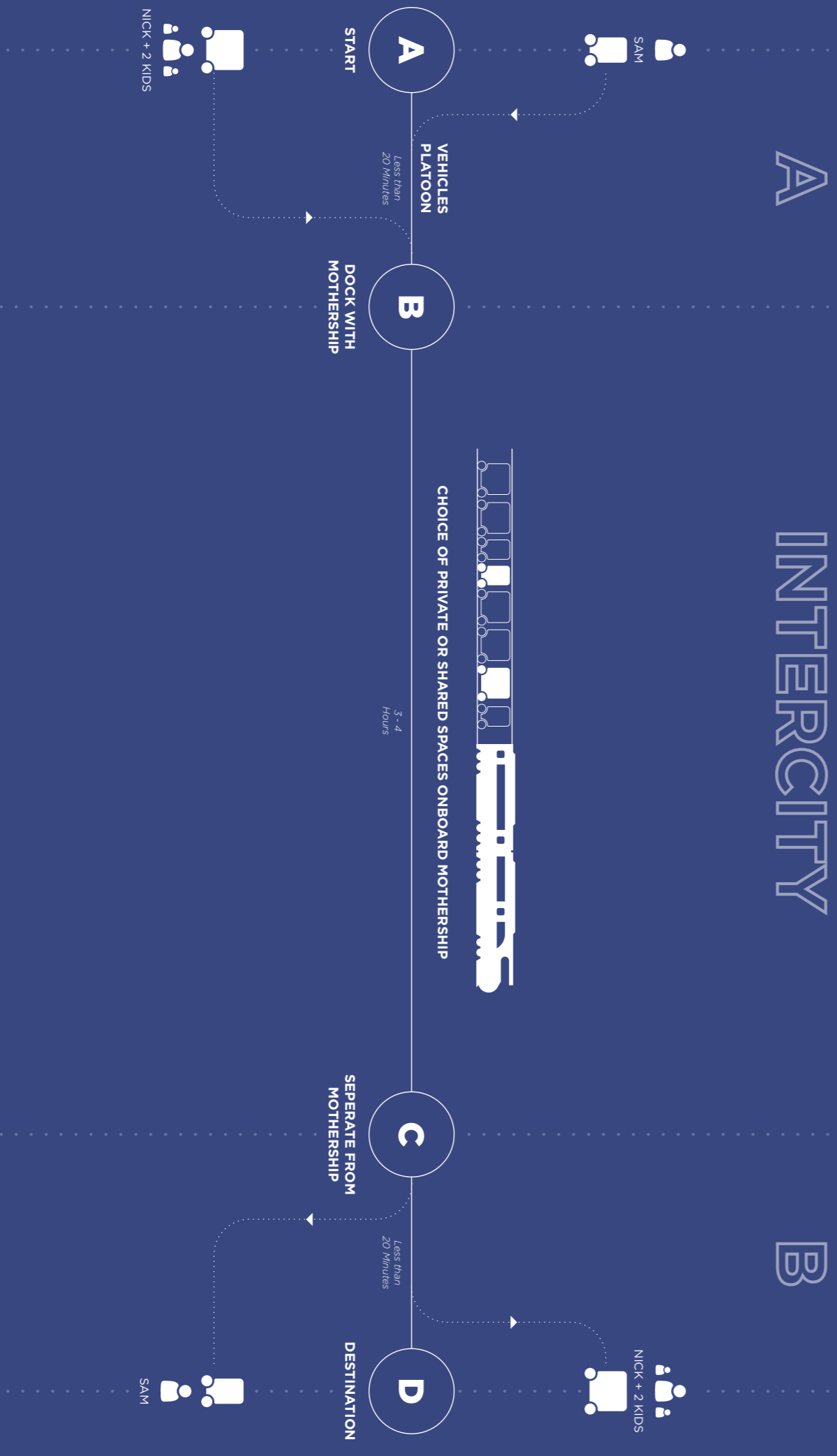


Fig. 76. Final service blueprint for MOSEY

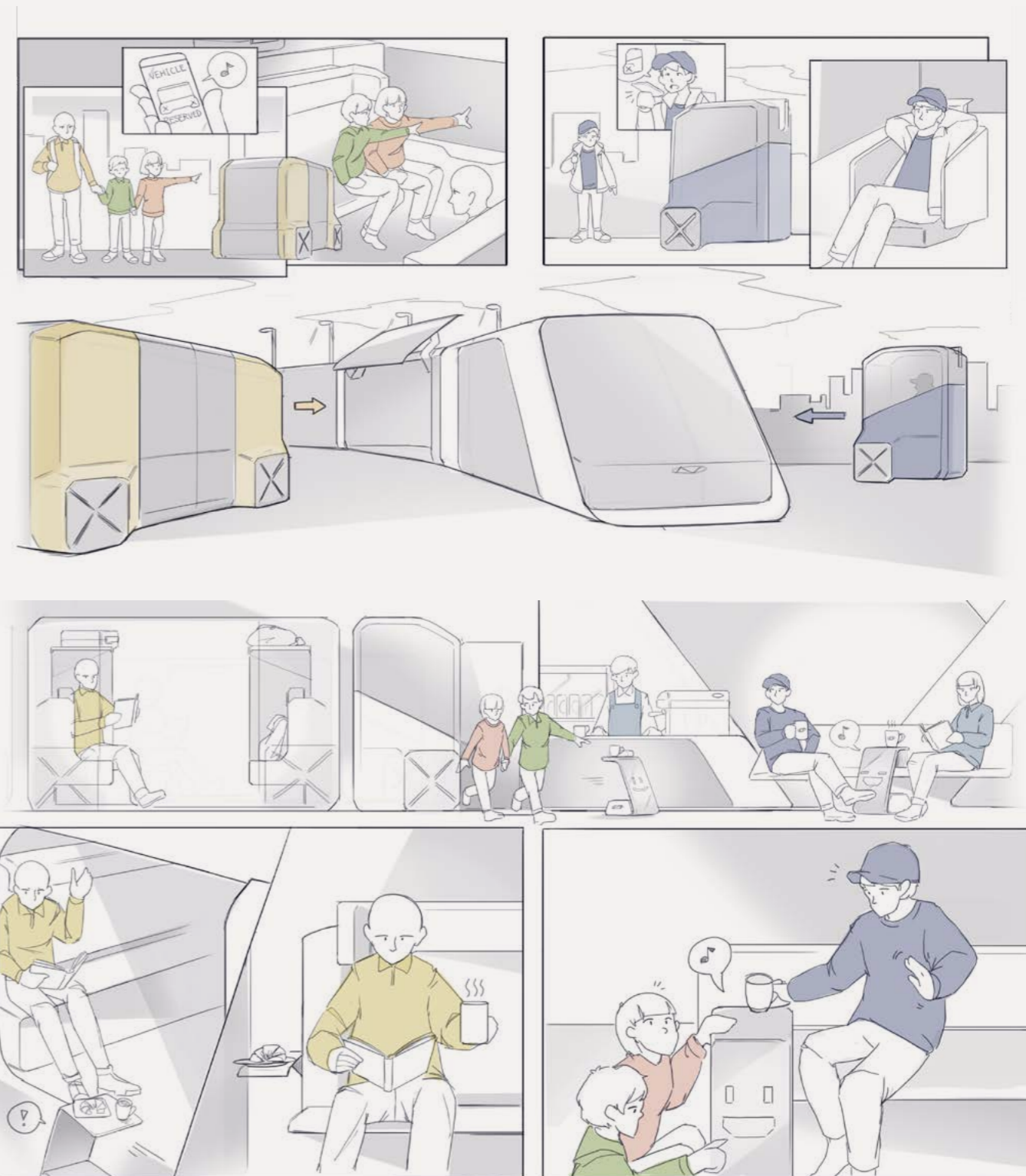


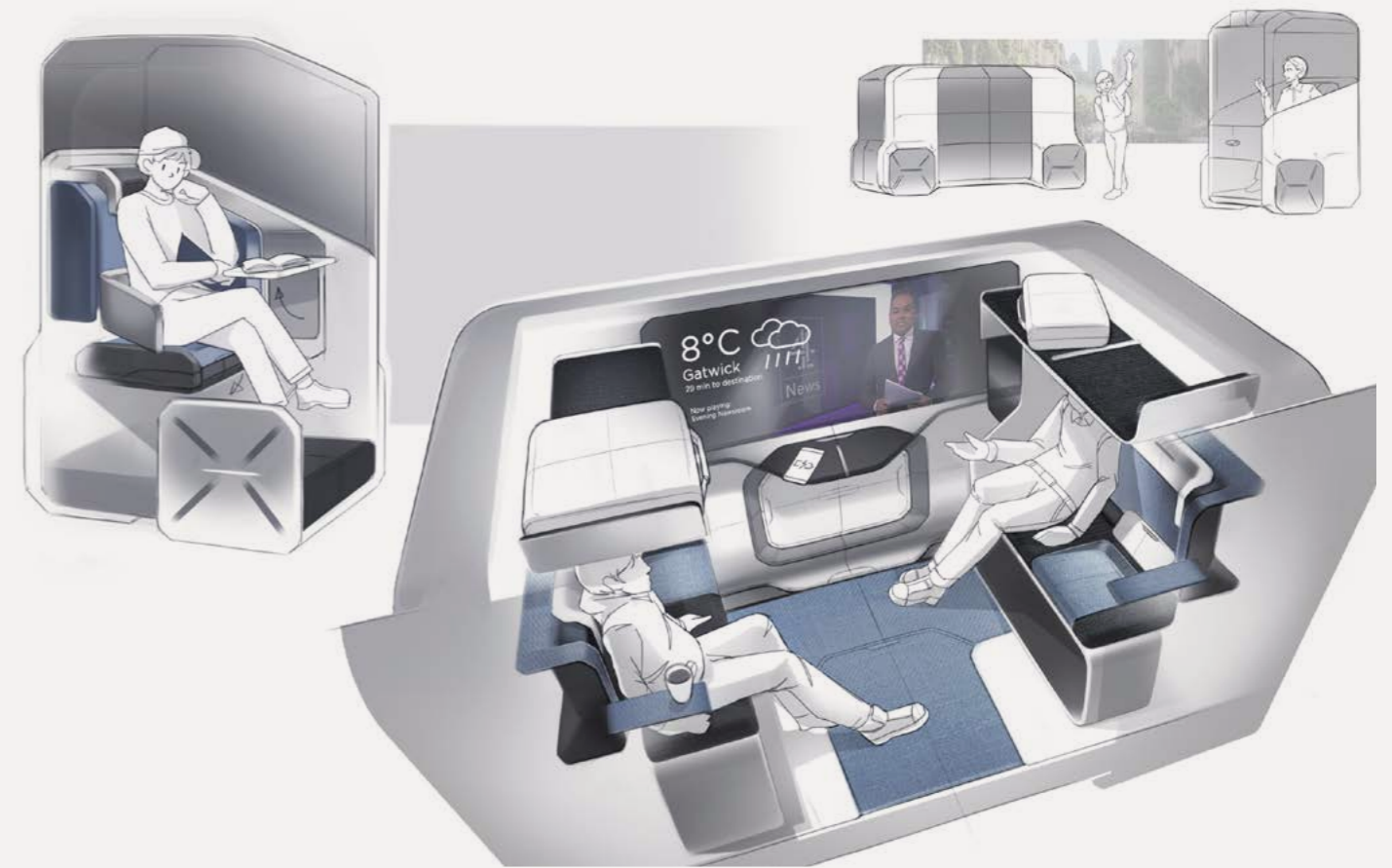
Fig 77. MOSEY storyboard

5.2.4. Vehicle Design Work

As with the first brief, the core ideas of flexibility, interaction and convenience set a basis for the vehicle design team to work from. The team explored a variety of interior layouts, what the various touch points are and what design outputs best created a sense of community. The tagline created for this project was: Freedom from the monotony of long journeys. This highlights the fact that just because the user has to travel for an extended period of time, it does not mean that they have to be bored, lonely or tired throughout the journey. They should be able to interact with others if they choose to, have an area they can sit in peacefully and focus, and be able to take a long journey without having to worry about missing the next leg of the journey.

The storyboard (Figure 77) is split to show how the journey of the two persona sets interact with each other, whilst also showing how each user's interaction points vary en-route. Starting with Nick, his two grandchildren and Sam receiving notification of their journey, they then enter their respective vehicles. The pods dock with the mothership, where the users have the choice to interact with other passengers or have a more private journey, depending on their preferences. A design challenge we found was how to create a seamless experience for both users, including getting to and from amenities onboard, even whilst staying in the users' pod. There are four interaction points through the journey: Waiting and entering the vehicle, first mile, moving throughout the mothership, and interactions with or privacy from other passengers.

Fig 79. MOSEY pod interior finalised designs



The pod interiors (Figures 78 - 80) use the same design features as the mothership. Its lines flow and guide the users to their seats as well as interaction points, such as the touchscreens and storage areas.

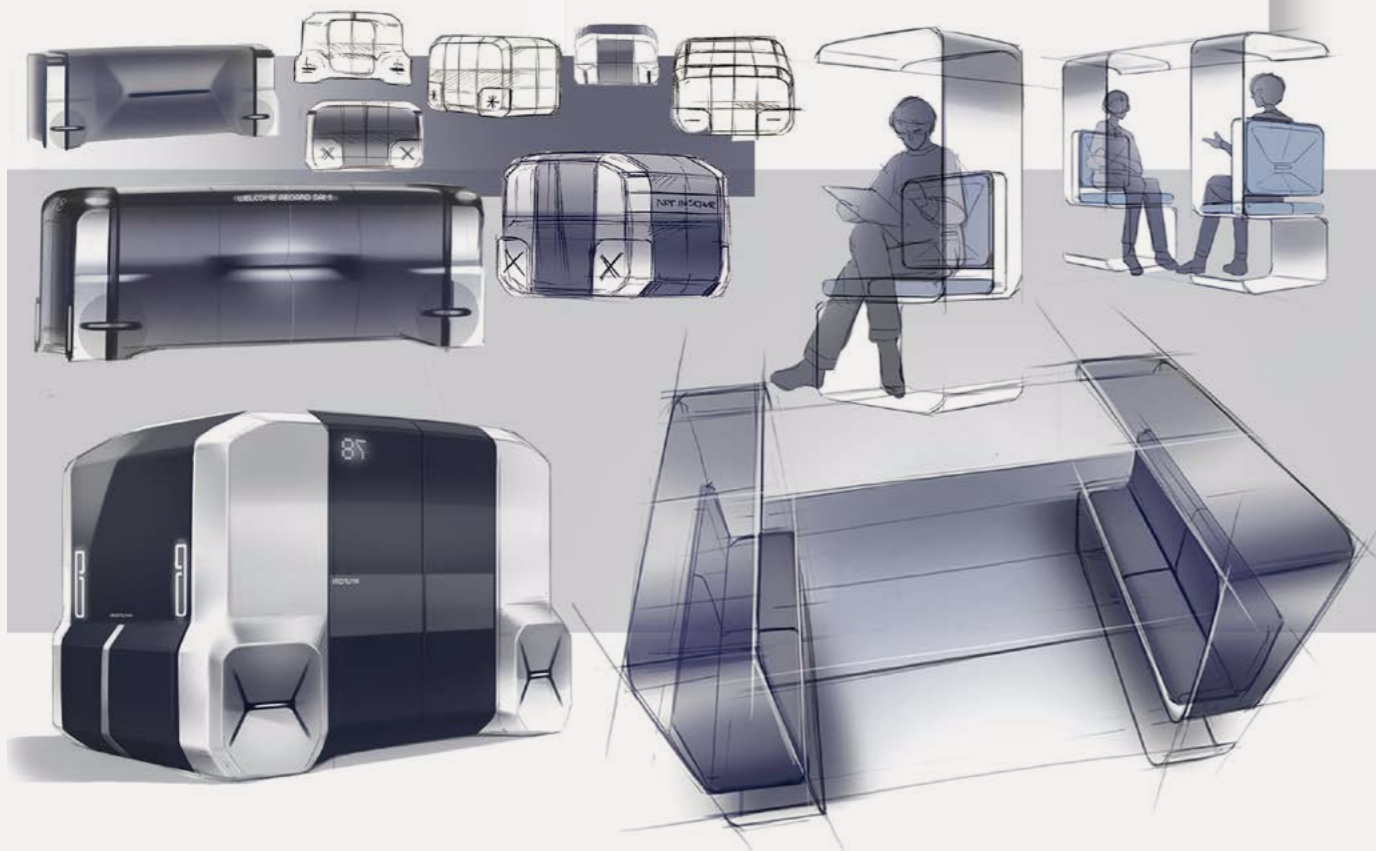


Fig 78. MOSEY pod development sketches

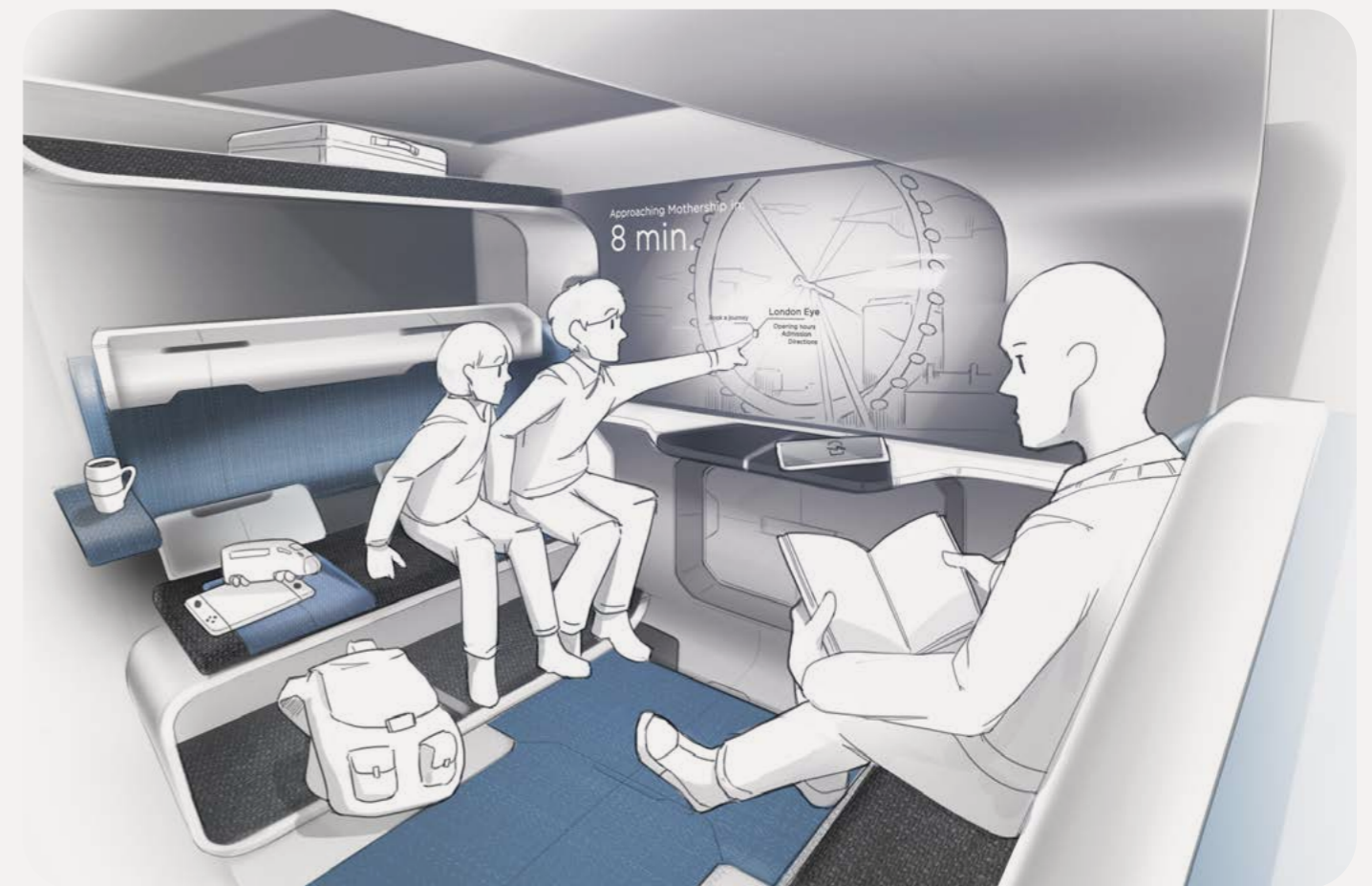


Fig 80. Detailed render of the MOSEY pod's interior



Fig 81. MOSEY system: stages for a journey from City A to City B

The system on the previous page (Figure 81) starts by a pod moving up alongside the mothership in City A and docking in a vacant space. From there, the users either exit the pod and socialise with other passengers, or stay in their pod for a more peaceful and relaxing experience. Once the mothership is near City B, the users return to their pods where they will undock within the city limits, rejoining the flow of traffic.

Figure 83 & 84 on the following pages shows the final renders for the interior of the mothership and how the users would interact with the various areas. Figure 91 shows an adult passenger and a child walking into the communal area and their potential interactions with the surrounding environment while Figure 84 shows the front end of the mothership where passengers can sit and watch passing scenery outside the vehicle.



Fig 82. Detailed interior of the MOSEY mothership

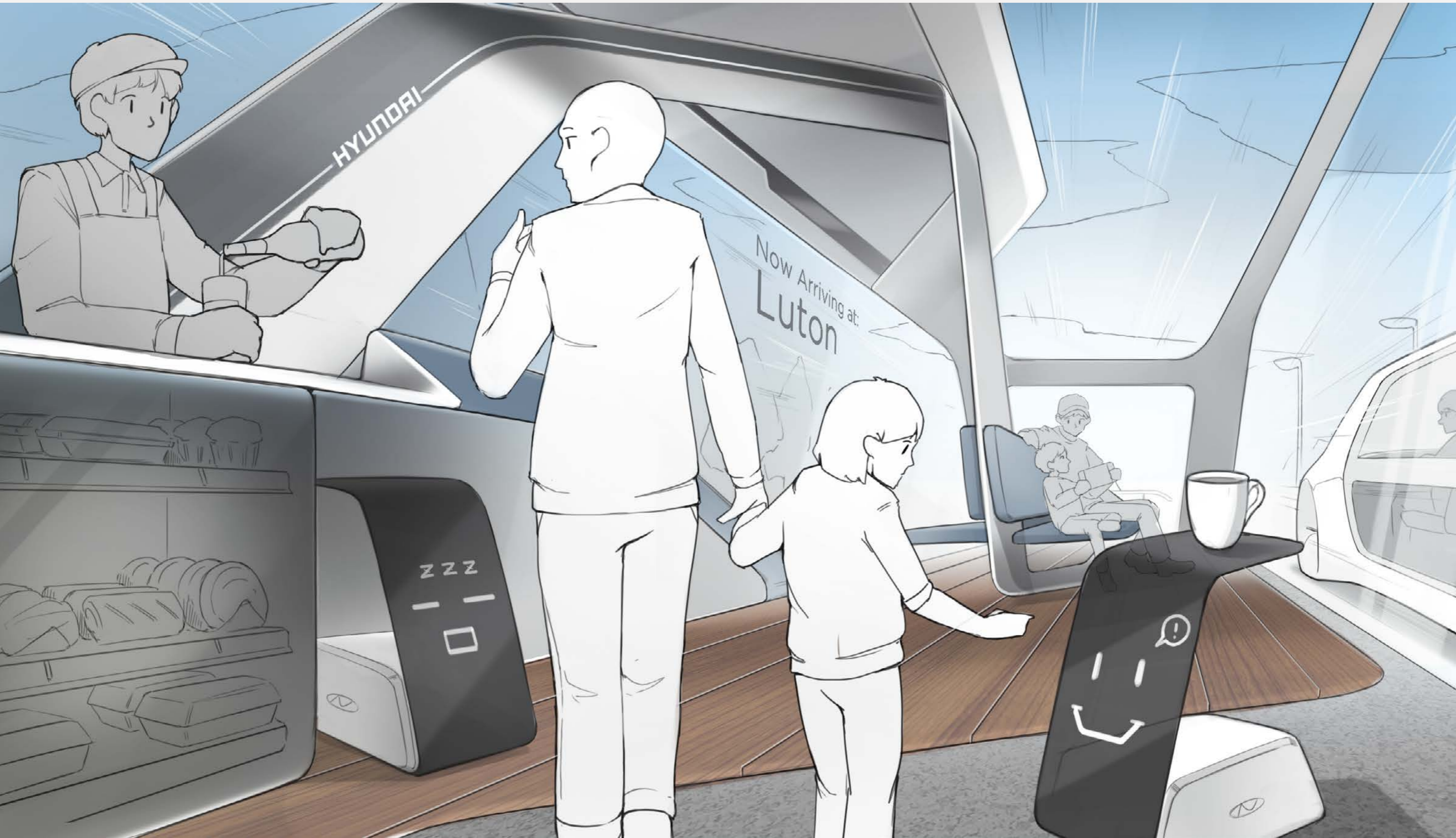
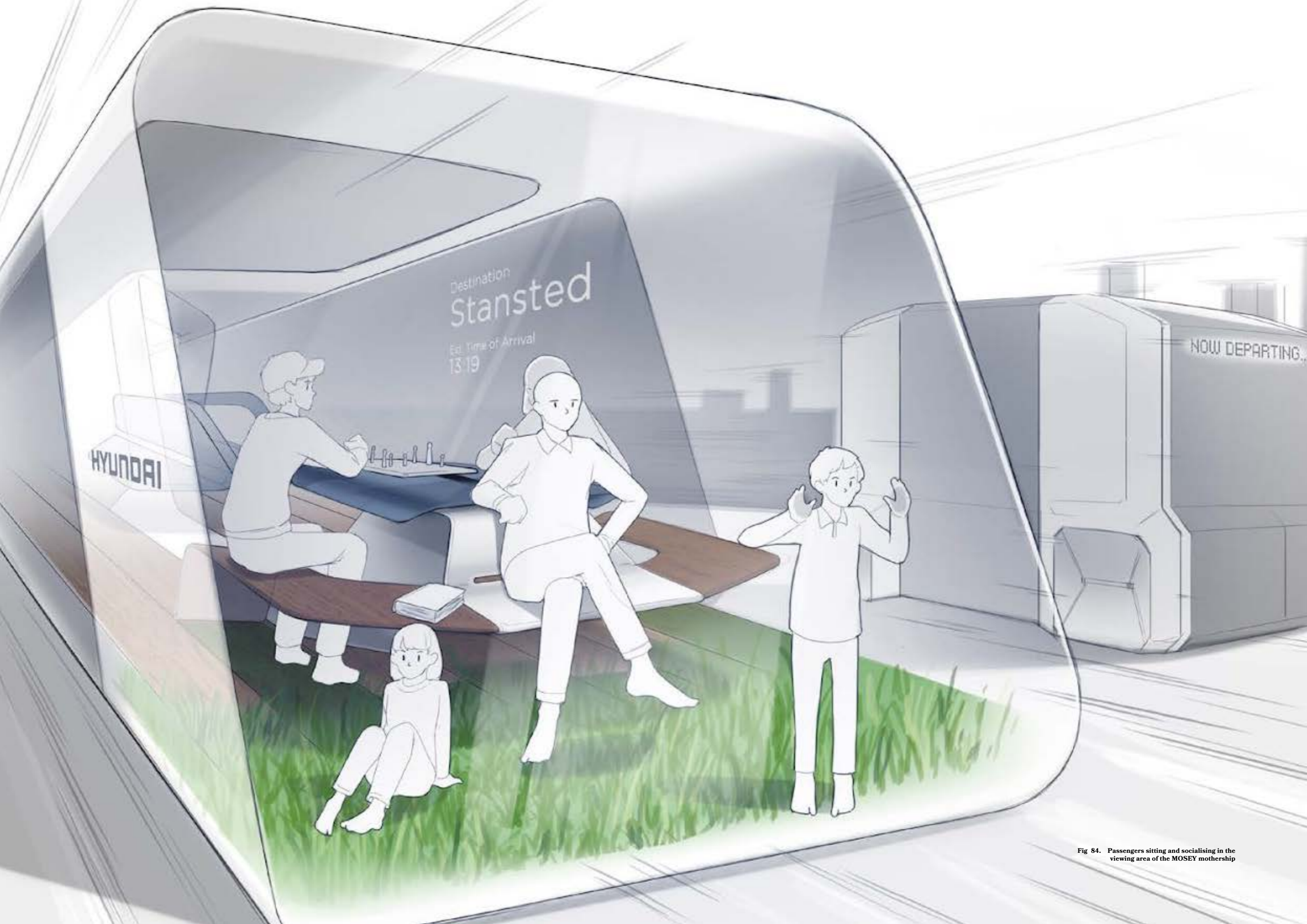


Fig 83. Passengers entering the main social area of the MOSEY mothership



Destination
Stansted
Est. Time of Arrival
13:19

HYUNDAI

NOW DEPARTING...

Fig 84. Passengers sitting and socialising in the viewing area of the MOSEY mothership

5.2.5. TRANSITION ROADMAP

Today (2020), users need to use various modes of transport to get from City A to City B. Each transport has its own individual tickets and schedules that are independent of the other. The first milestone sees an increase in on-demand transport that can be scheduled around other timetables. Rather than the user going to a bus stop, they order a shared or private to take them to the train station.

The next milestone is the private vehicle moving up alongside the train to allow passengers to transfer from one to the other. The last milestone is MOSEY, where a shared or private pod docks inside the mothership. The user can socialise and use amenities on-board or choose to remain inside their pods for the journey.

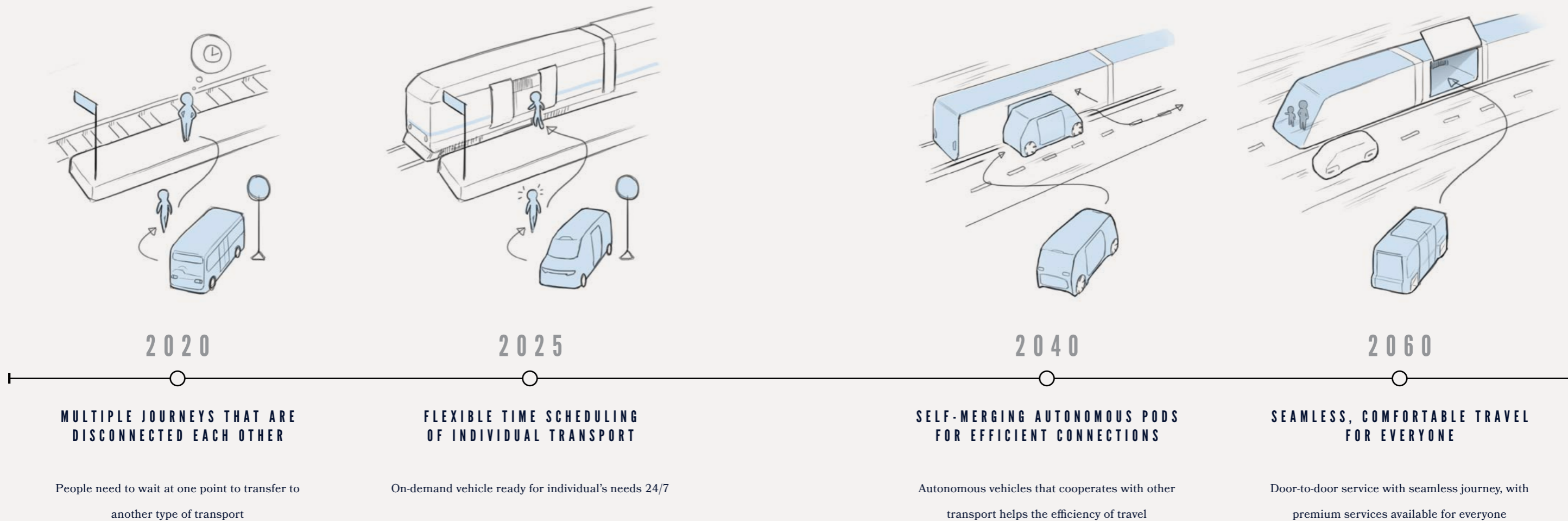


Fig 85. Transition Roadmap 2020 - 2060

ENROUTE

MOBILE PERSONAL PREMIUM WORKSPACES



5.3.1. Introduction

Project 3 is called ENROUTE, with the challenge of creating a personalised executive mobility service that is part of a sharing system for the year 2060. The goal was to design an interior and service that respects status, privacy and makes the user feel valued. Creating confidence of no interruptions. The user has to trust the service provider with his personal data in exchange for expected services. Other users in the vehicle or system are occupied with their own private work. The three key words for ENROUTE are Private, Productive and Relaxing. The question was, how can you create an exclusive environment in an inclusive system? The theme is based around the idea of privacy within a shared system.

5.3.2. Persona and scenarios

The persona created for ENROUTE is Mike, a 42 year old successful investment banker who prefers sophisticated and classic styling. He uses sharing transportation for convenience and because it is company appointed. Mike often needs to make trips to meetings with clients and external partner companies, using his company's chosen transportation service. These trips vary between short (10-30 min) and longer ones (30-90 min). About to make one of these typical trips, Mike is notified that his automatically booked ride is one minute away. During the ride, he uses the time to look at confidential memos and reports about the client whom he is to meet soon. After the meeting, he invites his client, who is going to a nearby location with Mike, to come on the ride with him and they finish their meeting in the vehicle.

5.3.3. Service design work

We developed two parts of Mike's emotional journey, alone and with a client, to find out what different interaction points and design challenges would arise from the contrasting situations (Figure 86).

The key needs identified in the emotional journey (Figure 87) include three points: an automated system for scheduling trips and bookings; an environment for work that has wifi, a desk, noise cancelling and more; lastly a privacy mode for confidential work. The key considerations identified (Figure 88) include a balance between privacy and surveillance for quality control, and what personalised services or actions can be designed to give the feeling of "being cared for"? Also addressed were, the use of personal data and the method of notifying the users of the collection and usage, and what potential adjustments can be made for rides with business meetings?

USER JOURNEY (expected)

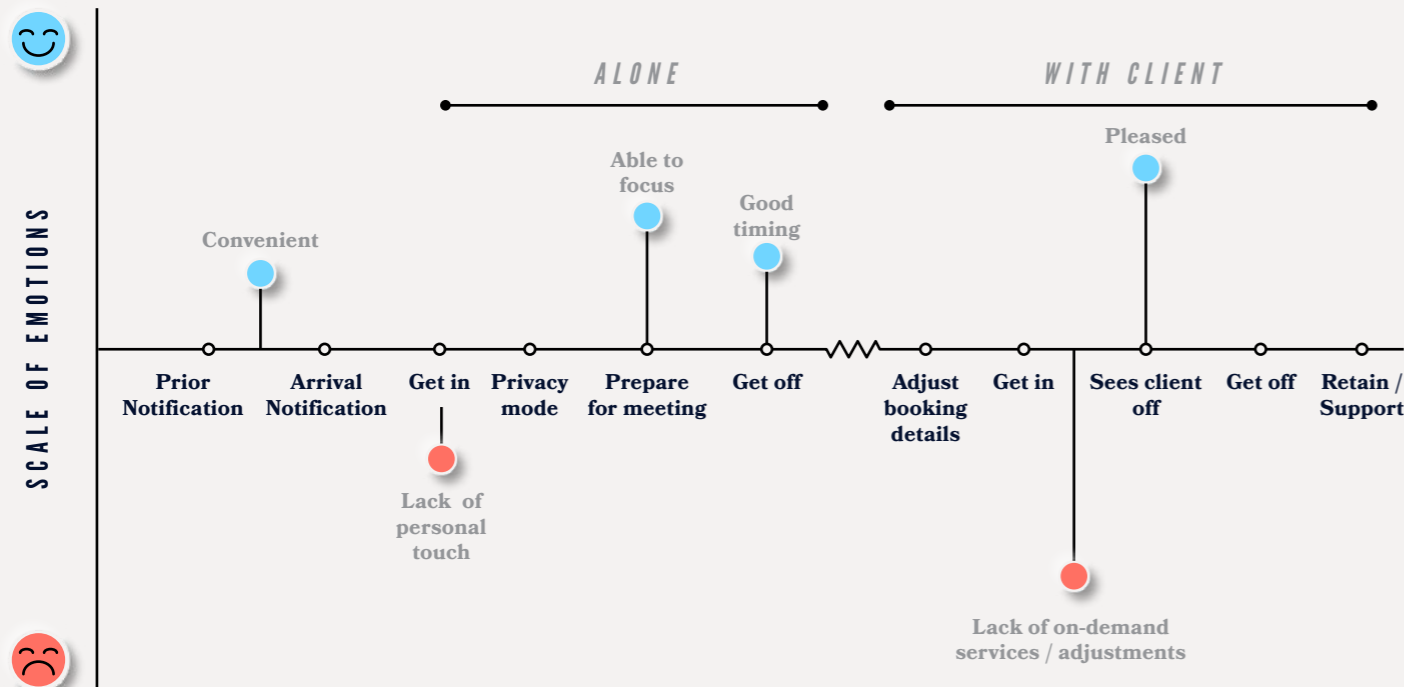


Fig 86. Mike's emotional journey

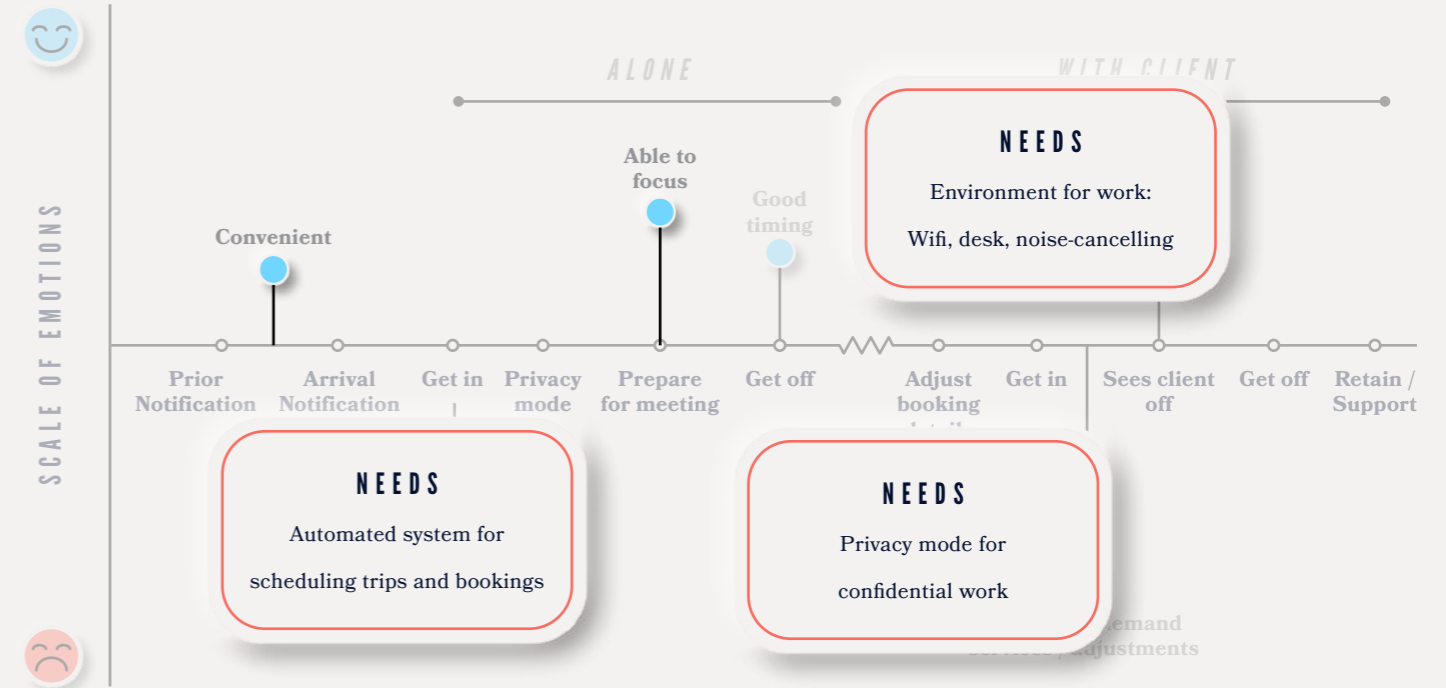


Fig 87. Needs based on Mike's emotional journey

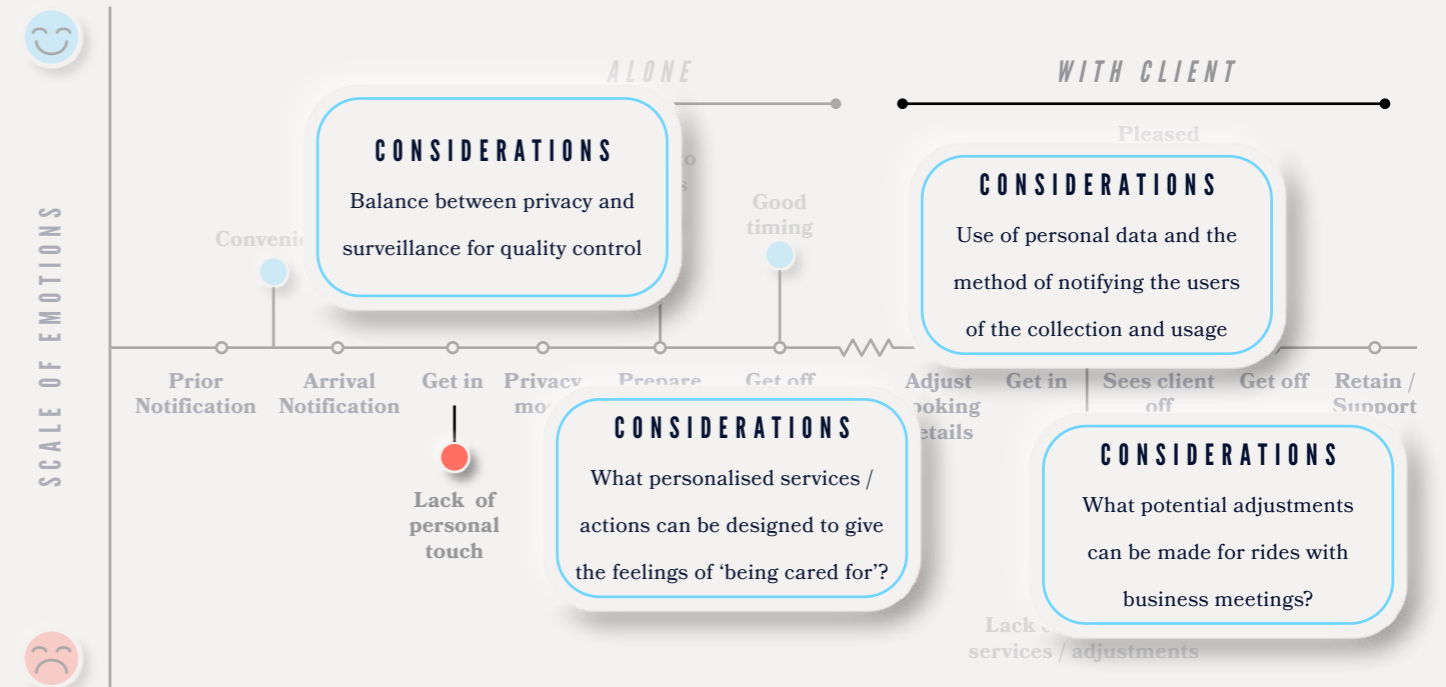


Fig 88. Considerations based on Mike's emotional journey

Keywords
Private
Relaxing
Productive

The service blueprint (Figure 89) developed focuses on pre-use, use alone, use in a meeting and retaining/support. The physical touch points identified were a personal device that includes a calendar and booking page, a company authorisation page for the employee and manager, the vehicle with its seats, refreshments, environment and more, and lastly a company account for employee usage data. User actions are: record company meetings and schedules in the service page, register impromptu trip, decide if the user wants to make the trip, get in the vehicle upon arrival, select journey mode type from: work, privacy, relax and meeting, work within the vehicle then leave once the final destination has been reached. Frontstage actions are: Update display of bookings and provide options to adjust pre-bookings, give a notification at the time of pre-booked journey, a second notification upon vehicle arrival, welcome services and basic information about the

journey (such as arrival time, route and more), the interior adjusts based on the users selected mode, and a farewell screen that includes route summary. Backstage actions include an automated transportation service booking, locating the user and sending a vehicle, personalising the interior based on the user's chosen mode and retaining the customers journey summary, including feedback for future adjustments. The support process was to synchronise with the company calendar, creating a premium interior to make the user feel "cared for" and is flexible to support the various modes, including a working environment. The last support process included a monthly billing payment system for the company account.

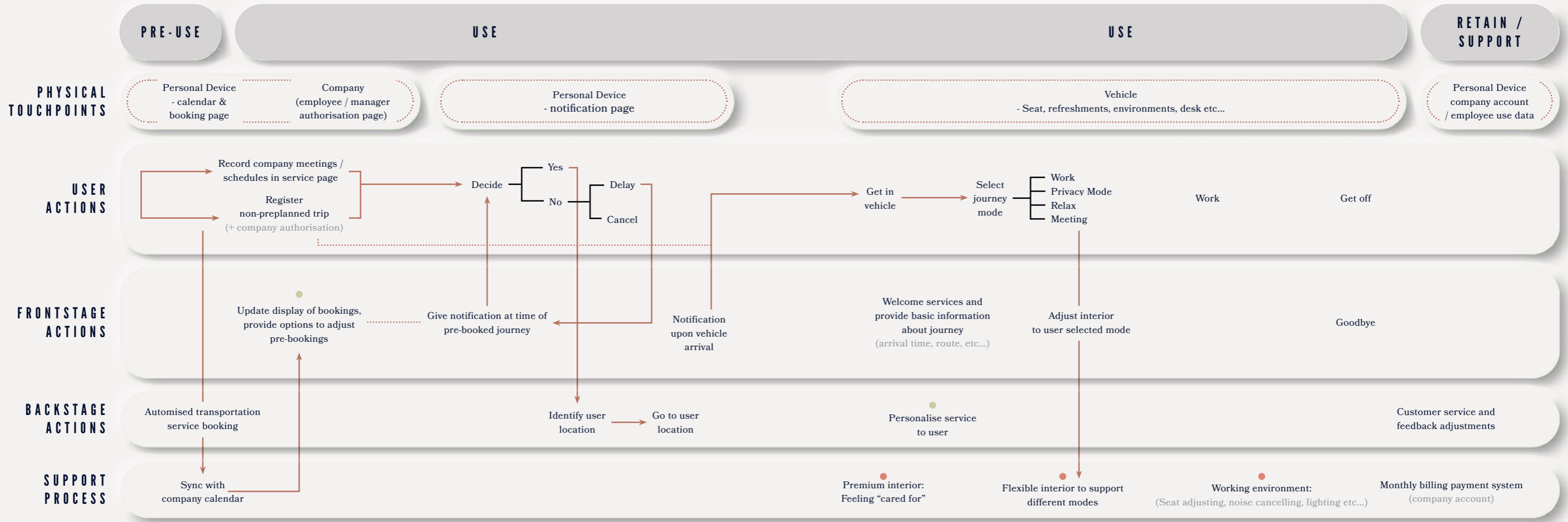
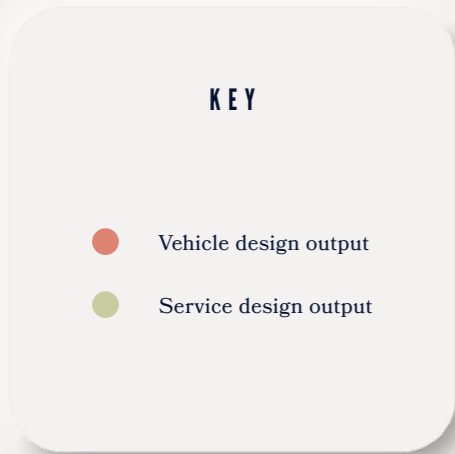
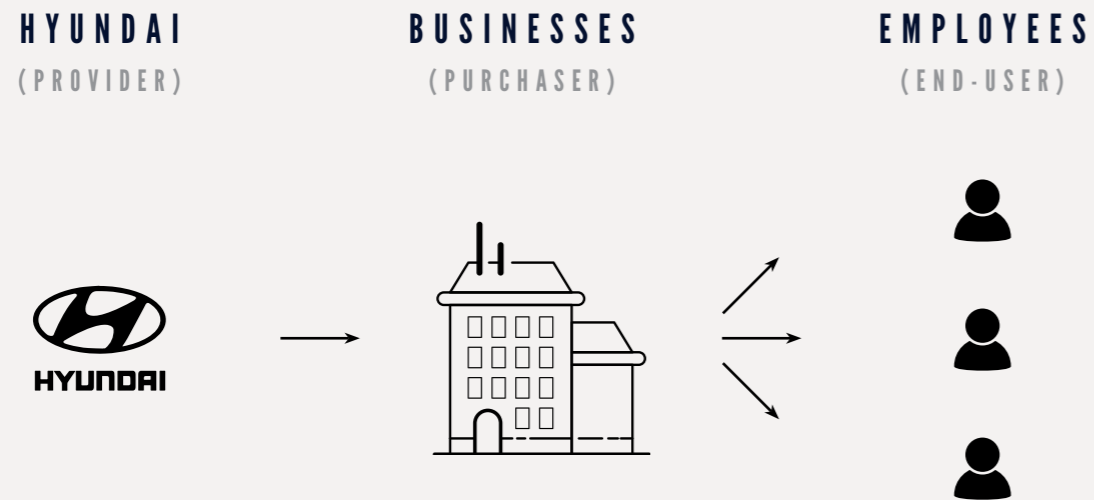


Fig 89. ENROUTE service blueprint



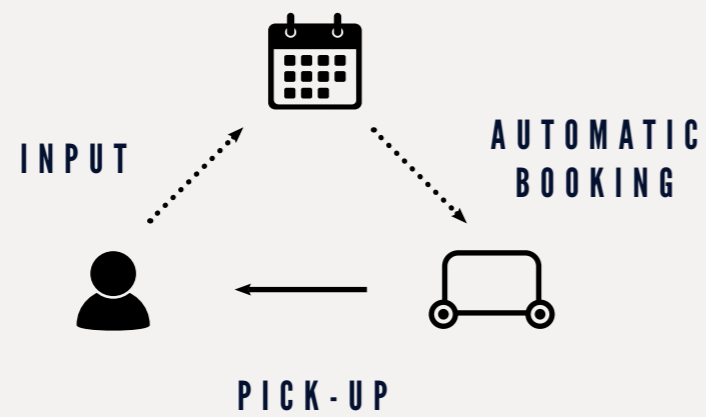
The overview of potential outputs from the service designers was to develop a display for bookings, providing updates that also adjusts for pre-bookings and creates a personalised service for the user. The vehicle designers were to develop a premium interior that is flexible for different modes and creates a "cared for" environment for the user. They were to also focus on the working environment, including how the seating will adjust, the noise cancelling system, type of lighting and more.

The inclusive system we designed (Figure 90) has Hyundai as a service provider, who works in partnership with businesses for their employees. We designed the inclusive system to focus on partnerships with businesses as a service provider for employees. This system will have a business account and calendar for each employee, keeping them connected and allowing the system to work seamlessly throughout the company. In this scenario, Hyundai would be the provider for the back and front end systems as well as the vehicles.



Partnerships with businesses as a service provider for employees.

Creates a business account and calendar for each employee



Automated transportation pre-booking service by calendar sync

Fig 90. Key services of ENROUTE

Lastly for this project, we designed a user interface (Figures 91 - 93) for the interior of the vehicle, showing how the user would interact with and distinguish between the different interior modes. These interactions would let the user choose their preferences for the environment, such as sound, lighting, smell and more. There would also be a clear UI when entering privacy mode whilst working (Figure 94). Privacy mode creates a secure and direct line between the vehicle and the company, meaning the user can work with confidential information without worrying about outside surveillance.

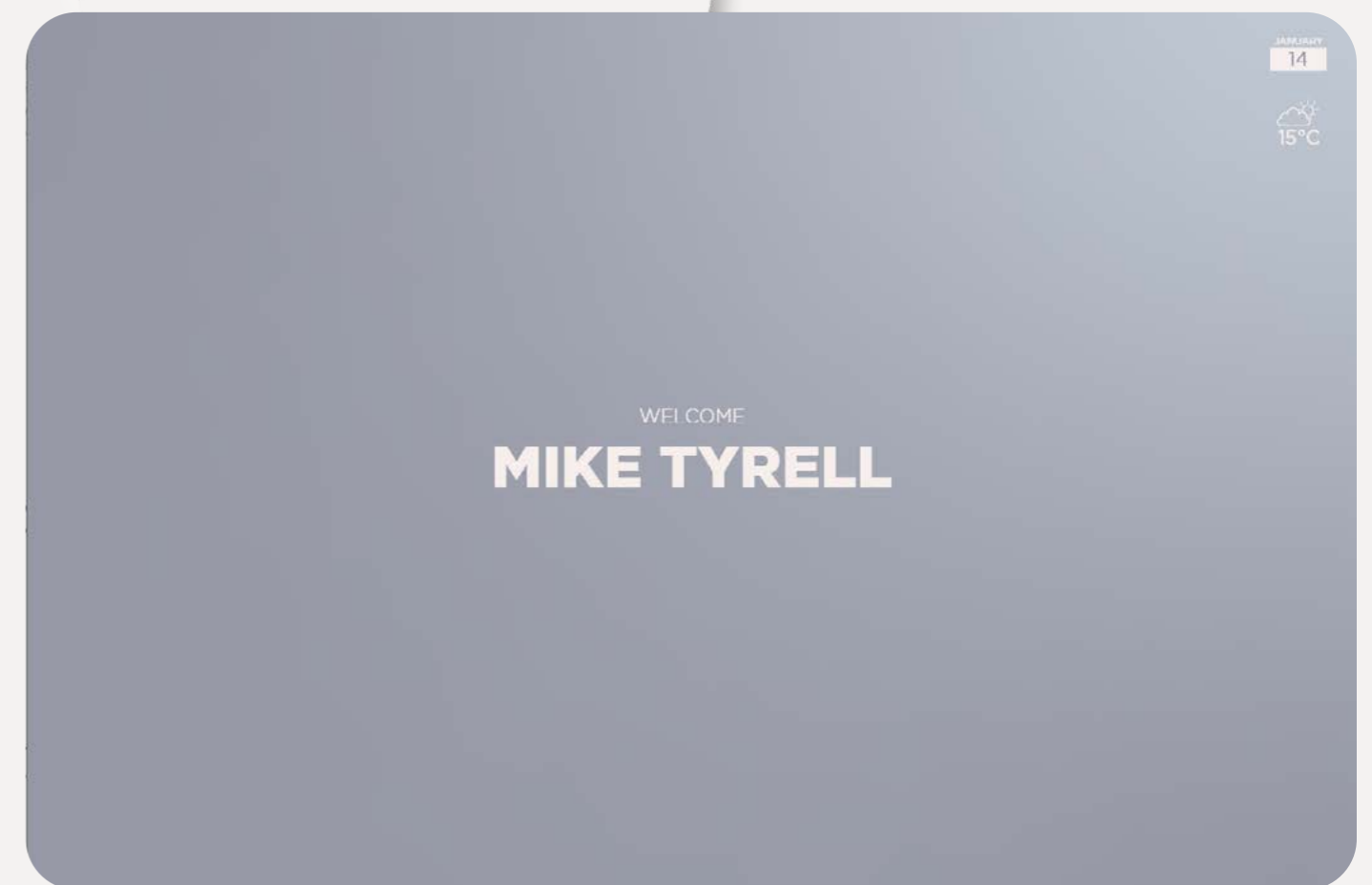


Fig 91. Welcome ENROUTE screen in the vehicle

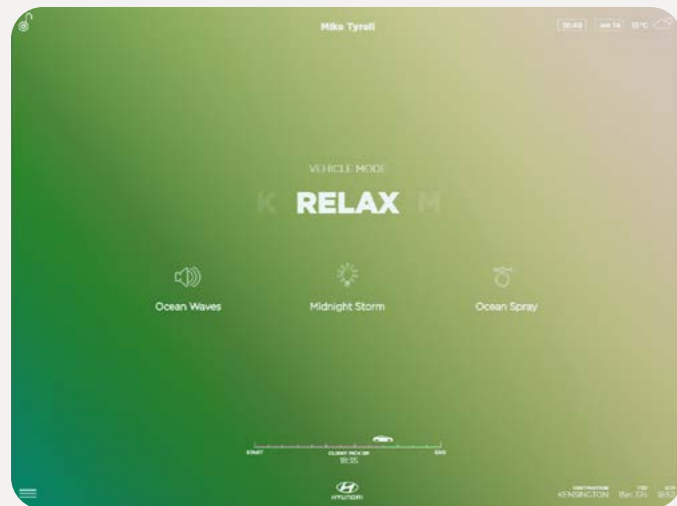
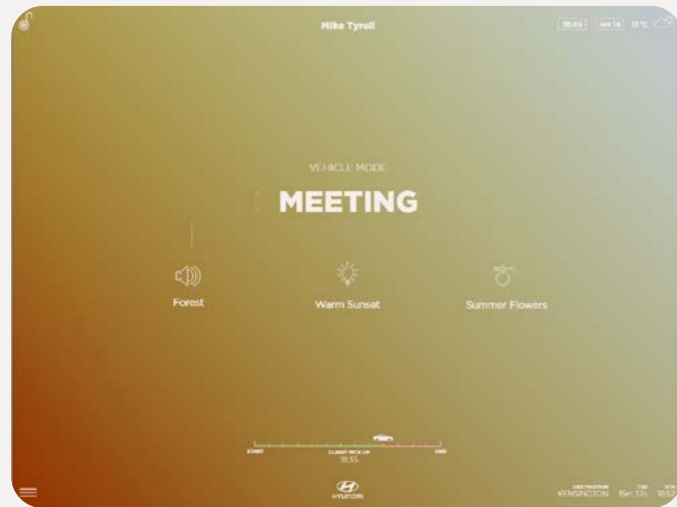
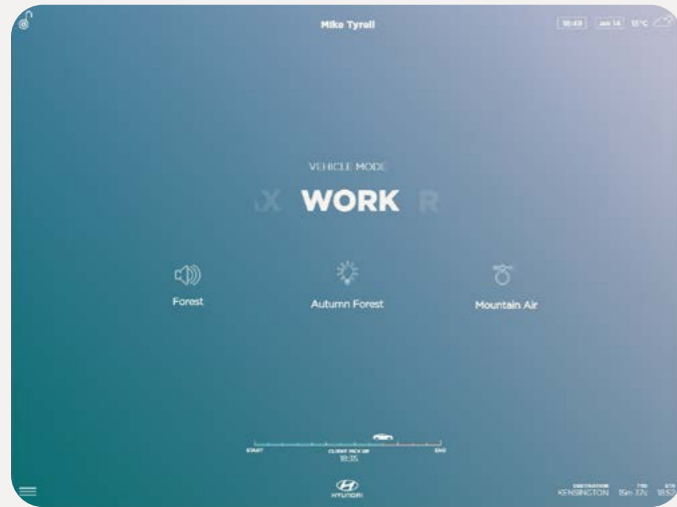


Fig 92. Selection of different ENROUTE vehicle mode settings

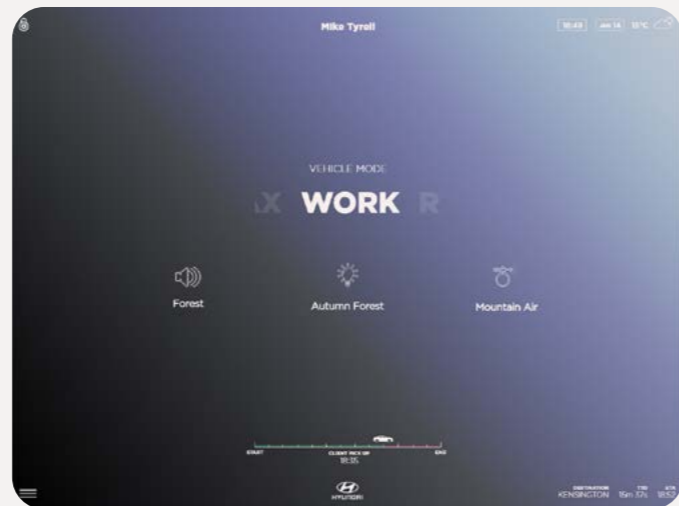
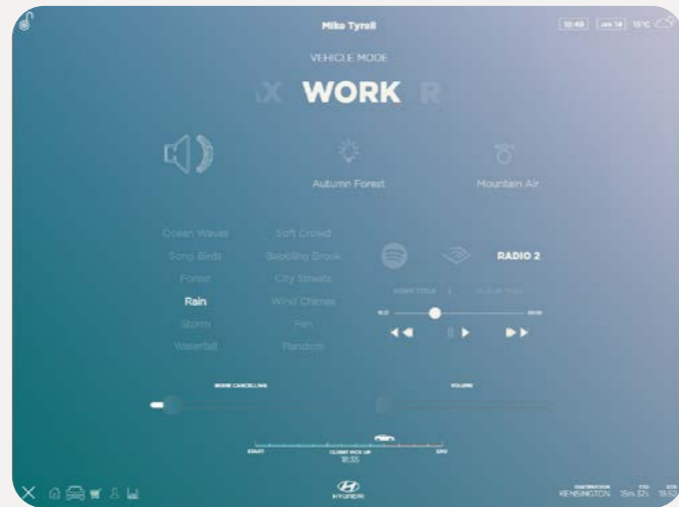


Fig 94. ENROUTE privacy mode to create a digitally safe working environment

Fig 93. ENROUTE personalisable environment to optimise work

5.3.4. Vehicle design work

Working from the service design blueprints, we created moodboards based on the keywords private, relaxing and productive (Figure 95). The moodboard explores lighting and space, how the two relate to each other and how various combinations of the two can create desirable interior environments.

The tagline for ENROUTE is “A premium sharing working space on the move”. The core idea we explored in the design phase was how could a shared space be premium, when the two are commonly thought of as opposing ideas. To share means to have a design that suits a large number of users. Premium usually means a more bespoke experience for individuals.

Fig 95. Moodboard inspirations for ENROUTE



We moved on to creating the storyboards for Mike's Journey. Starting in the morning, when he receives a notification from his personal device, that the vehicle is being cleaned and prepped with his bespoke interior. This initial stage creates the bespoke experience that was identified in the service design blueprint (Figure 96).

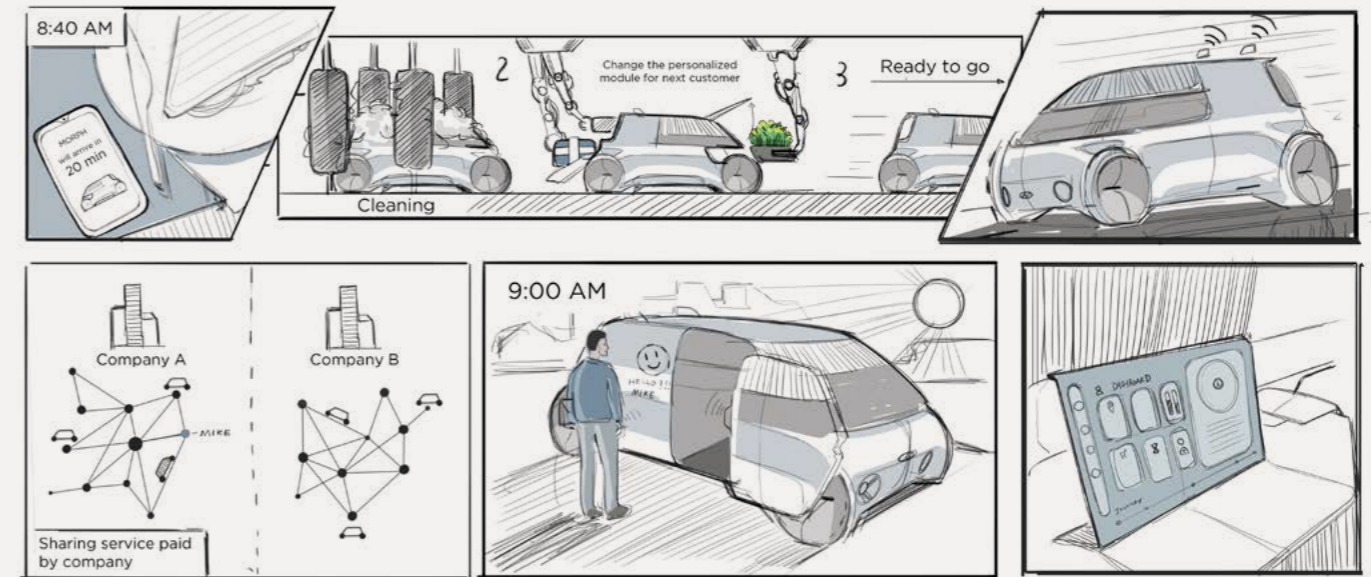


Fig 96. ENROUTE storyboard: bespoke stage of the vehicle and user journey

Whilst in the vehicle, Mike can work on his way to the office, relax at lunchtime enroute to his next appointment and also have a meeting with a client. The interior subtly adapts to suit these three scenarios with small, but important changes in the lighting and layout (Figure 97).

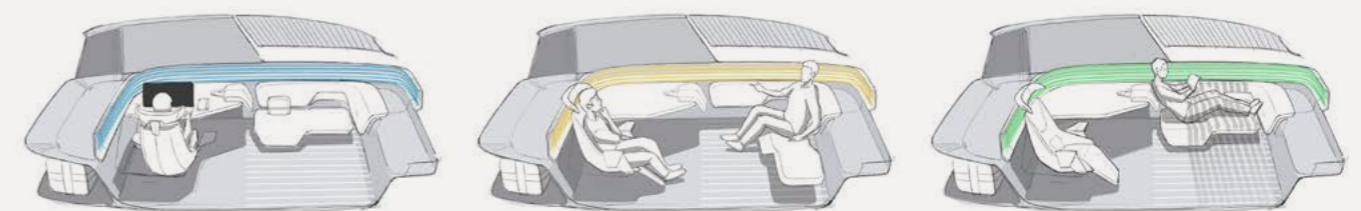


Fig 97. The three modes of the vehicle interior for ENROUTE

Once the vehicle has completed all the planned journeys, it returns to the nearest service station to be prepared for the next user and their bespoke requirements (Figure 98).

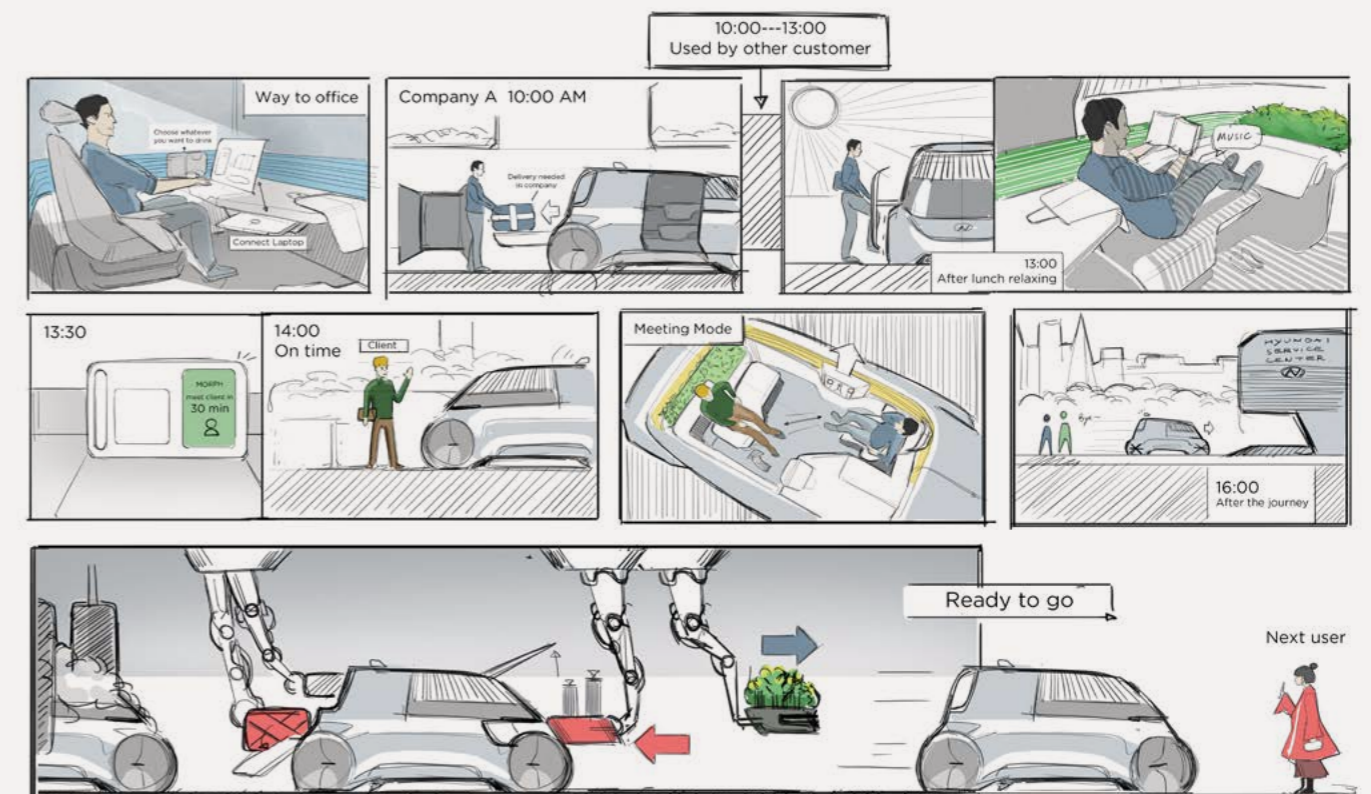


Fig 98. ENROUTE storyboard: User's interactions with the vehicle and post journey service

Since the user would be in the vehicle for extended periods, certain amenities were explored. These could include, depending on the users preferences, a coffee machine, reading zone, gym gear, sleeping set and more (Figure 99).

U-Shape Module

Tailored for Mike

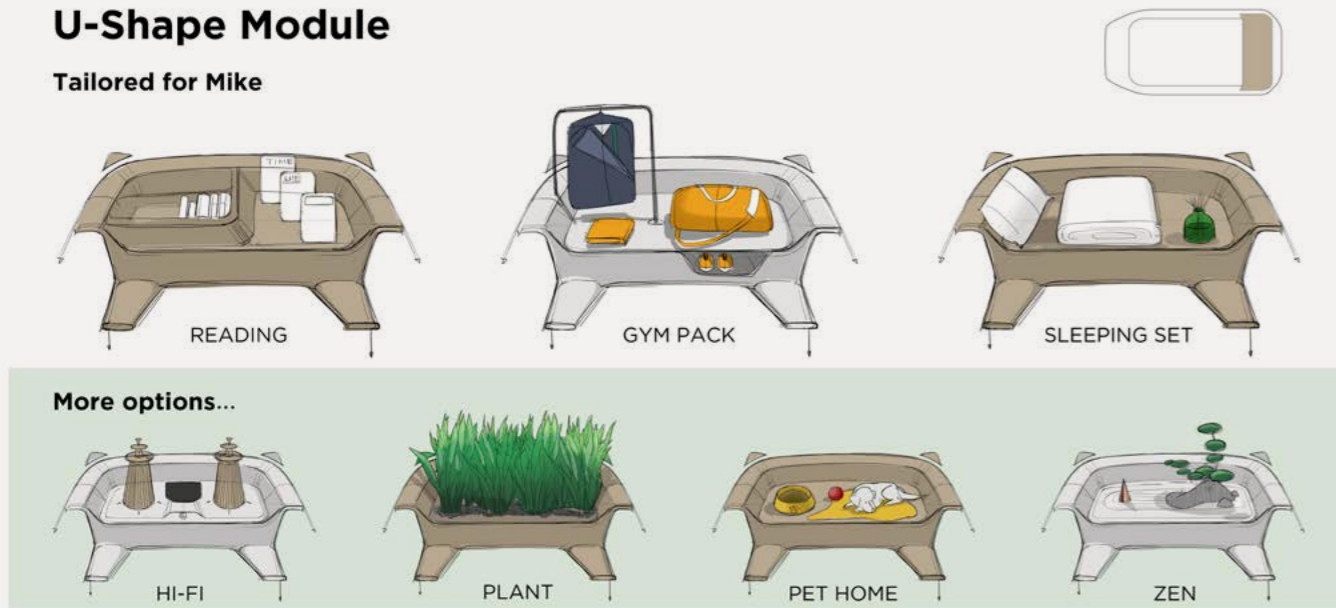


Fig 99. ENROUTE bespoke amenities modules that fit into the vehicle

The solution explored was a cartridge system that would be installed as the vehicle was being prepped for the next user. An amenities cartridge slides in from the front and rear, with the appropriate experiential items. This creates a bespoke experience with easy extraction and clean up for the next user. Other design features explored include a charging cubby hole to place the users personal device whilst they work or relax as a physical “Do Not Distract” (Figure 100).

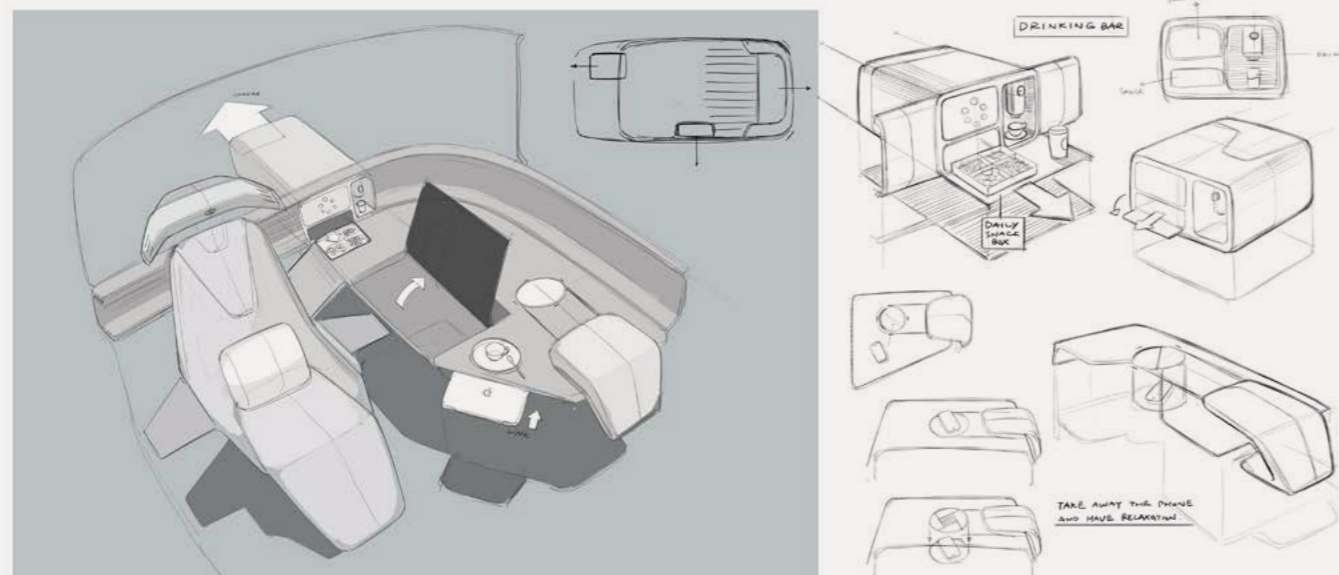
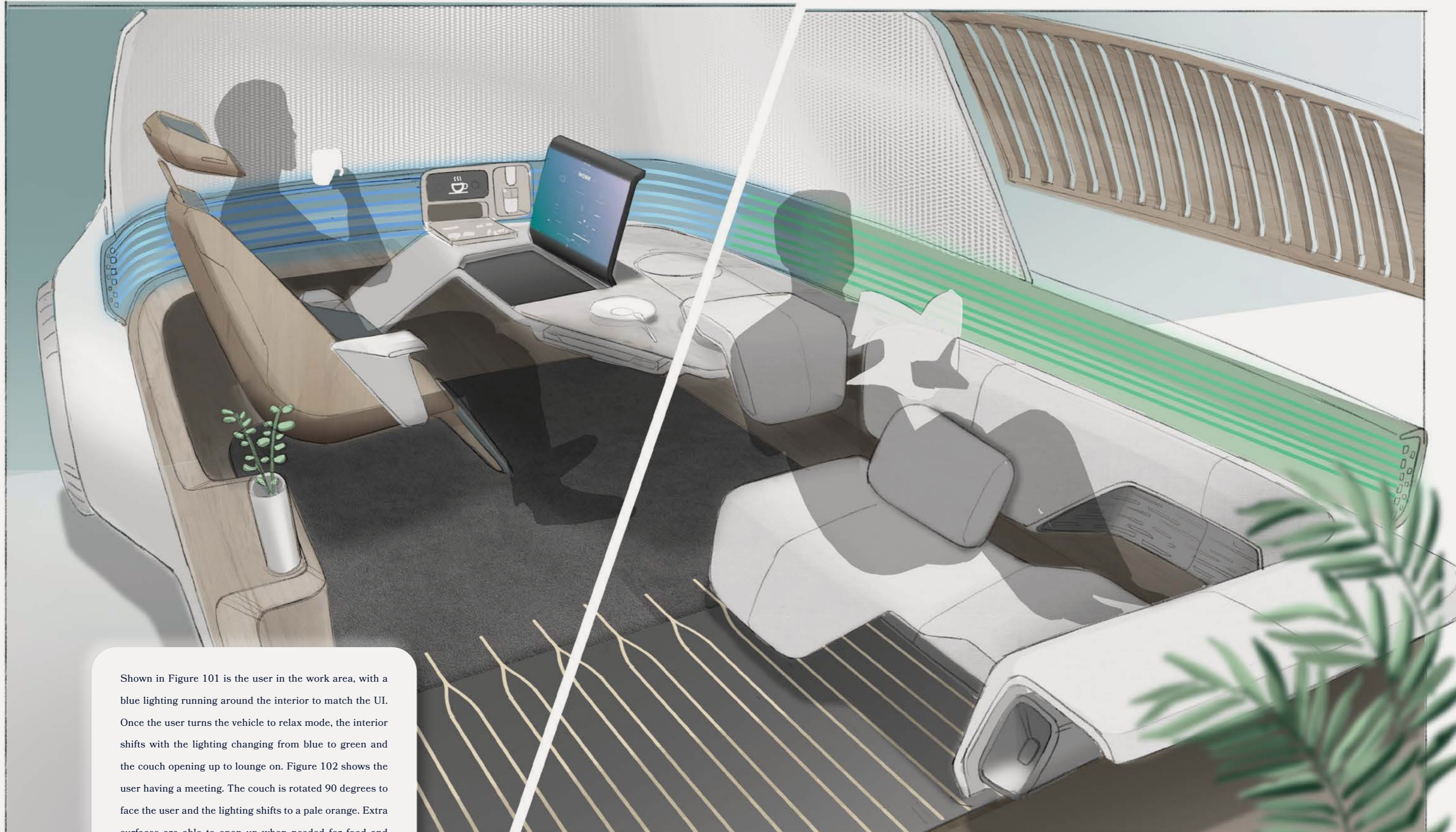


Fig 100. ENROUTE bespoke amenities and interior design development



Shown in Figure 101 is the user in the work area, with a blue lighting running around the interior to match the UI. Once the user turns the vehicle to relax mode, the interior shifts with the lighting changing from blue to green and the couch opening up to lounge on. Figure 102 shows the user having a meeting. The couch is rotated 90 degrees to face the user and the lighting shifts to a pale orange. Extra surfaces are able to open up when needed for food and beverages.

Fig 101. ENROUTE final render of a user in various modes for working and relaxing

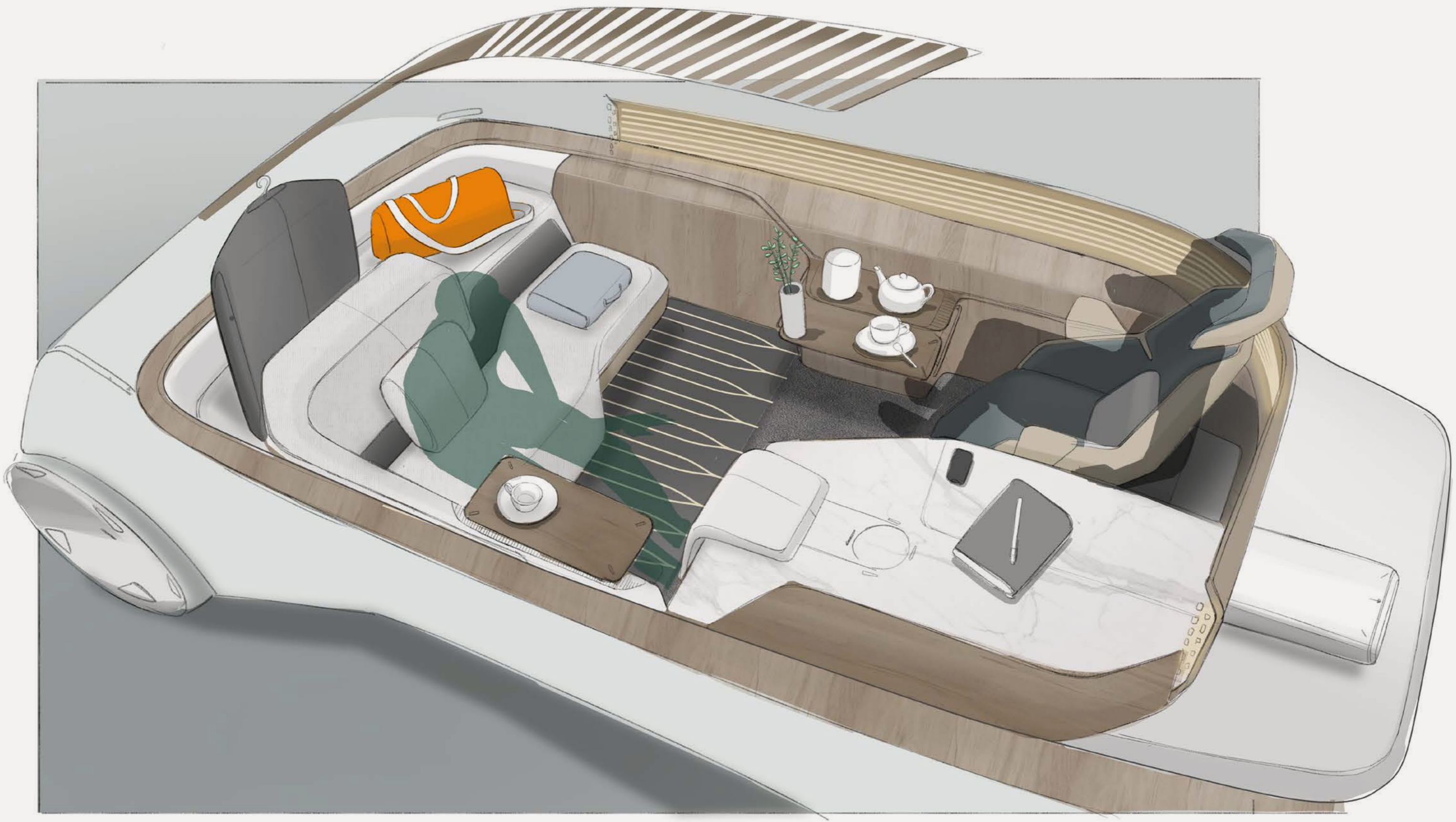


Fig 102. ENROUTE final render of a user in interacting with a client in meeting mode

5.3.5. TRANSITION ROADMAP

Vehicles today (2020) limit users to having a meeting in a vehicle whilst facing the same direction. A driver is needed to get the users from A to B. The first milestone sees users able to sit face to face to have a meeting, whilst a supervisor drives and keeps users comfortable. The next milestone creates a separate compartment with an on-

board steward to look after the users and the vehicle. The final milestone is a fully autonomous vehicle with space for the interior to have various modes that caters to the users needs and wants. From working remotely to relaxing and hosting meetings.

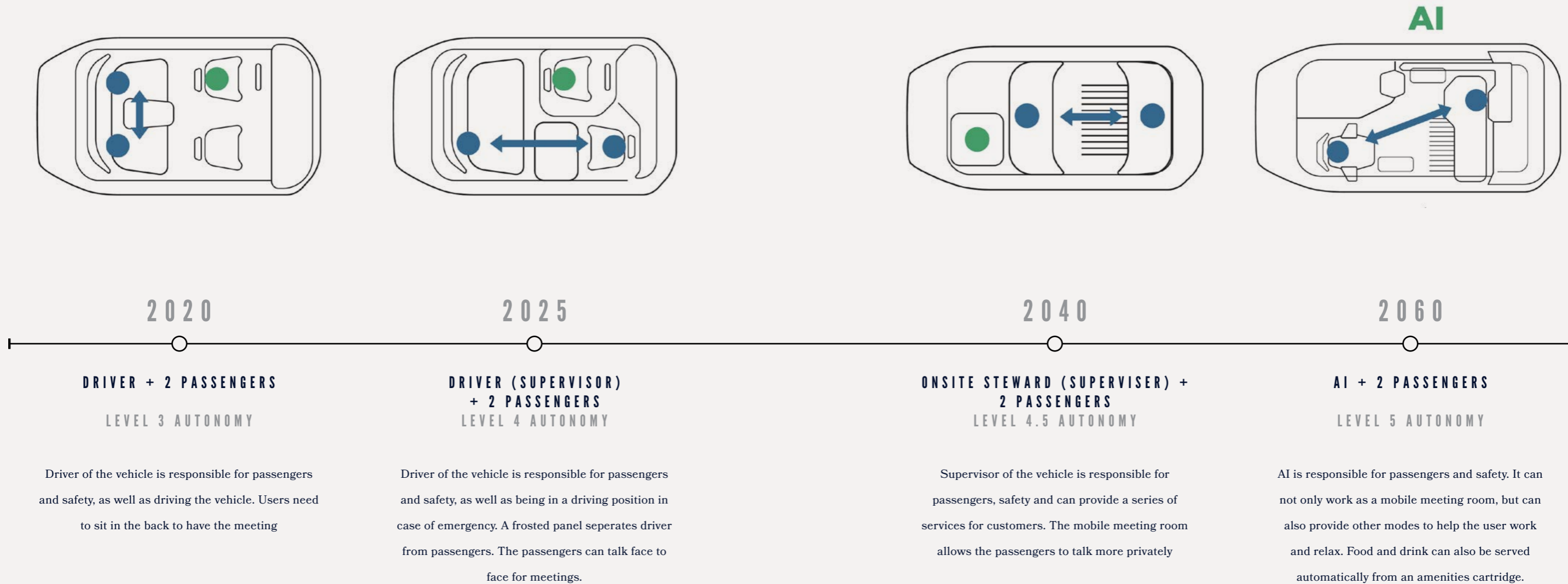


Fig 103. Transition Roadmap 2020 - 2060

SPAREVROOM

MULTI-USE FAMILY VEHICLE / LIVING SPACE



5.4.1. Introduction

Project 4 is called **SPAREVROOM**, which is based around a multi-use family vehicle / living space. The challenge was to design an interior and service, split between three short journeys, that encourages a good balance for all facets of family life. The system and interior must work together to address the various needs of each family member. The three short journeys can be consecutive or split throughout the day. It will be an extension of the family home, where the vehicle provides a detachable mobile space with an adjustable interior to suit the needs and schedules of all the family. The interior can be customised to serve the needs of home, work and social life. The three keywords for **SPAREVROOM** are versatile, tailored and architectural. The question was how can you create a multi-use service and interior system that addresses all facets of family life?

5.4.2. Persona and scenarios

The persona created for **SPAREVROOM** is a family of four: Tom (A professor in a central university), Susan (A freelance architect), Jimmy (10 years old at primary school) and their pet dog. They live in a suburban area 30 minutes away from the city. They have a busy, but peaceful family. Tom and Susan have irregular schedules due to their jobs, while Jimmy is an active and curious child with various after school activities. They are accustomed to using shared services such as toys, skill sharing, household items and more.

Tom has an irregular schedule due to various symposiums and conferences, as well as his lectures, and the same for Susan, as her job as a freelance architect requires her to go to various client meetings, on-site checks, etc. The family has their groceries and dry-cleaning delivered once a week.

5.4.3. Service design work

The user journey is split between Susan, Tom and Jimmy. On this particular day, Tom is returning from an overseas conference and planning on a relaxing day before going out for a family dinner. Susan has a client meeting in the morning, after which she will head to her shared office. Jimmy will go to school and a piano lesson before dinner (Figure 104).

From the user journey, we determined that the family's needs (Figure 105) for these trips were: flexibility in interior configuration to cater for different activities (work, play, relax, family time etc); adequate organisation (physical) for the various interior configurations and/or props; lastly, parent reassurance or safety features, especially in the case that Jimmy rides alone. Key considerations (Figure 106) were identified as: supporting organisational systems for the family schedule to maximise efficient use of car and how can the car be externally shared when not in use?



USER JOURNEY
(expected)

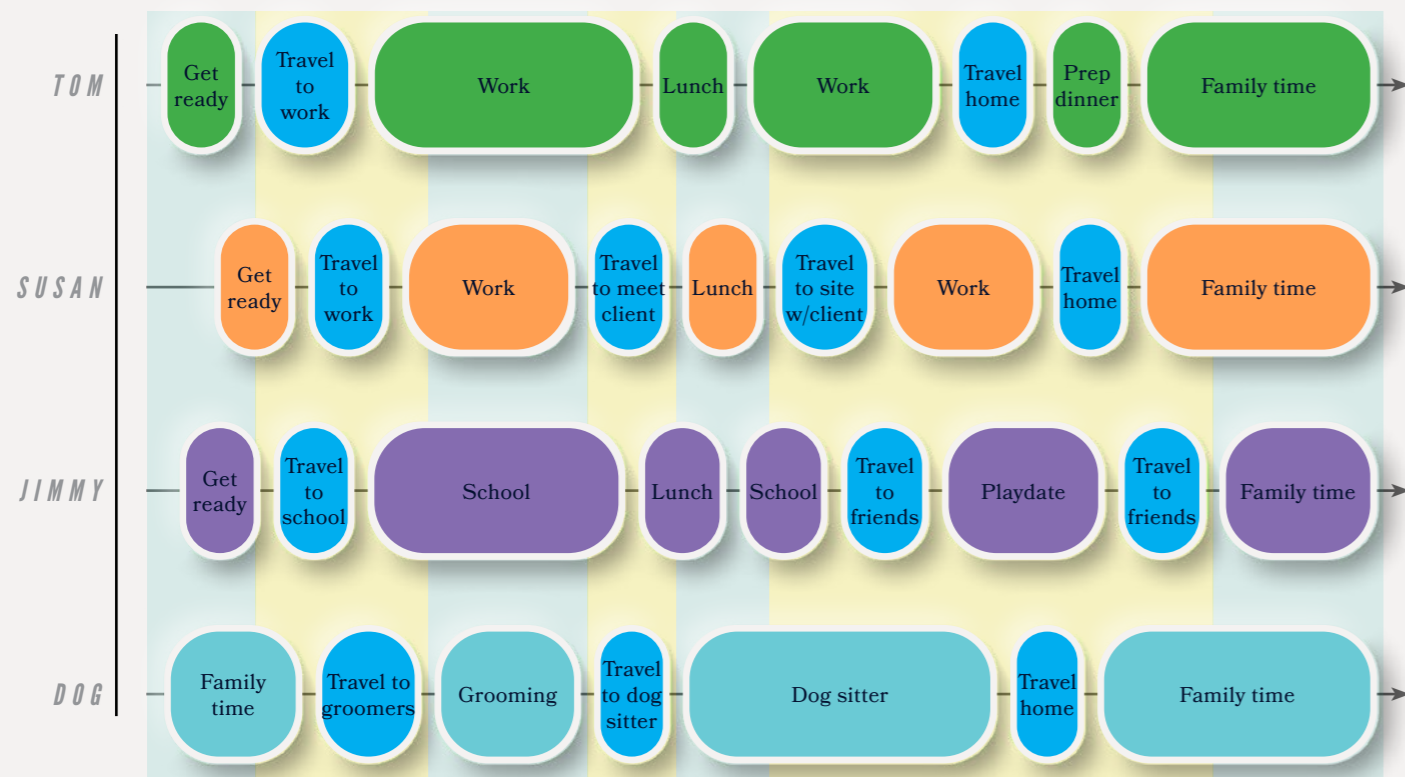


Fig 104. The family's day journey with the car

Fig 105. Needs based on the family's day journey with the car

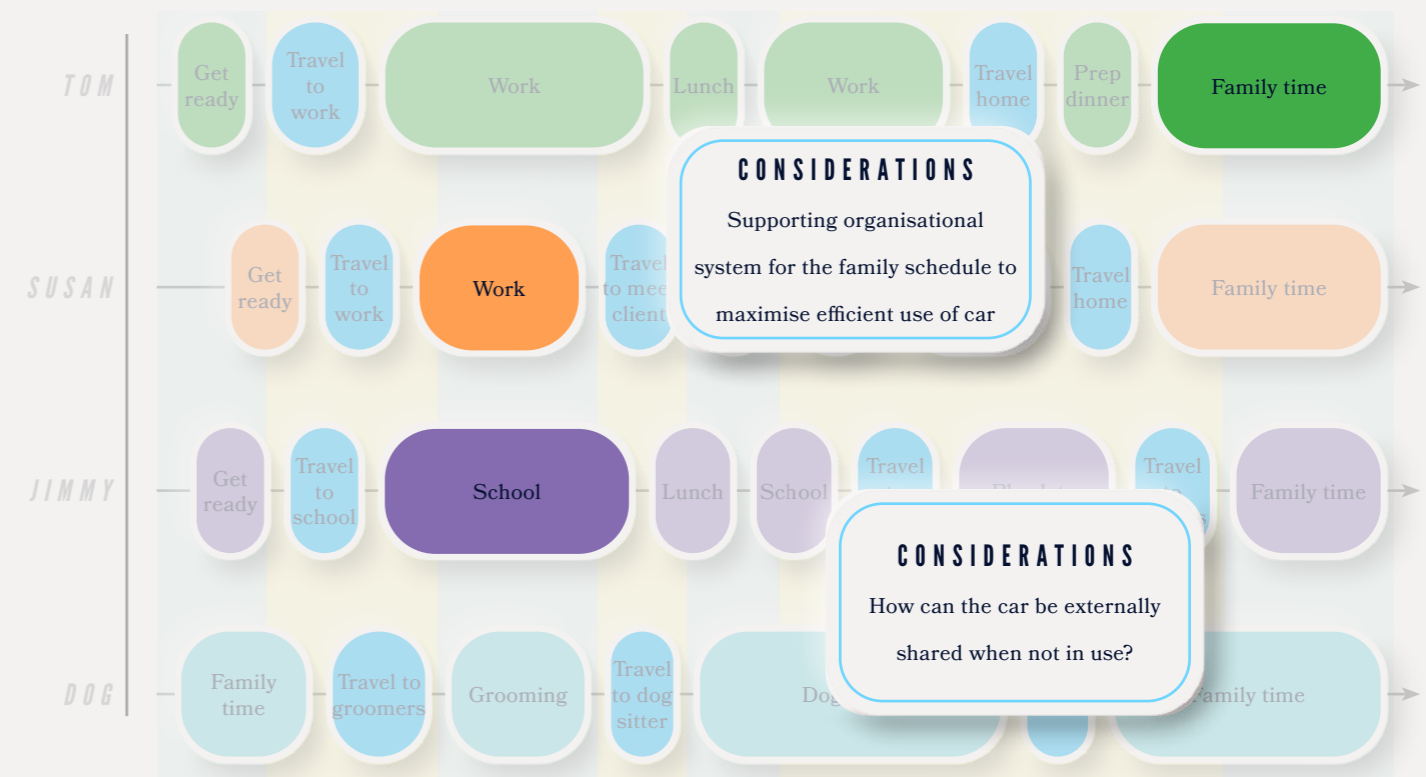
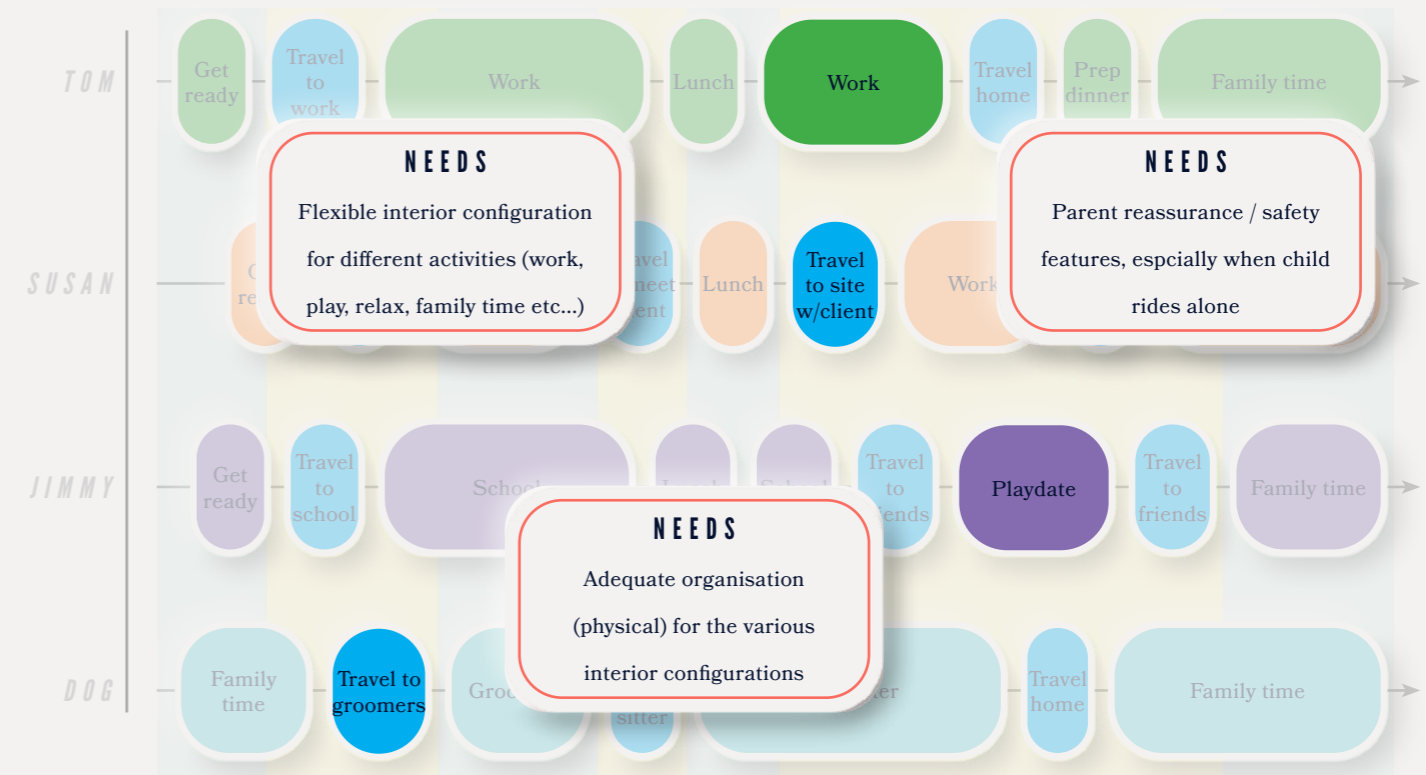


Fig 106. Considerations based on the family's day journey with the car

Keywords

**Versatile
Tailored
Architectural**

The service blueprint (Figure 107) developed is based on the pre-use, use during the day, whilst it is not in use by the family, retention and support. The physical touchpoints identified were personal devices that contain the calendar of each member of the family and the vehicle's interior. The user actions are: join service upon purchase of car, record family member schedules, select among options, adjust or change journeys as needed, confirmation of the journey, users entering the vehicle, the journey itself (which could involve work, playing, naps, family time and more), other activities and engagements whilst the vehicle is not in use, and finally feedback from the user and system. The frontstage actions include showing overlapping trips and providing alternative options, daily notifications or of planned journeys, receiving notifications upon vehicle arrival, notification service for the vehicles other activities and shared status, and vehicle maintenance. Backstage

actions are to calculate the journey time and duration, to change the configuration and seating arrangements accordingly, to have the vehicle travel to the pick up location, to give the parents reassurance with safety features, and to engage in the other activities. These can include charging the vehicle, picking up groceries, renting out to another family's trip, taking the dog to a grooming parlour and more. The support process was to have different (subscription) modules for various activities, creating a flexible vehicle configuration and organisational system, having a GPS system for user location, and to be in partnership with external systems (grocery stores, car sharing services, schools and more).

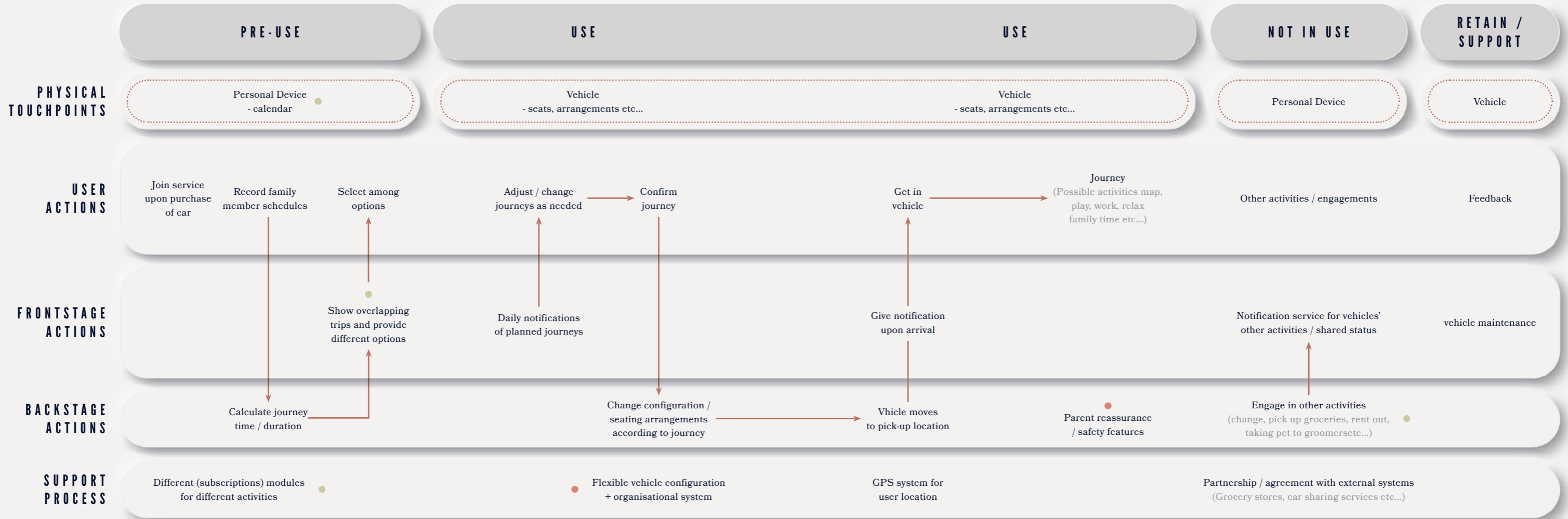
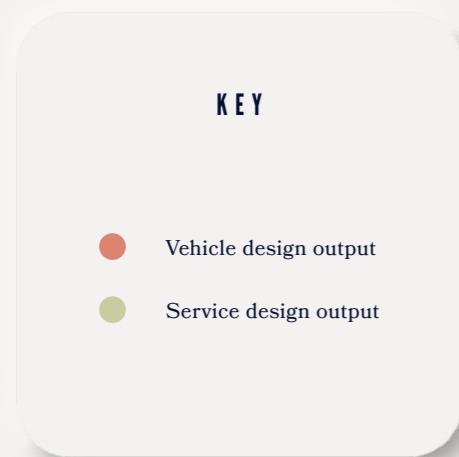


Fig 107. SPAREVROOM service blueprint



The overview of potential outputs from the service designers was to develop a personal device with a calendar to show the overlapping trips, providing different options for the user. They were also to develop different subscription modules for various activities. The vehicle designers were to design a flexible vehicle with configurable interiors, as well as to design the safety features for parent reassurances.

There are two key services designed for SPAREVROOM: a subscription model and a sharing community. The subscription model enables family members to easily change, add or cancel their vehicles based on their current needs. These needs could and would change over time

(for example, the child going to a different school or the parents getting new jobs). The sharing community is so that neighbours can use the platform to share different vehicle models between close friends, or to borrow and loan between users with payments involved (Figure 108).

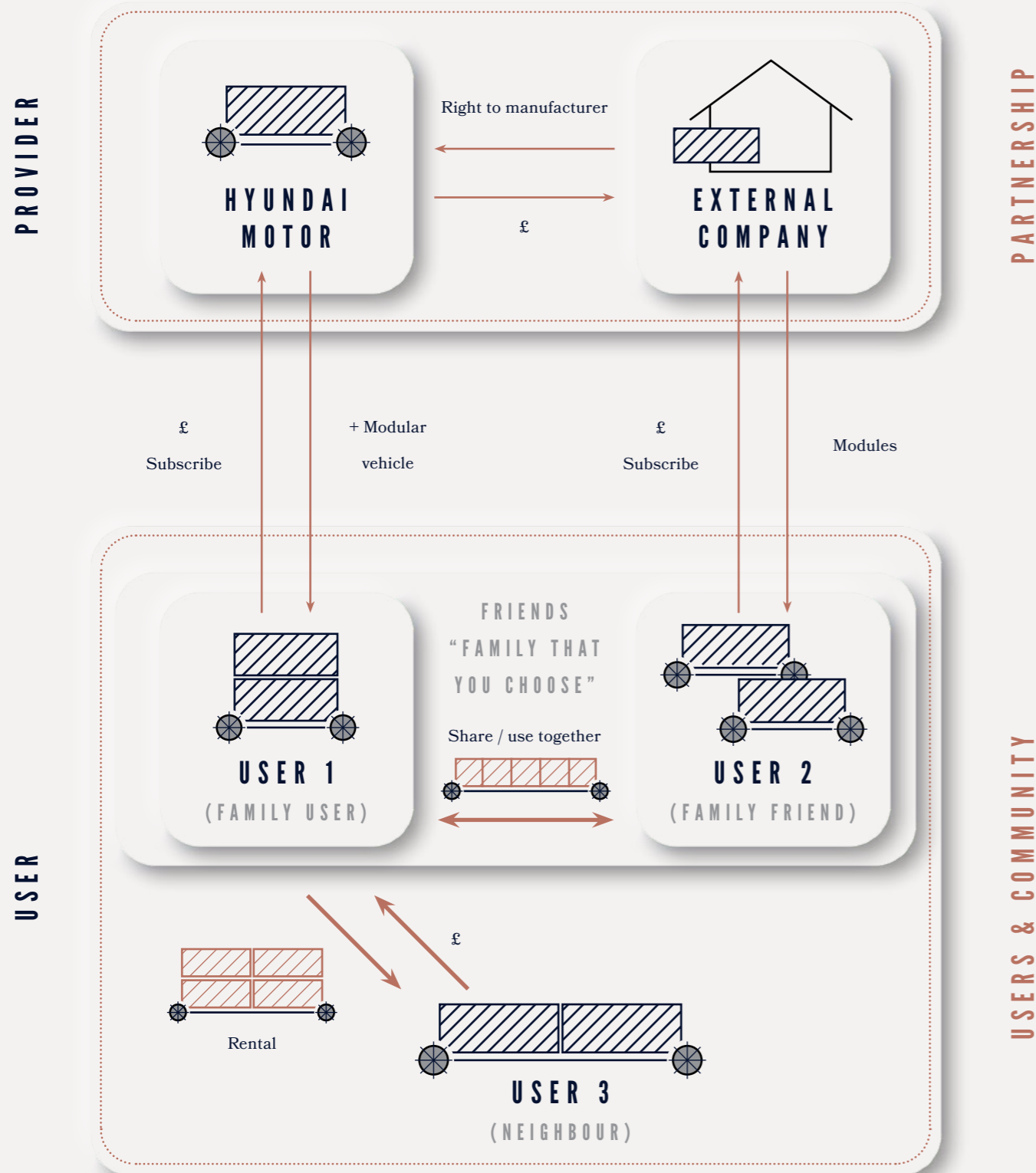


Fig 108. Key services for SPAREVROOM provider and users

5.4.4. Vehicle design work

SPAREVROOM had similar design challenges to ENROUTE, where the interior of the vehicle would adapt to suit the needs of the user. The differences being that the family would essentially own the vehicle, as part of a subscription service, and it would be integrated with the house, becoming a part of their daily lives. The moodboard (Figure 109) was inspired by the key words of comfort, tailored and coexisting. Images were chosen for how small

spaces can be used to great effect, various family activities, personalising spaces, modularity and traditions. The tagline for SPAREVROOM is "Mobility as an extension of your home", emphasising that the user's home and their vehicle do not have to be two separate entities. They could be designed together as a whole, creating a more seamless experience through the day of the users.

Fig 109. Moodboard inspirations for SPAREVROOM



The main design challenge was to find a way for three separate users, each with their own requirements, to use this vehicle at the same time (Figure 110-112). The three zones determined to have the most impact for this particular family were: Focus, Meeting and Relax.

The conclusion we arrived at was for the vehicle to be able to split up and rejoin at relevant times. This is achieved by a wall that can roll up into the ceiling of the vehicle, allowing users to walk through the entirety of the interior when two or more sections are joined together (Figure 113).

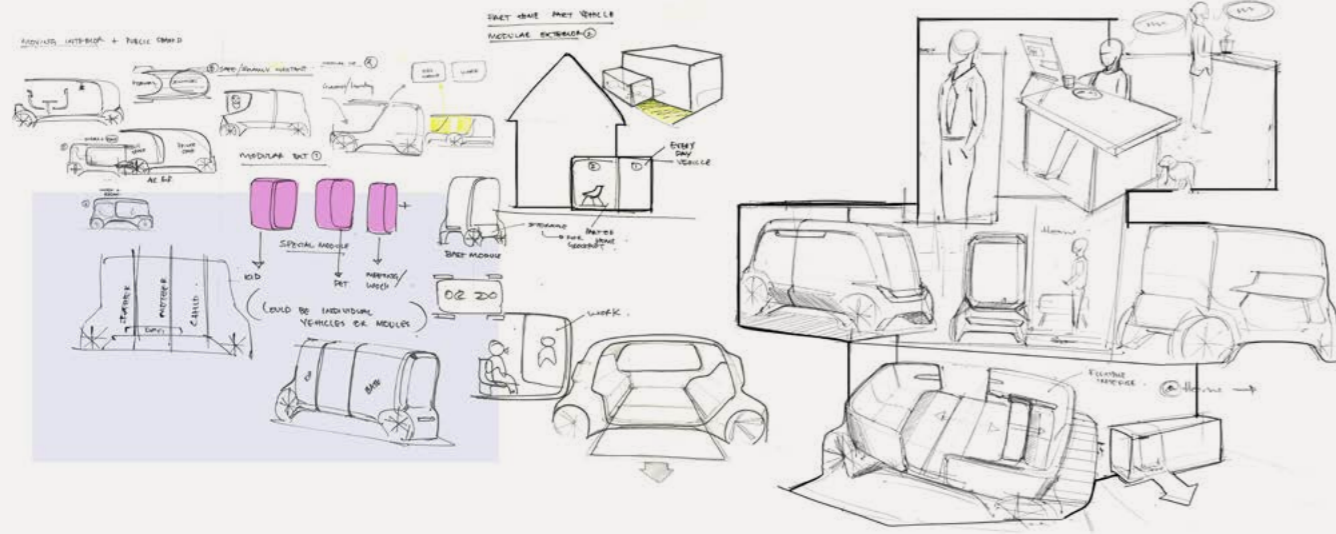


Fig 110. Modular development sketches for SPAREVROOM

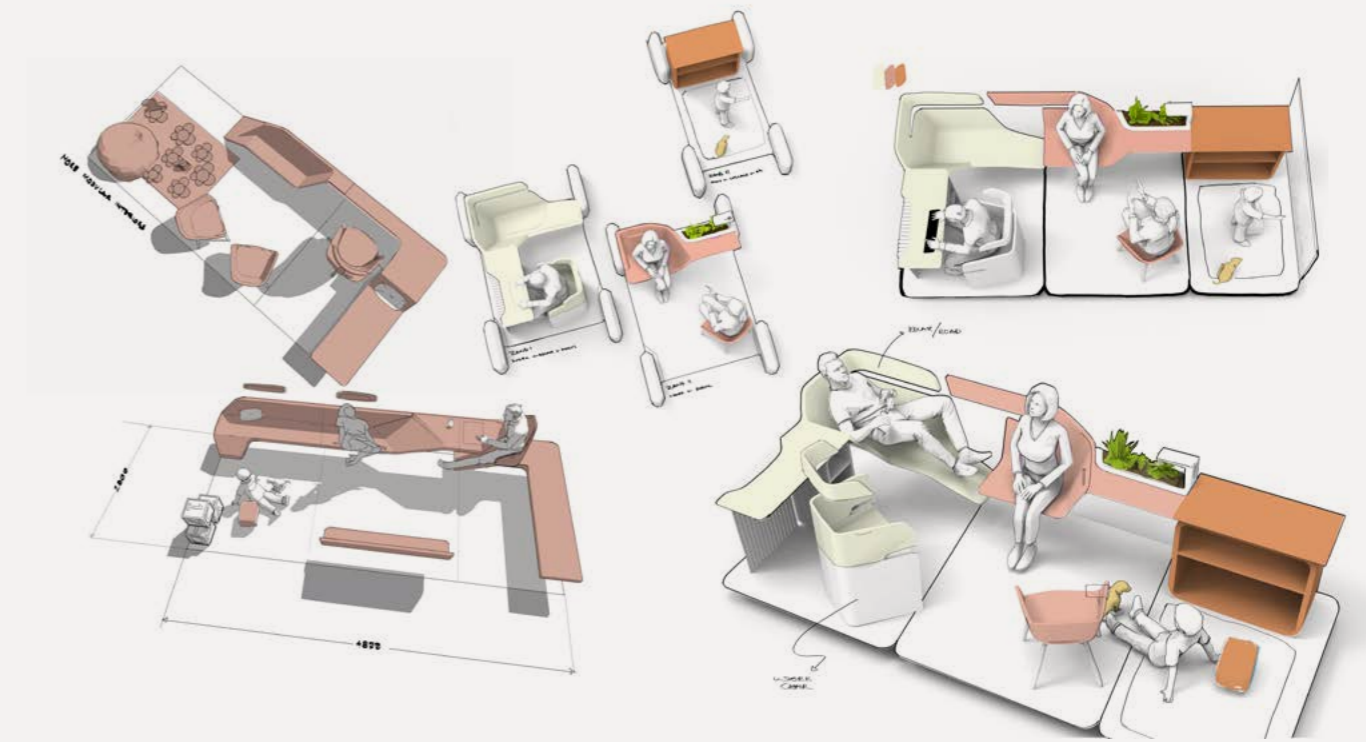


Fig 112. Development of the 3 modules and their interiors for SPAREVROOM

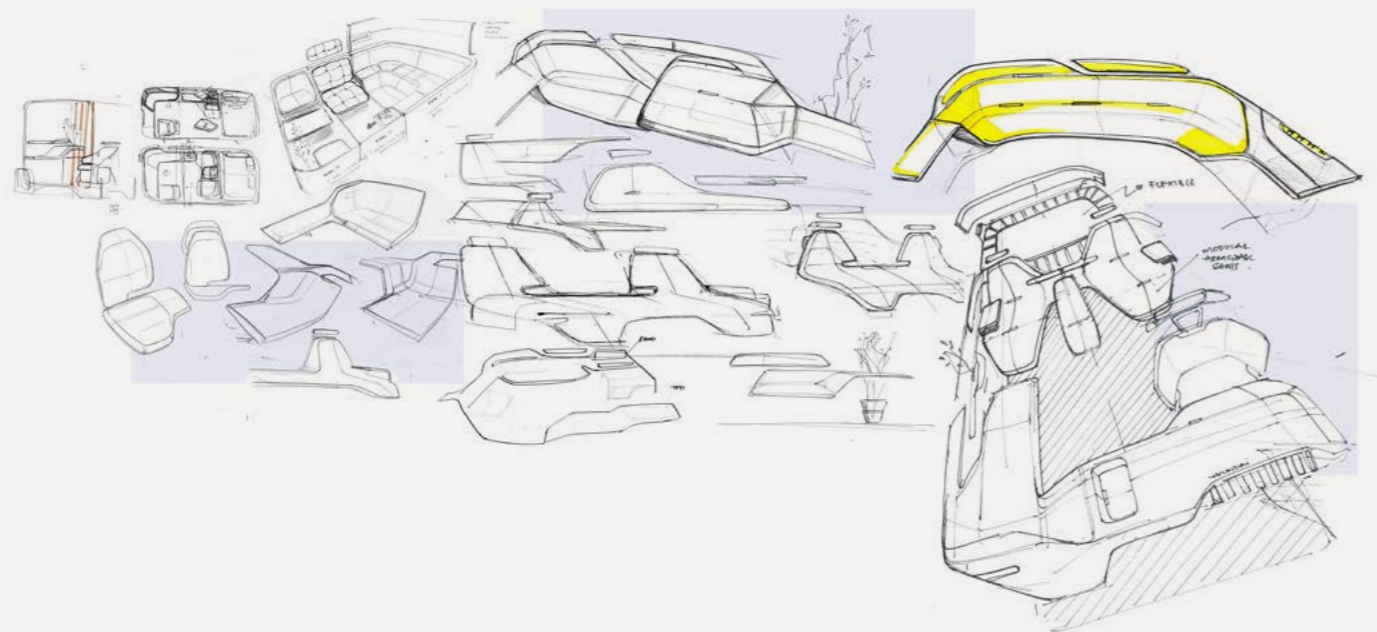


Fig 111. Interior development sketches for SPAREVROOM

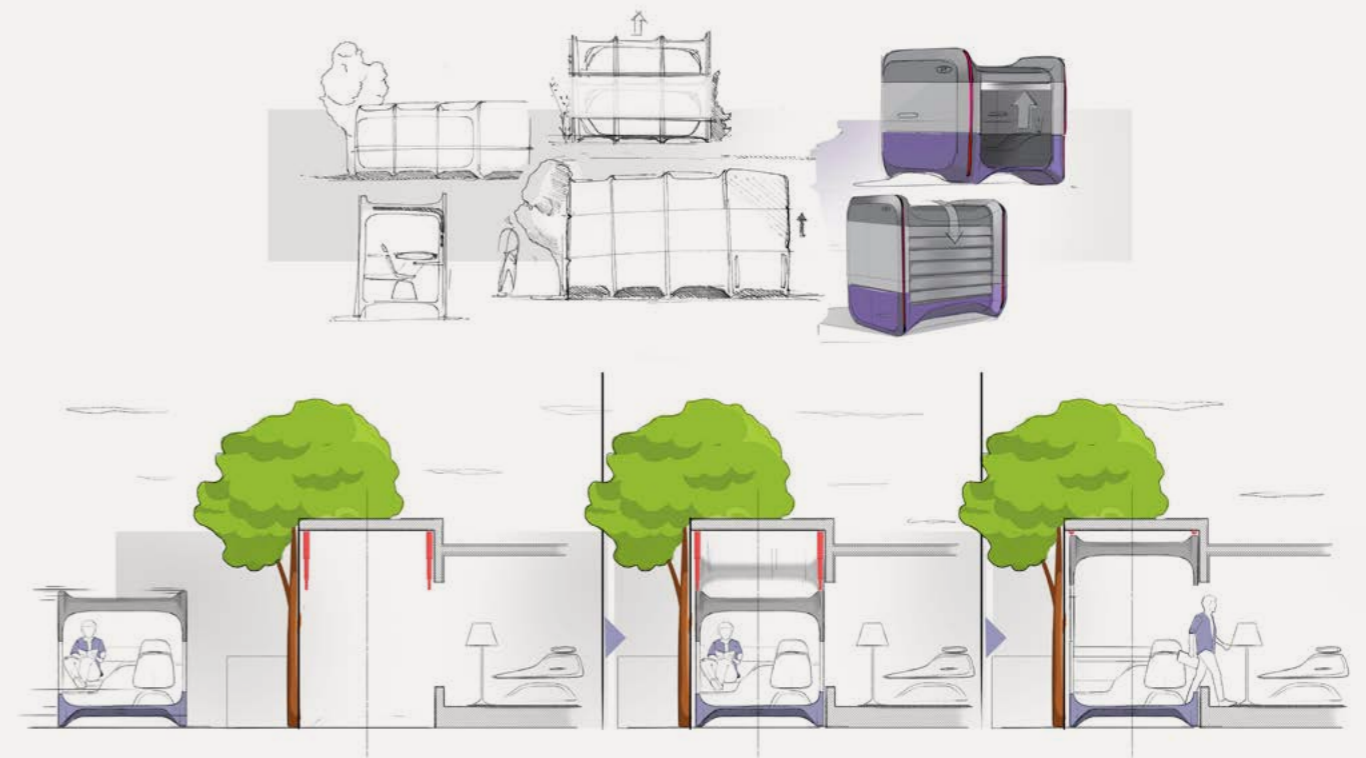


Fig 113. How SPAREVROOM vehicle docks with the home

The journey map of the vehicle starts with Susan and Jimmy leaving the house at the same time, splitting up while travelling to their respective destinations, then all three meeting up on their way to the final destination. (Figure 115).

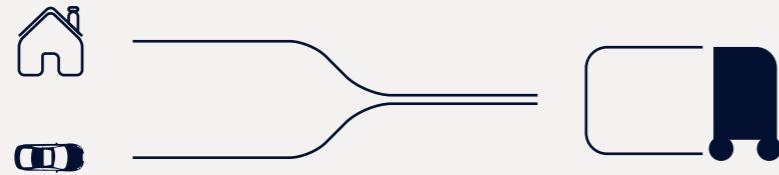


Fig 114. Core concept of merging the vehicle with the home

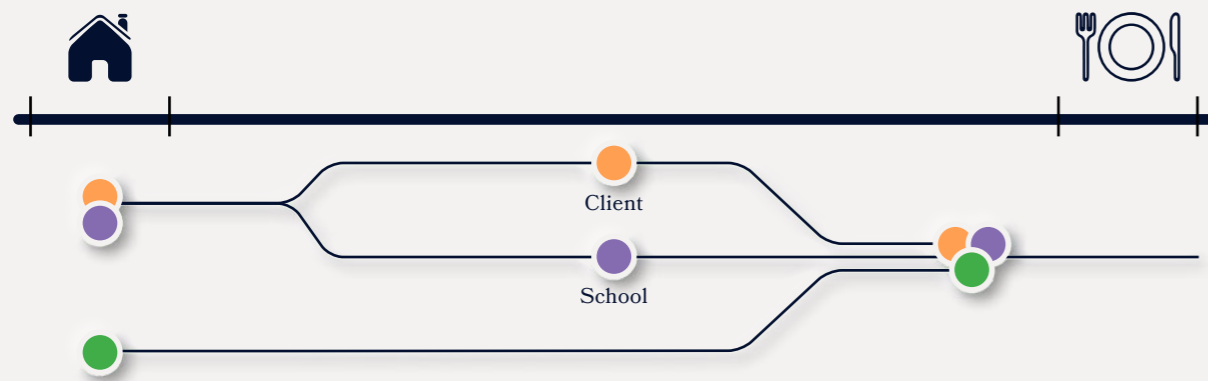


Fig 115. Journey map for Susan, Tom and Jimmy

The SPAREVROOM storyboard extends on the above diagram, highlighting the design challenges at each key interaction. These challenges include how the vehicle will dock with the house and each other, how users will interact with the various areas within the interior, and how the separate sections will rejoin en-route to their destination (Figure 116 & 117).

Fig 116. SPAREVROOM storyboard: morning

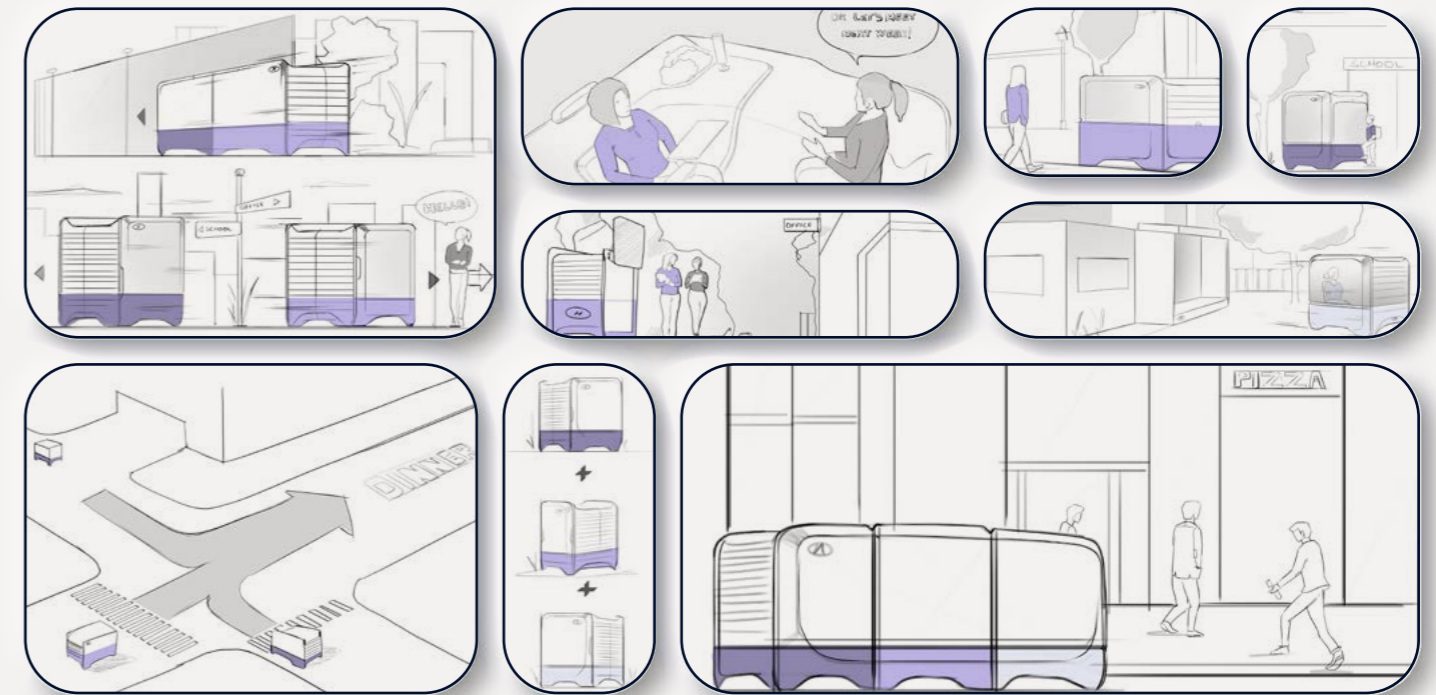
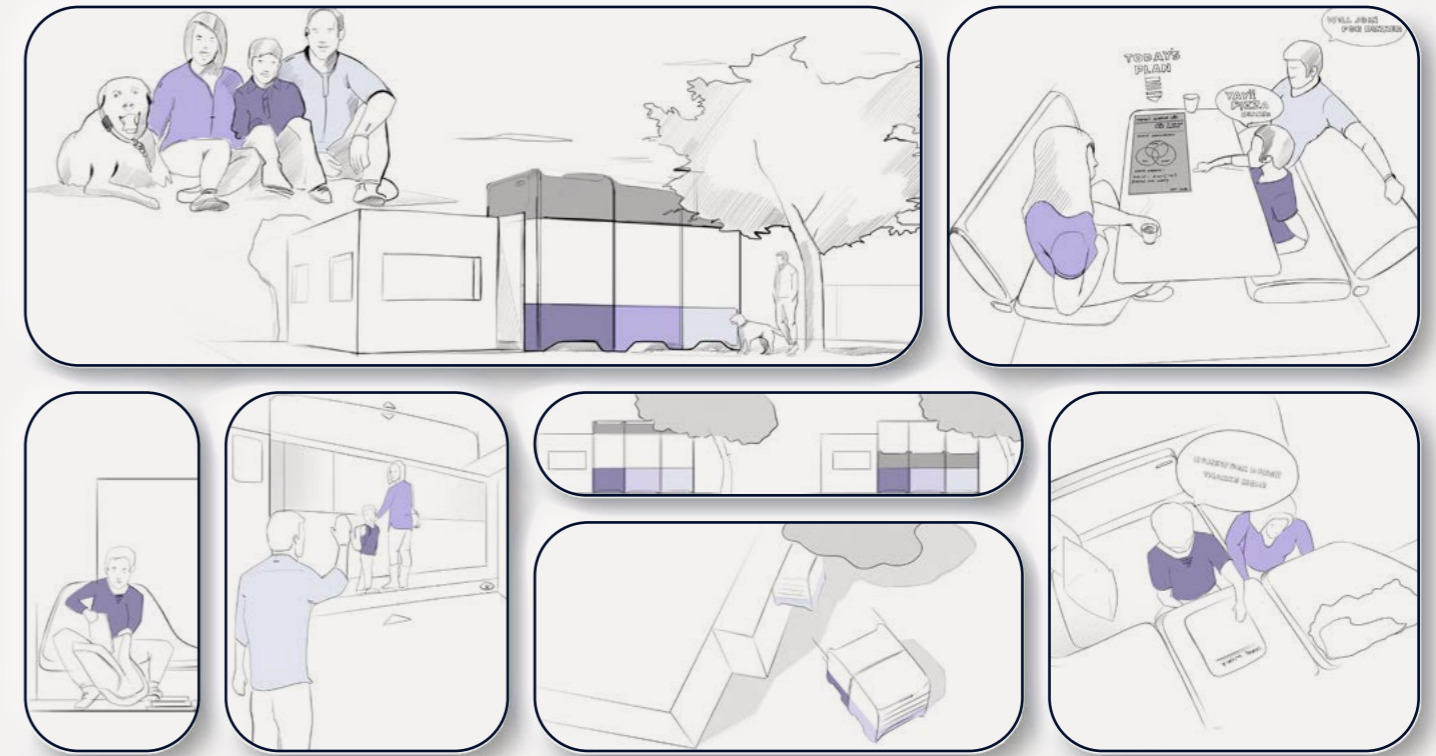


Fig 117. SPAREVROOM storyboard: afternoon and evening



In the final renderings, you can see the three sections clearly, with Tom working at the focus space, Jimmy working on his music in the relax area, and Susan having a meeting in the work area (Figure 118).

Fig 118. Final render showing the various interactions in a SPAREVROOM vehicle



Fig 119. Final render showing the family together in a SPAREVROOM vehicle

Lastly for SPAREVROOM, we designed the interior to be modular, able to change to suit the families needs. In Figure 120, you can see how the various spaces interact with each other when selected. The top view would be an interactive interface on the users personal devices. Figure 121 shows the UI for how the family would organise their profiles and schedules.



Fig 120. UI showing the various SPAREVROOM interior modular layouts



Fig 121. UI showing SPAREVROOM users profiles and schedules

5.4.5. TRANSITION ROADMAP

Today (2020), users park their vehicle(s) on their driveway. The first milestone sees the start of a vehicle that integrates with the house. The next milestone has the vehicle begin to separate for each user. The final milestone shows the vehicle and house fully integrated together, where the interior space of the vehicle becomes a new room in the home.



Fig 122. Transition Roadmap 2020 - 2060

CHAPTER 6.

CONCLUSIONS

Throughout the research and concept design process, we tried to unpack the meaning of the five keywords (mobility, ownership, relationship, personalisation, hospitality) that emerged at the beginning of the project.

We combined service design and vehicle interior design into our concept design phase and conceived new design opportunities around shared vehicle spaces and related services. We gained in-depth knowledge about the benefits and concerns around sharing vehicles, potential sharing scenarios and behavioural patterns. Potential shared mobility users' requirements are repeatedly 'privacy', 'safety', 'space', 'communication' and 'economic'. Through our concept design process, we identified design briefs that focus on improving users' trust in shared vehicle services by offering choices to enable them to use the shared space comfortably.

The project adopted a typical research-through-design process with a scientific approach - identify the key research topic (in this case from previous project's user studies and a key mobility trend); review past research, designs, and up-to-date policy and state of the art technology; refine the research topic and define research questions by creating design briefs; create design concepts with detailed vehicle and service design as well as interaction touch points. Further research may be needed such as testing concepts in order to prove feasibility if any concepts are to be developed into real world solutions; building prototypes to refine functions, materials, space designs or to improve user-vehicle interactions in detail; exploring business opportunities of the design concepts by communicating with industry partners.

Research topics for further exploration based on the results of the project can be grouped into four innovation opportunities: mini sharing mobility spaces, comfortable spaces for multi-modal communities, personal premium workspaces, and multi-use family vehicle/living space. For example:

Mini shared mobility spaces

Further research into natural personal interfaces to allow individuals to contact service operators or report security issues, and seating materials that allow users to arrange the separation of space and to interact or disconnect with other passengers needs exploration.

Comfortable spaces for multi-modal communities

More design attention should be given to consider both single and group travellers and their choices around keeping the space private or being able to interact socially. Allowing shared mobility users be able to rearrange the vehicle space according to their physical and emotional needs has significant design potential.

Personal premium workspaces

Our research found that most shared mobility users would prefer to be able to customise in-vehicle spaces according to the purpose of their journey, the nature of activities they wish to undertake on the move and their mood at the time. We created a concept design for a premium workspace on the move as an example, but there are many design opportunities for other scenarios. More inclusive designs can be explored when considering lower cost journeys and provision for disabled or elderly users.

Multi-use family vehicle/living space

Sharing vehicles with family, acquaintances and neighbourhood communities is an area that has often received attention but, to date, has not resulted in any successful business models. By embedding design thinking when exploring suitable services and business models, more innovation is expected to be seen especially for shared vehicles or when sharing vehicle spaces with someone that people know and trust.

This research set out to explore novel innovations and to develop design examples for future shared mobility. The research and concept design was focused on interior design and relevant services available for individual users' activities before, during and after using the shared vehicle spaces. The major contribution of the results is to create a holistic view for vehicle designs and vehicle services to be developed within a brand ecosystem with potential to integrate other transport modes and customised services. Vehicle design blends seamlessly into service design. This project is intended to show that in-vehicle space design is not a standalone process, it is responsible for a critical part of an entire journey experience for users, therefore it should be considered along with elements such as other transport modes before and after the shared journey, trip monitoring services that can ensure a safe and comfortable journey, trip management tools for users that allows appropriate ratings to be awarded and reviewed, and many more.

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APPENDIX 1 SURVEY QUESTIONS

Sharing and Mobility

What are your views on sharing?

We are from the Intelligent Mobility Design Centre at the Royal College of Art exploring the sharing economy and how this may affect the design of mobility in the future. This questionnaire will ask about your views on sharing and should take between 5-10 minutes to complete.

* 1. How old are you?

- 18 - 24 55 - 64
 25 - 34 65 - 74
 35 - 44 75+
 45 - 54

* 2. What is your gender?

* 3. What is your nationality?

4. If you currently live in the United Kingdom, where do you live?

* 5. What is your income level

- Under £11,850
 £11,851 - £19,999
 £20,000 - £29,999
 £30,000 - £39,999
 £40,000 - £49,999
 £50,000 - £69,999
 £70,000 - £89,999
 Above £90,000

Part 1: What shared services do you use?

We want to understand what makes the shared economy work. Our aim is to learn what sharing services you have used and why you use them.

* 6. Can you tell us what shared services or products you have used in the past?

- Public Transport** (Bus, Underground, Tram, Santander bikes etc...)
 Mobility Hiring (Hertz, MoBike, Lime Scooters, Zip Car, Anyvan etc...)
 Taxi Services (Black Cab, Uber, Kaptin etc...)
 Delivery Services (Nimber, DPD, UberEats, Deliveroo etc...)
 Information and Knowledge (Skillshare, Wikipedia, study classes etc...)
 Clothes Hiring (Rent The Runway, Fancy Dress Hire etc...)
 Equipment Hiring (Library of things, Burly etc...)
 Accommodation services (AirBnb, Shared Accommodation, Airsorted etc...)
 Recycling Services (Too good to go, Charity Shops, Carboot Sale etc...)
 Workspace (WeWork, Fora, De Beauvoir Block)
 Facilities (Gyms, Swimming Pools, Sport Centres etc...)
 Peer - to - Peer (Taskrabbit, GumTree, Ebay, BlaBla Car etc...)

* 7. Which service or product that you selected in Q6 do you use most frequently?

* 8. When was the last time you used the sharing service or product answered in question 7?

- Today In the past six months
 This week In the past year
 In the past two weeks Never
 In the past month

Sharing and Mobility

* 9. What are the main motivation(s) for you to use this service or product?

- | | |
|--|--|
| <input type="checkbox"/> Access | <input type="checkbox"/> Charity |
| <input type="checkbox"/> Convenience | <input type="checkbox"/> Value for money |
| <input type="checkbox"/> Part of a community/ connecting with other people | <input type="checkbox"/> Low costs |
| <input type="checkbox"/> Environmentally friendly | <input type="checkbox"/> Ethically responsible |
| <input type="checkbox"/> Entertainment | |
| <input type="checkbox"/> Other (please specify) | |

Sharing and Mobility

Part 2: What do you share?

We are interested in finding out what you are willing to share and if not, why?

* 10. How likely are you to share the following with someone you *know*?

	Very unlikely	Unlikely	Neither likely or unlikely	Likely	Very Likely
Clothing (lending out or borrowing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valuable accessories (watches, jewellery, etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic devices (mobile phone, personal computer, camera etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal information (passwords, Pin, home address, medical conditions etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media profiles (facebook, instagram, LinkedIn etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your home (Renting out / house sitting)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shared accomodation (living space, Flat share, Office space etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very unlikely	Unlikely	Neither likely or unlikely	Likely	Very Likely
Kitchen appliances and kitchenware (fridge, cutlery, tuppaware etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tools (power tools, ladder, paint brushes etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal hygiene products (shaving razor, toothbrush etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A journey (taxi service, Uber, Road trip etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your bicycle (lending out)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your car (lending out)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entertainment (music playlist, Movie choice, Games etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food and drink (bowl of snacks, sharing platter, bottle of drink etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facilities (gym, swimming pool, sauna, public w/c etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 11. How likely are you to share the following with someone you *do not know*?

	Very unlikely	Unlikely	Neither likely or unlikely	Likely	Very Likely
Clothing (lending out or borrowing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valuable accessories (watches, jewellery, etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic devices (mobile phone, personal computer, camera etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal information (passwords, Pin, home address, medical conditions etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media profiles (facebook, instagram, LinkedIn etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your home (Renting out / house sitting)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very unlikely	Unlikely	Neither likely or unlikely	Likely	Very Likely
Shared accomodation (living space, Flat share, Office space etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kitchen appliances and kitchenware (fridge, cutlery, tuppaware etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tools (power tools, ladder, paint brushes etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal hygiene products (shaving razor, toothbrush etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A journey (taxi service, Uber, Road trip etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your bicycle (lending out)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your car (lending out)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entertainment (music playlist, Movie choice, Games etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food and drink (bowl of snacks, sharing platter, bottle of drink etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facilities (gym, swimming pool, sauna, public w/c etc...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 12. What are the top 3 barriers preventing you from wanting to share the possession(s) identified in question 11 & 12?

- | | |
|---|--|
| <input type="checkbox"/> Safety | <input type="checkbox"/> Lack of regulation |
| <input type="checkbox"/> Cleanliness | <input type="checkbox"/> I'm worried I will get poor reviews |
| <input type="checkbox"/> I don't want to share it | <input type="checkbox"/> It has a negative impact on the community |
| <input type="checkbox"/> Lack of availability | <input type="checkbox"/> It has a negative impact on employment rights |
| <input type="checkbox"/> Privacy | <input type="checkbox"/> I won't make enough money out of it |
| <input type="checkbox"/> Reliability | <input type="checkbox"/> I don't know the people I'm sharing with |
| <input type="checkbox"/> The time it takes to get back | <input type="checkbox"/> I don't trust the people im renting to |
| <input type="checkbox"/> Too complicated | <input type="checkbox"/> Cost of repairing damages |
| <input type="checkbox"/> I can't review the product / service before I have committed to it | <input type="checkbox"/> I don't know who is liable in the case of an accident |
| <input type="checkbox"/> Other (please specify) | |

Sharing and Mobility

Part 3: What are your thoughts on future technology?

Many of the platforms used to enable the sharing economy are digital. So we would like to know what you think about the way your data is being collected and used by technology firms and governments, as well as finding out how you feel about emerging technologies.

* 13. Do you ever worry about your personal data when using sharing services such as Uber, Airbnb, Skillshare, Taskrabbit etc?

- Yes
- No

14. If yes, what are your worries?

- | | |
|--|--|
| <input type="checkbox"/> Data being shared to various companies | <input type="checkbox"/> I'm worried that it is not secure |
| <input type="checkbox"/> My data is being used to target me with advertising | <input type="checkbox"/> I don't know what will happen to it in the future |
| <input type="checkbox"/> Sensitive information being shared in public | <input type="checkbox"/> I don't like feeling monitored or watched |
| <input type="checkbox"/> Other (please specify) | |

Sharing and Mobility

15. Why are you not worried?

- It doesn't really impact my life
- I believe that I need to give my data away in order to get better service
- I trust the companies that process the data
- I trust the legal system that should protect me
- Data is not that important
- I don't have time to be bothered
- Other (please specify)

Sharing and Mobility

Part 4: Sharing Vehicles

We are interested in how shared vehicles are changing the way we travel and what you think are the key benefits and shortcomings of using shared vehicles.

* 16. What key benefits do you perceive the vehicle/ride-sharing schemes have?

- | | |
|---|--|
| <input type="checkbox"/> More socially responsible | <input type="checkbox"/> Because you can select the vehicle best suited to your needs on each occasion |
| <input type="checkbox"/> Better use of resources | <input type="checkbox"/> Convenience |
| <input type="checkbox"/> Increases local community cohesion | <input type="checkbox"/> Reducing congestion |
| <input type="checkbox"/> Low costs | <input type="checkbox"/> Better for the environment |
| <input type="checkbox"/> Accessibility | <input type="checkbox"/> Reduced travel time |
| <input type="checkbox"/> Access to unaffordable services | <input type="checkbox"/> Less hassle |
| <input type="checkbox"/> Value for money | |
| <input type="checkbox"/> Other (please specify) | |

* 17. What key concerns do you have regarding shared vehicle schemes?

- | | |
|---|--|
| <input type="checkbox"/> Personal data security | <input type="checkbox"/> Travel cost |
| <input type="checkbox"/> Privacy | <input type="checkbox"/> Membership |
| <input type="checkbox"/> Personal safety | <input type="checkbox"/> Terms of use: Having to stick to a set of rules |
| <input type="checkbox"/> Regulations issues | <input type="checkbox"/> Monitoring |
| <input type="checkbox"/> Insurance issues | <input type="checkbox"/> Disruptive business approach |
| <input type="checkbox"/> Reliability | <input type="checkbox"/> Freedom: Not having it when I need it |
| <input type="checkbox"/> Travel time | |
| <input type="checkbox"/> Other (please specify) | |

* 18. Would you trust using a shared vehicle if:

- | | |
|--|--|
| <input type="checkbox"/> You were sharing the space with people you knew | <input type="checkbox"/> You could use an app to live report any concerns to the regulator whilst travelling |
| <input type="checkbox"/> All users were part of a regulated scheme | <input type="checkbox"/> The journey was monitored by the regulator |
| <input type="checkbox"/> Your driver had been vetted to high standards | <input type="checkbox"/> The interior had options to screen off areas for personal privacy |
| <input type="checkbox"/> You could use an app to track the progress of your journey in real time | |
| <input type="checkbox"/> Other (please specify) | |

* 19. Under what circumstances would you feel comfortable using a shared vehicle if you didn't know the other users:

- Be separated from the other occupants by interior screens or divisions
- Having enough space between you and the other users
- Having opportunity to interact with other people in the same journey
- Other (please specify)

* 20. Would you trust a shared autonomous vehicle?

- Only if sharing the space with people you knew
- All users were part of a regulated scheme vetted by the service provider
- The service provider uses enabling technology to monitor and supervise each journey
- If the interior was configured to have the provision to provide personal space and privacy for each passenger.
- Other (please specify)

APPENDIX 2 MORPH SURVEYS COMBINED ANALYSIS

MORPH SURVEYS COMBINED ANALYSIS

NOVEMBER 2019

SURVEY 1

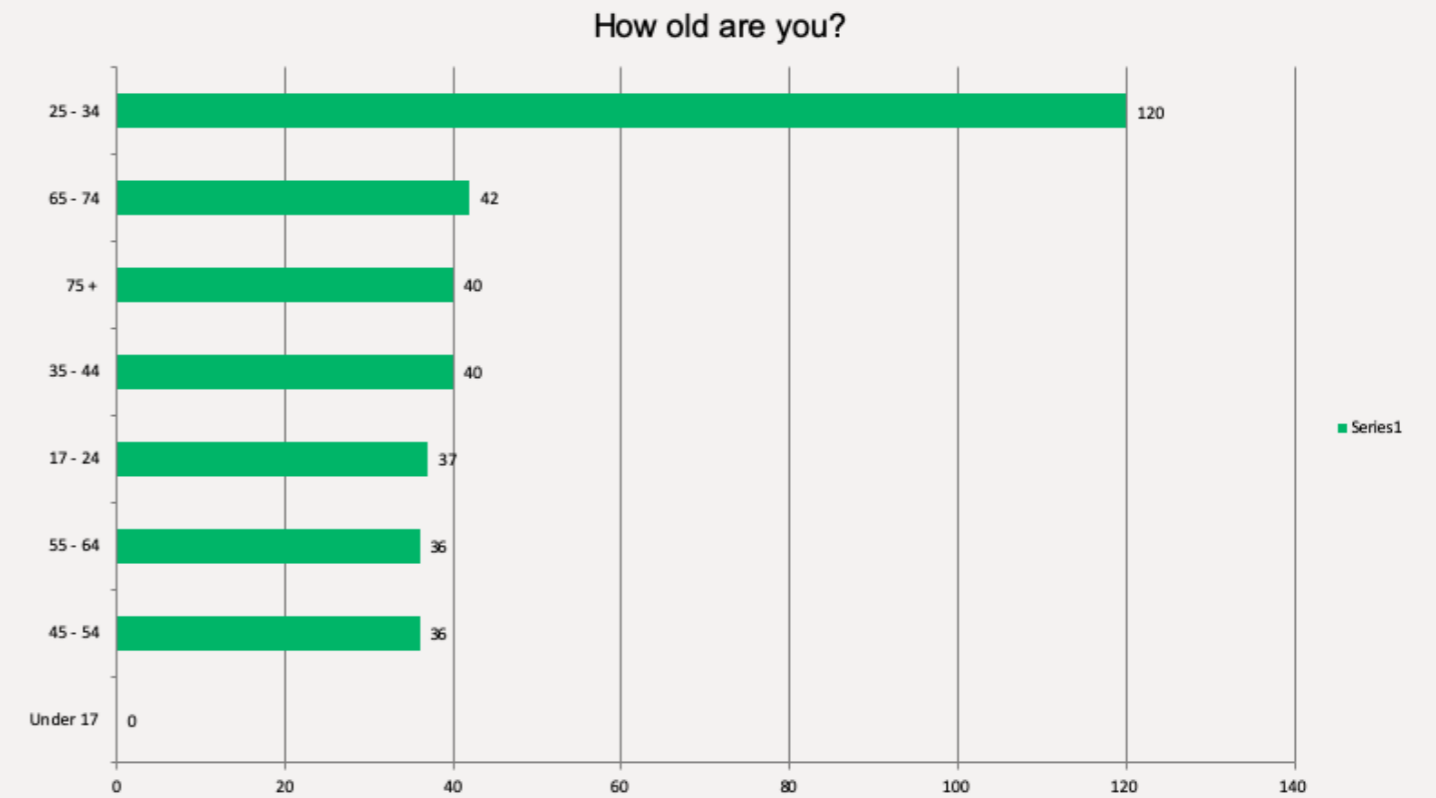
132 total responses

93 complete responses

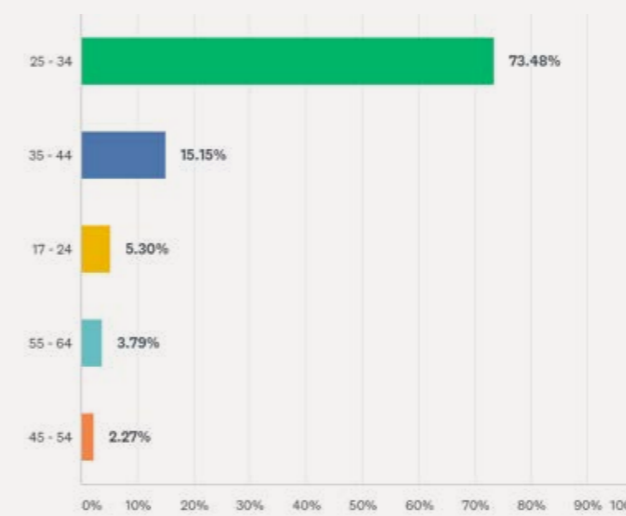
SURVEY 2

219 total responses

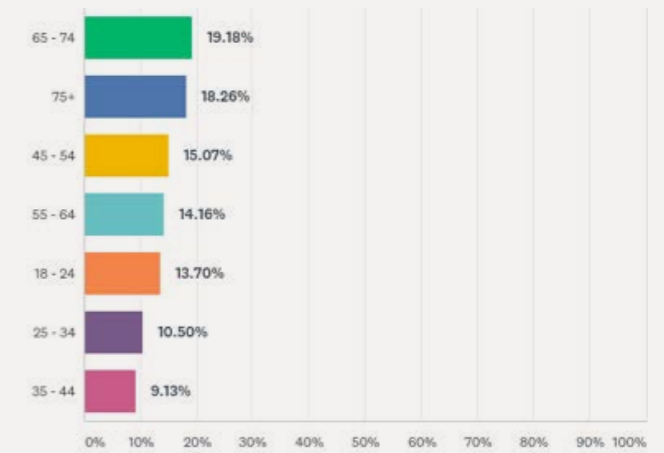
203 complete responses



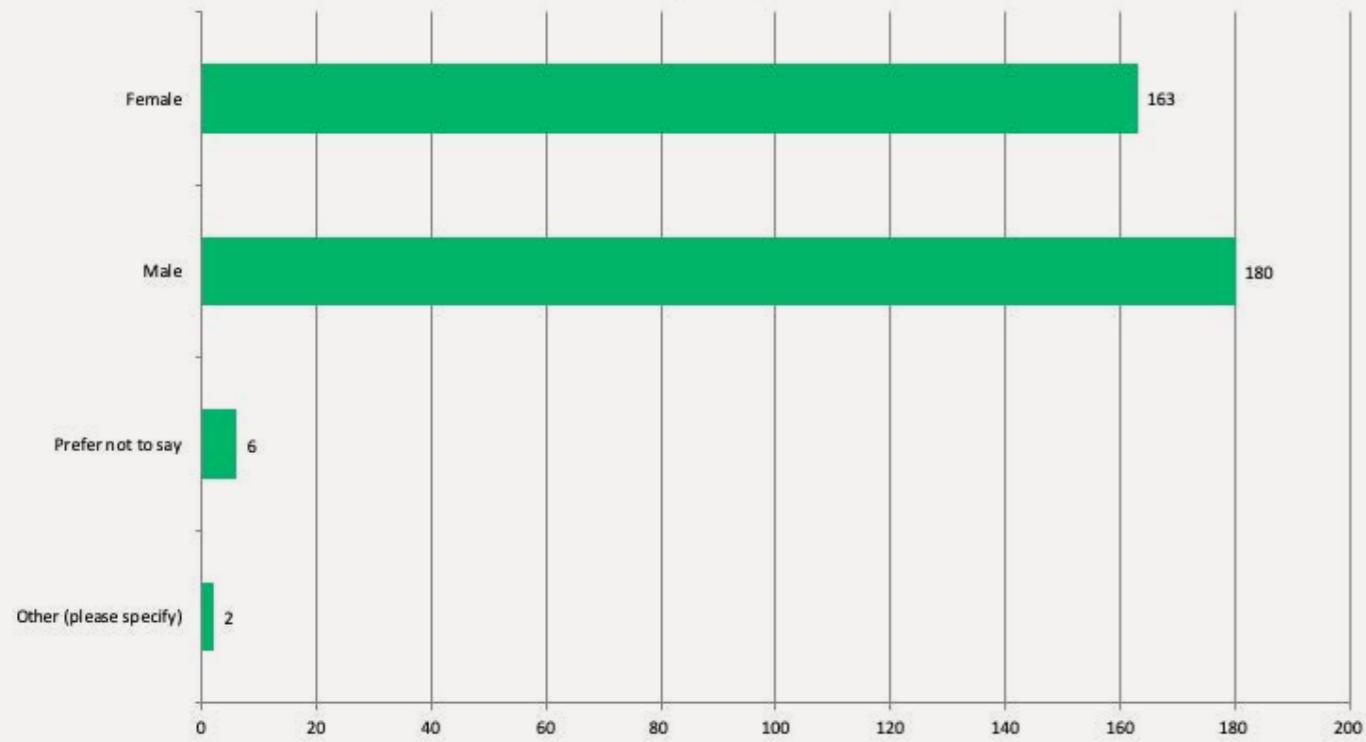
SURVEY 1



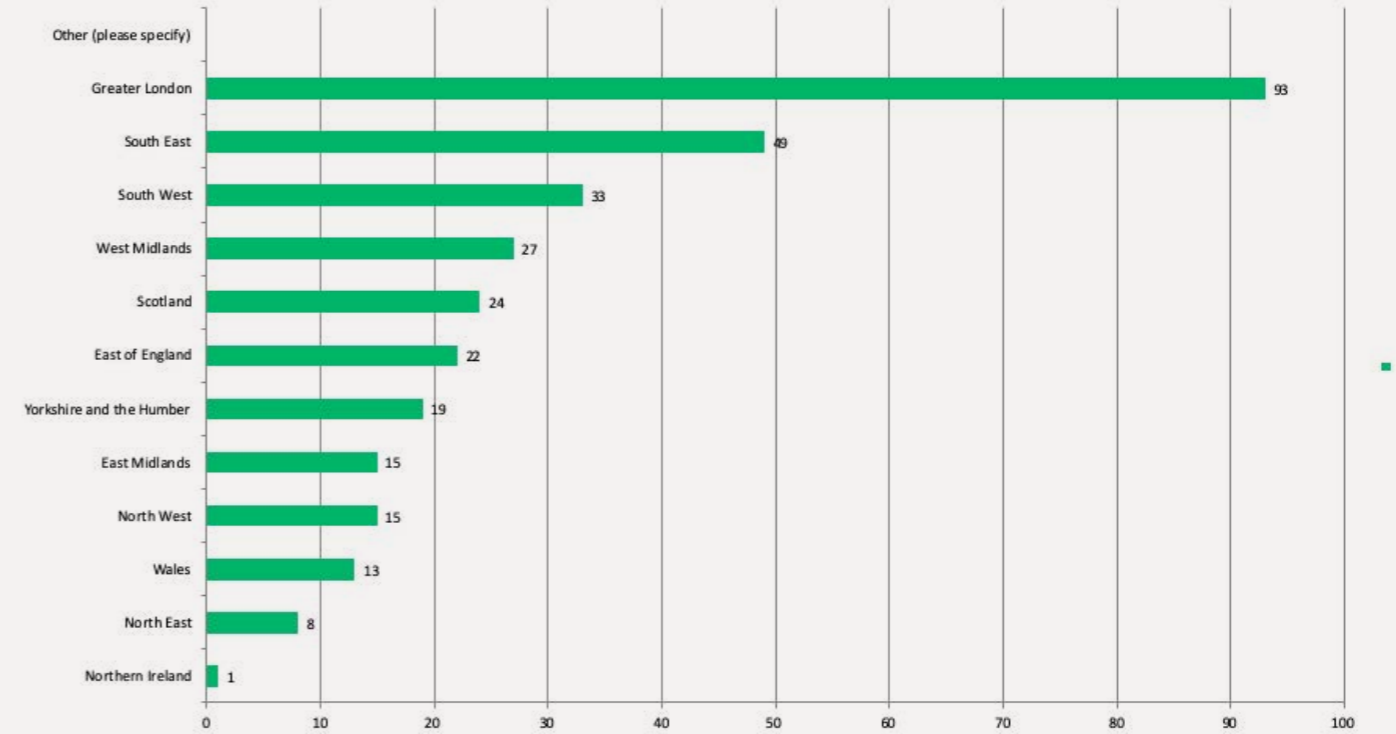
SURVEY 2



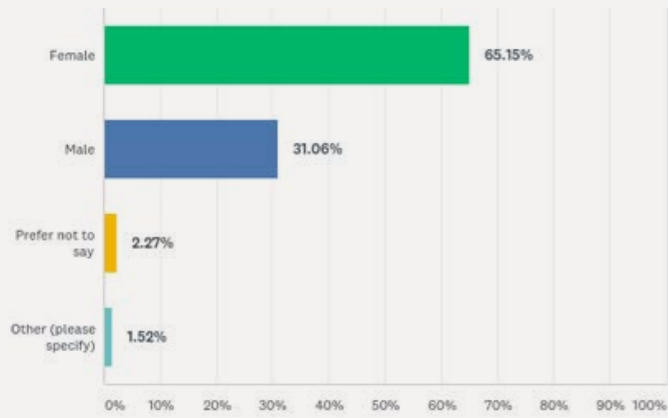
What is your gender?



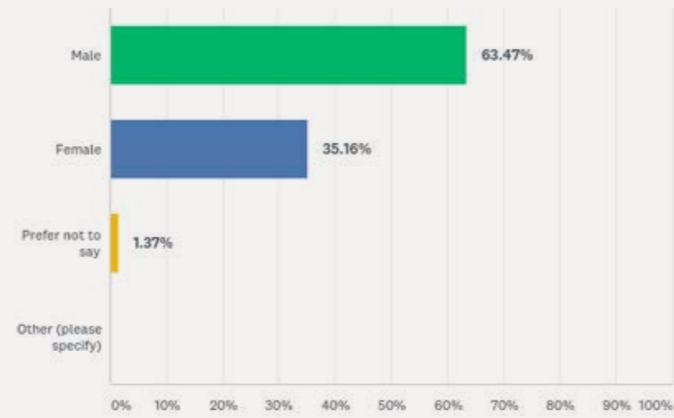
If you currently live in the United Kingdom, where do you live?



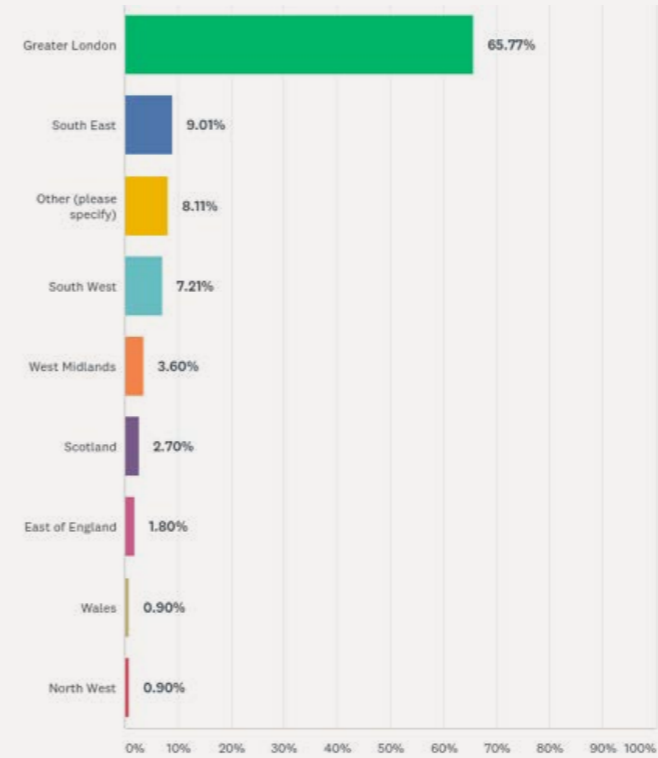
SURVEY 1



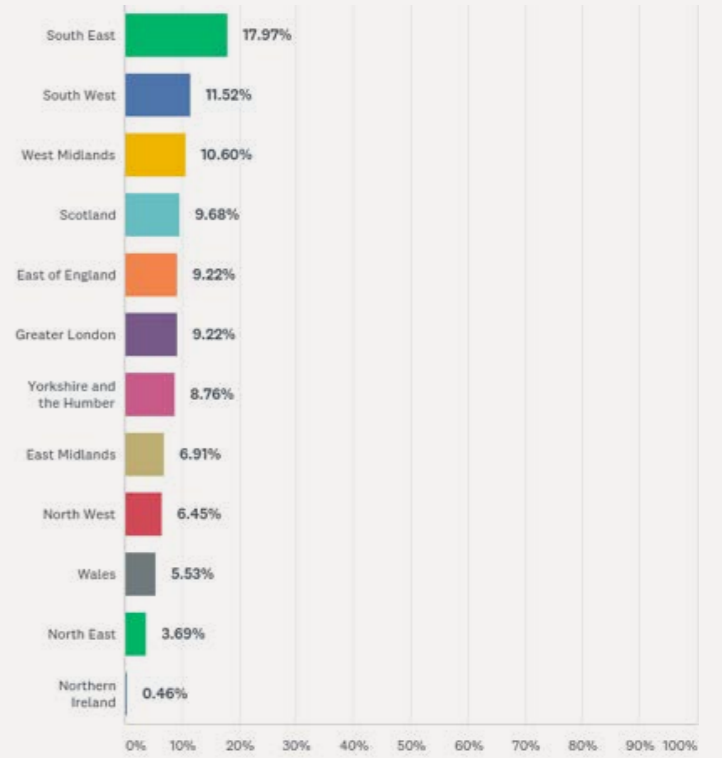
SURVEY 2



SURVEY 1

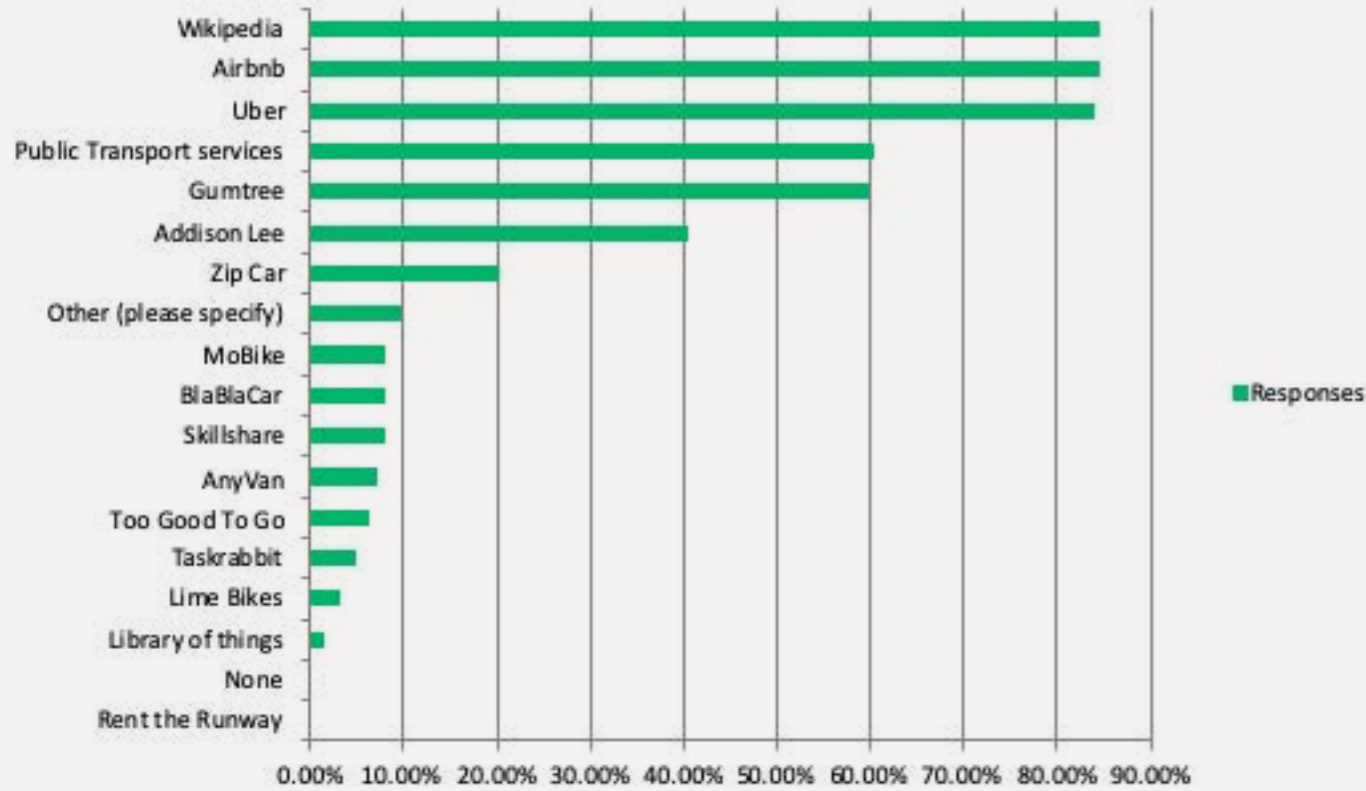


SURVEY 2

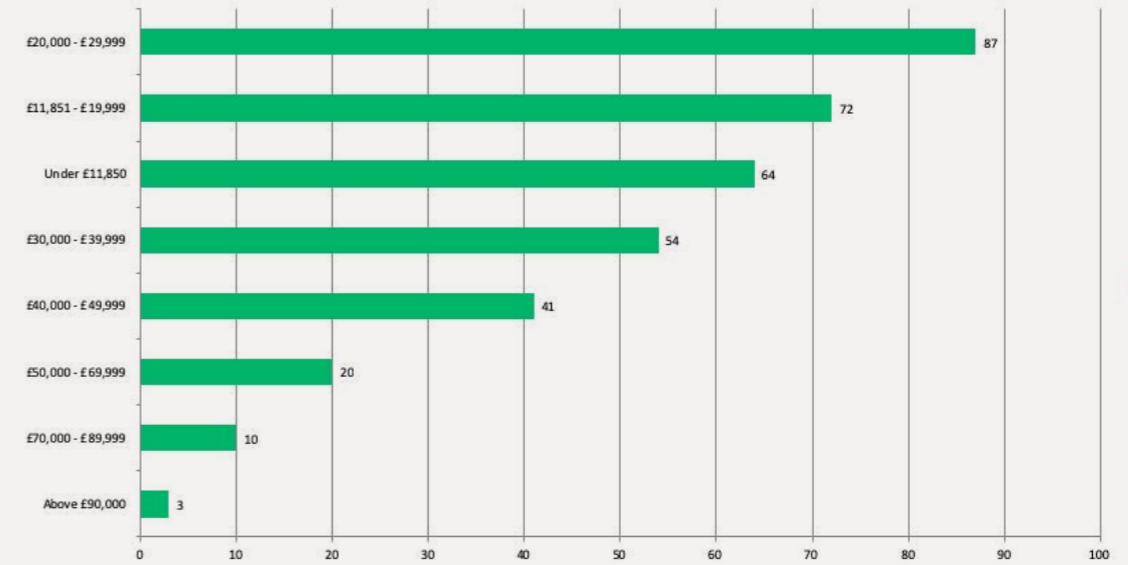


SURVEY 1

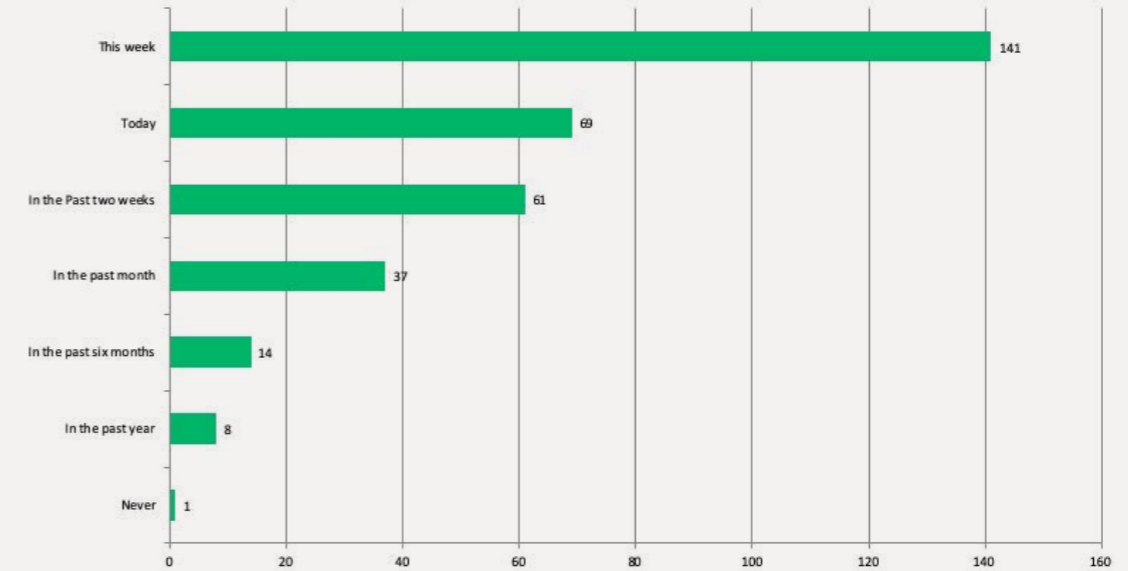
Can you tell us what shared services or products you have used in the past?



What is your income level

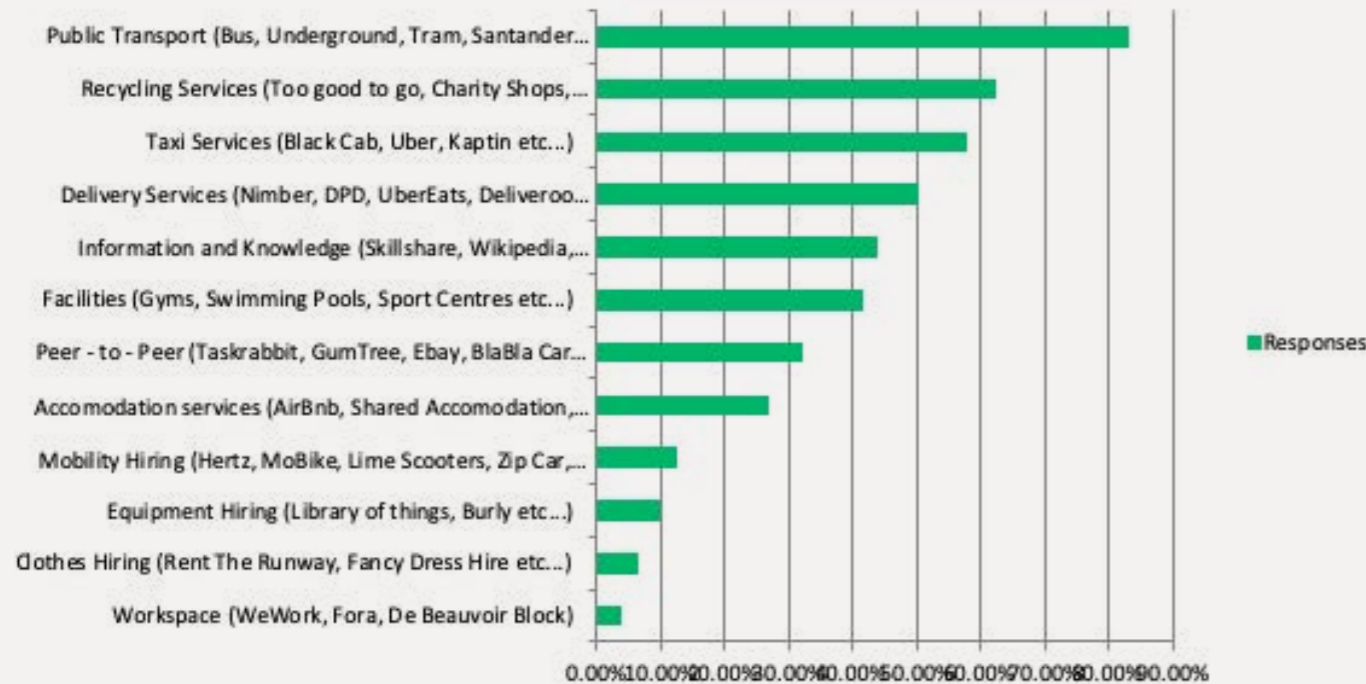


When was the last time you used a sharing service or product?

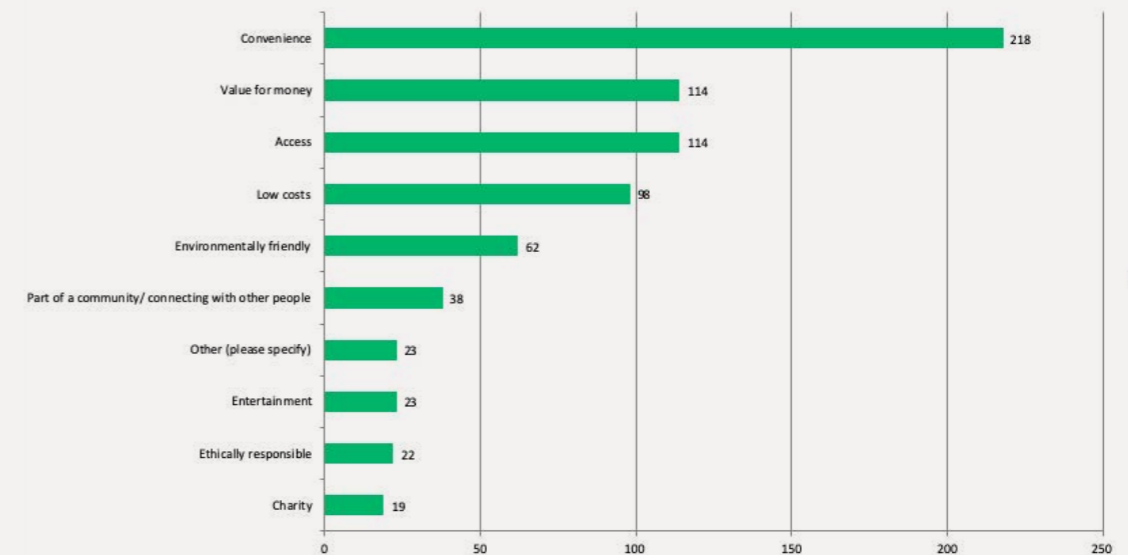


SURVEY 2

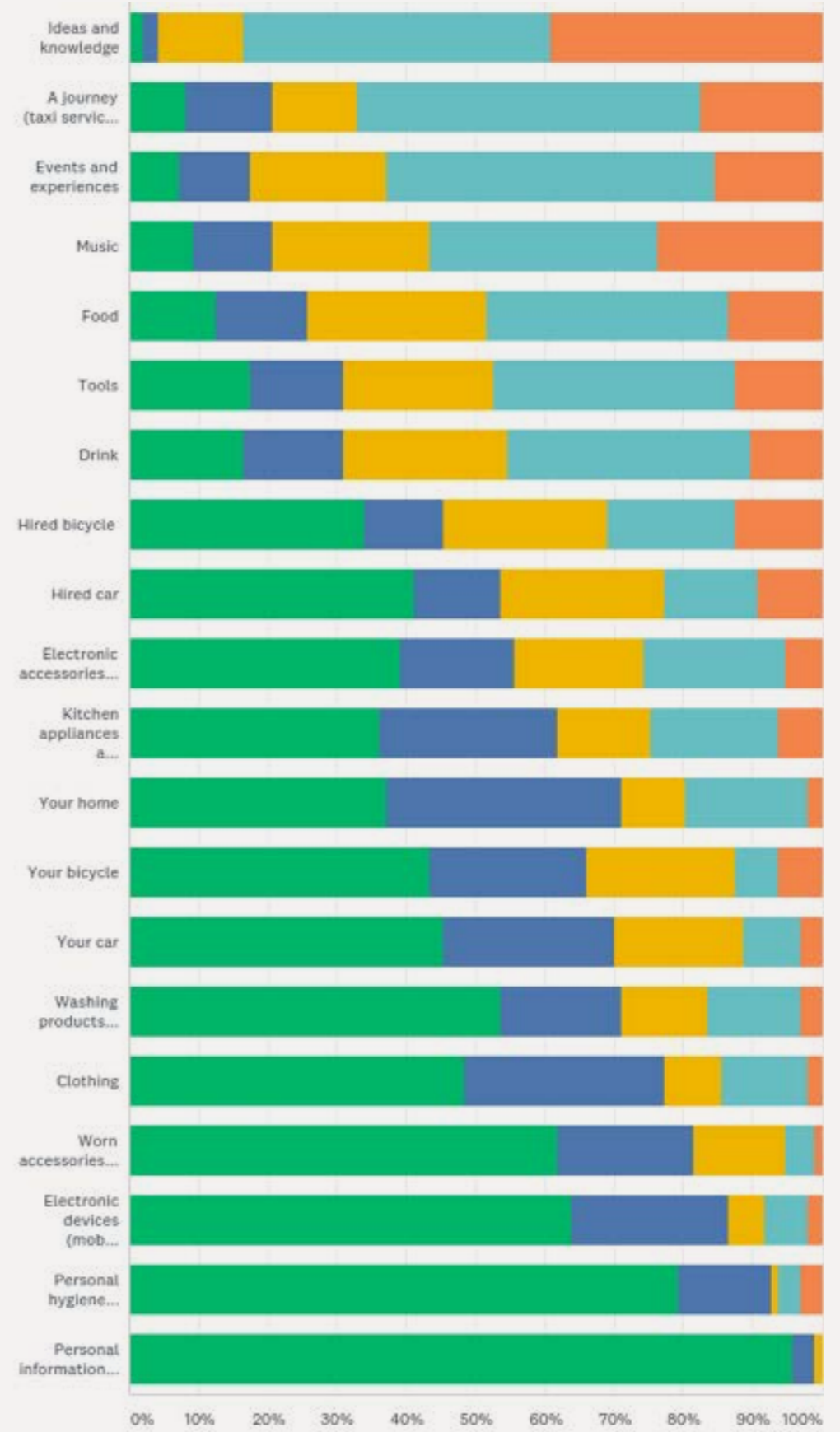
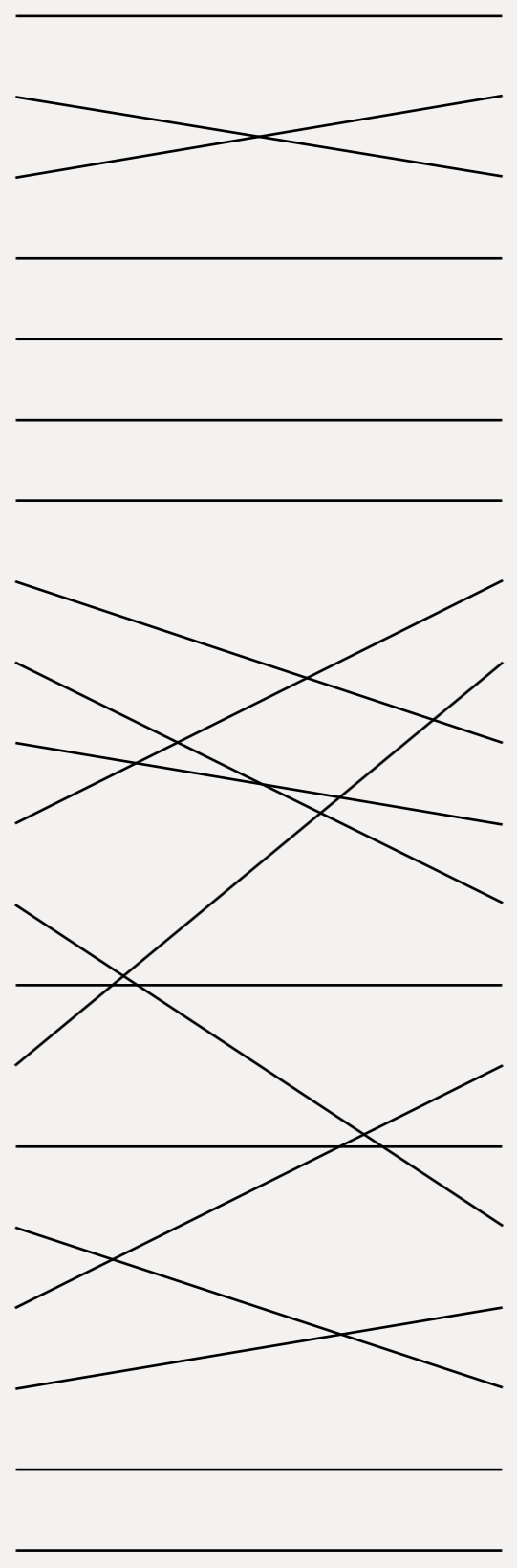
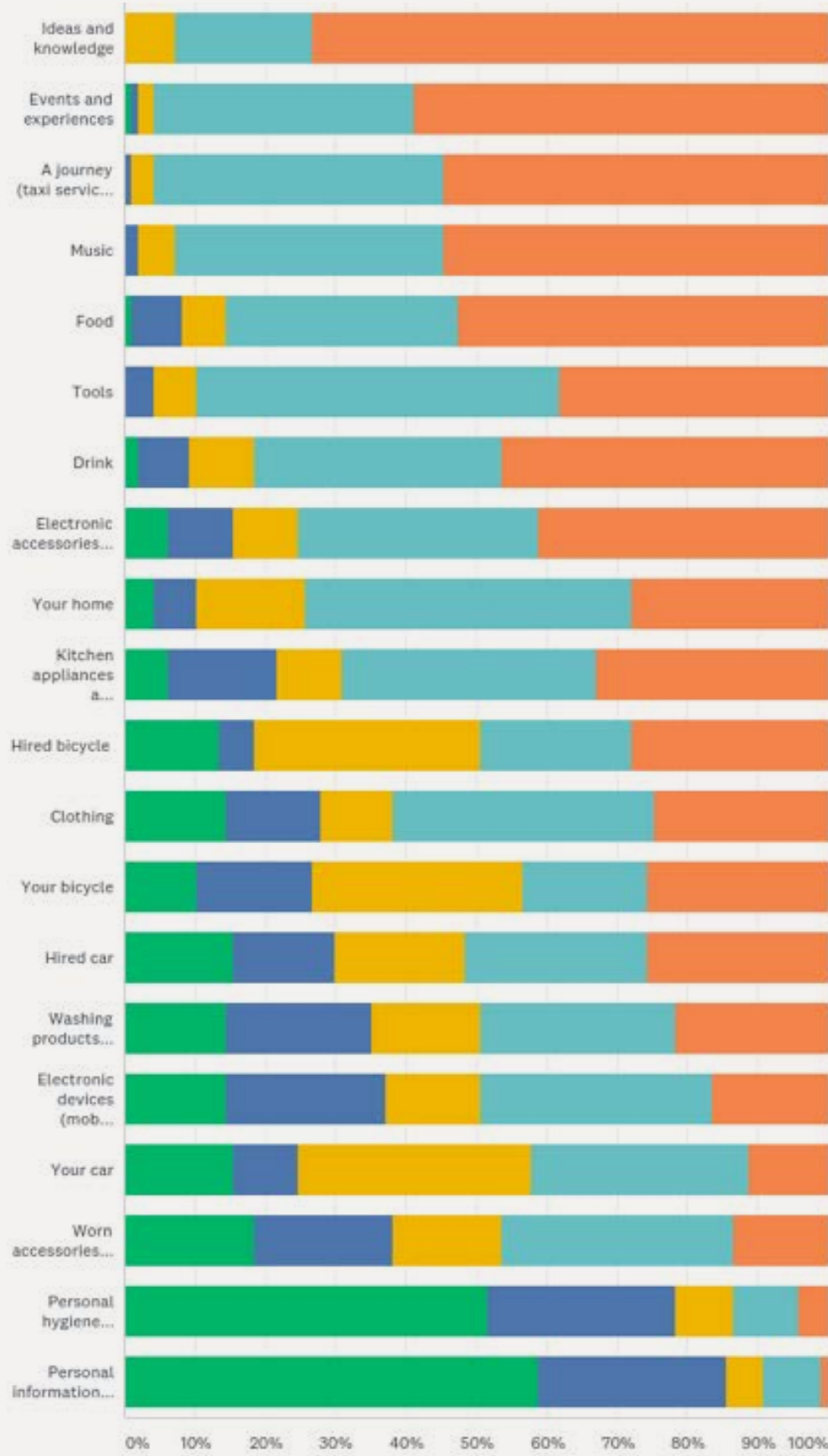
Can you tell us what shared services or products you have used in the past?



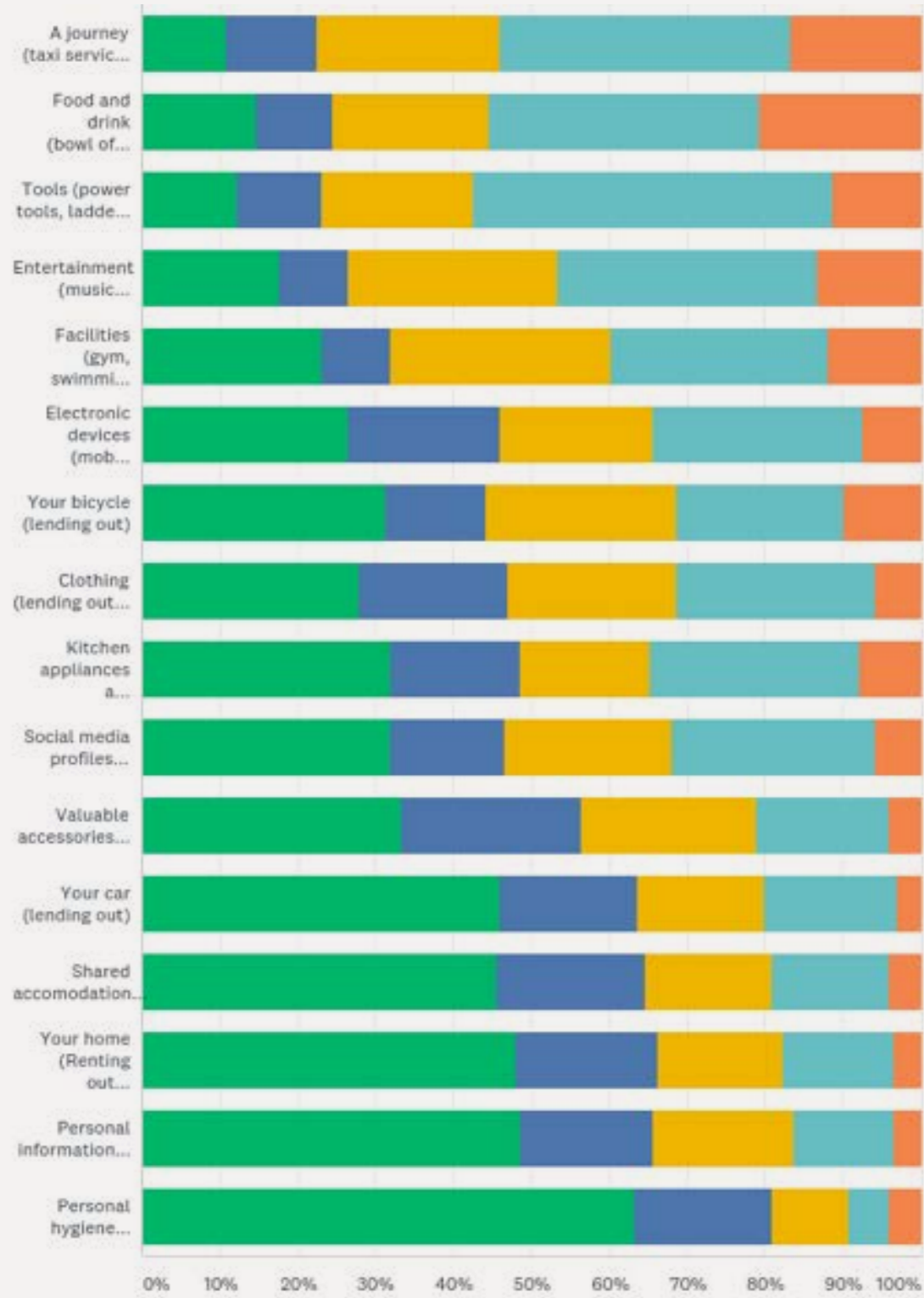
What was the main motivation for you to use this service or product?



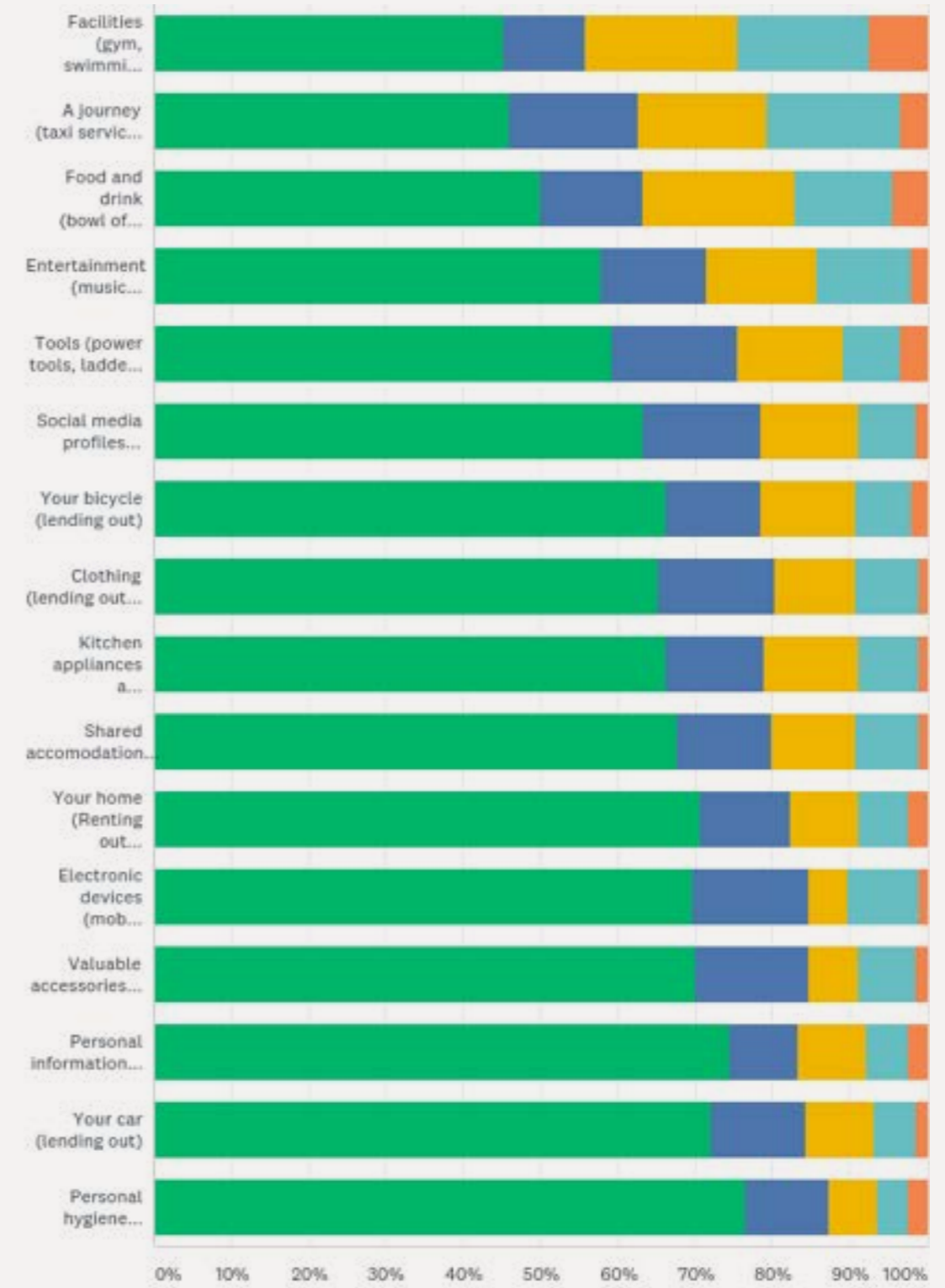
SURVEY 1



SURVEY 2

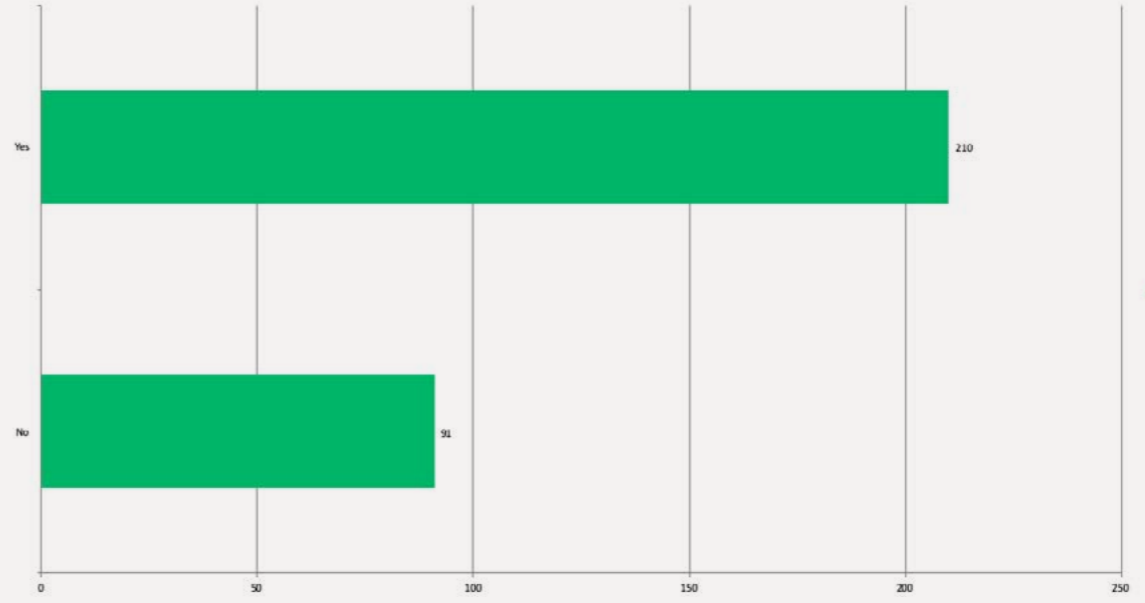


Very unlikely Unlikely Neither likely or unlikely Likely Very Likely

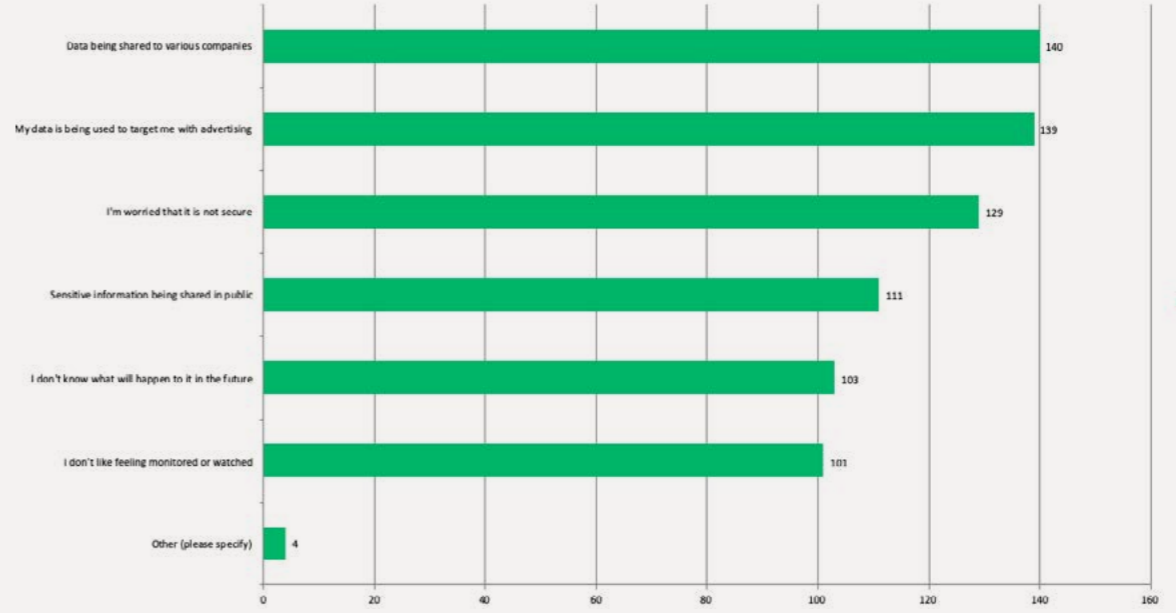


Very unlikely Unlikely Neither likely or unlikely Likely Very Likely

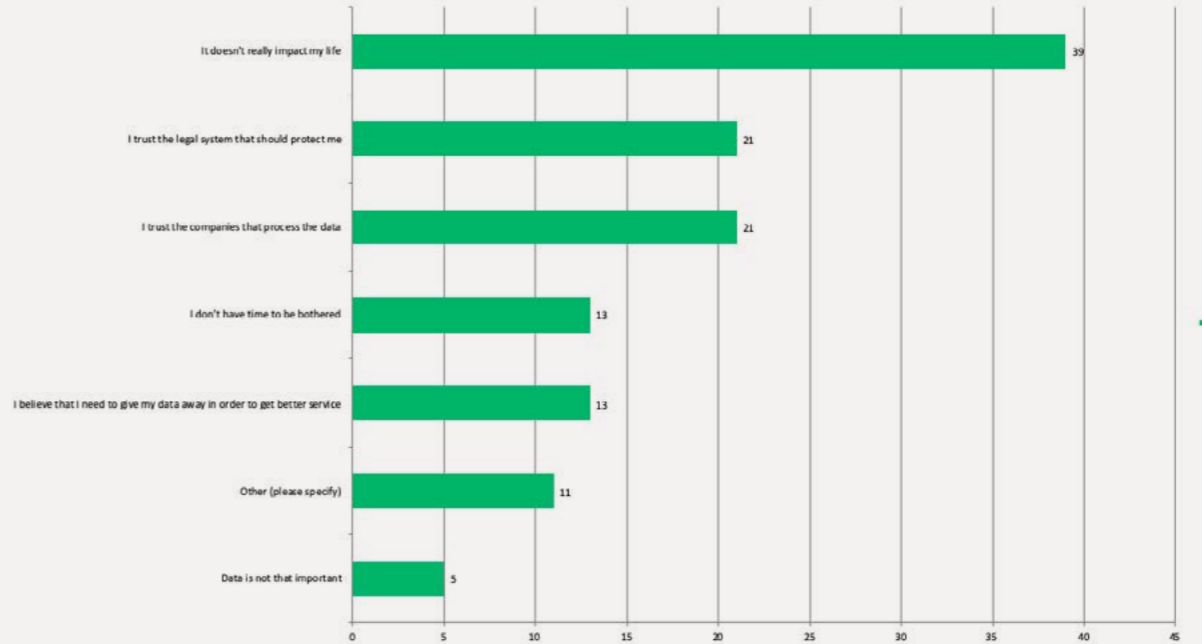
Do you ever worry about your personal data when using sharing services such as Uber, Airbnb, Skillshare, Taskrabbit etc?



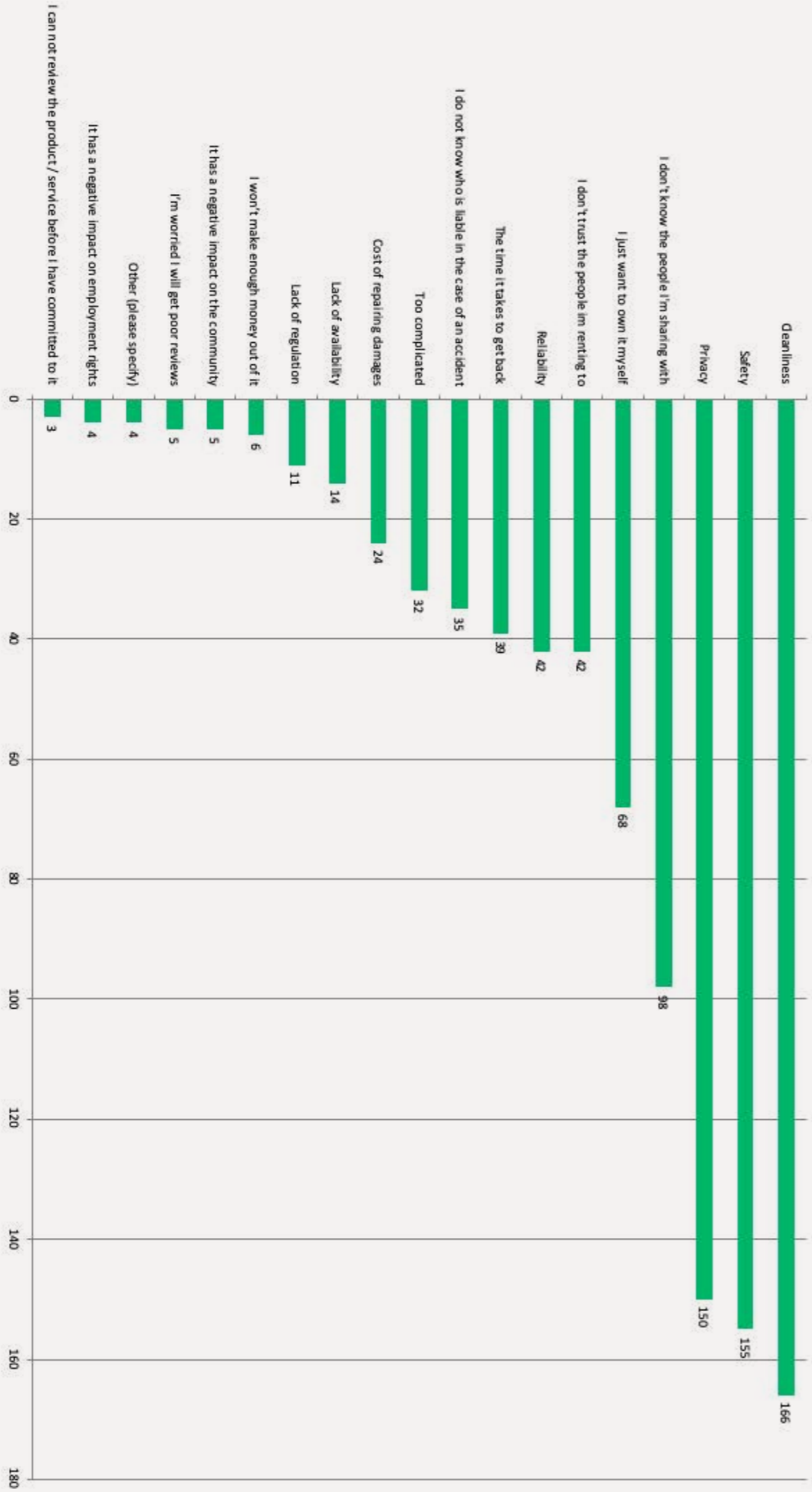
Why are you worried?



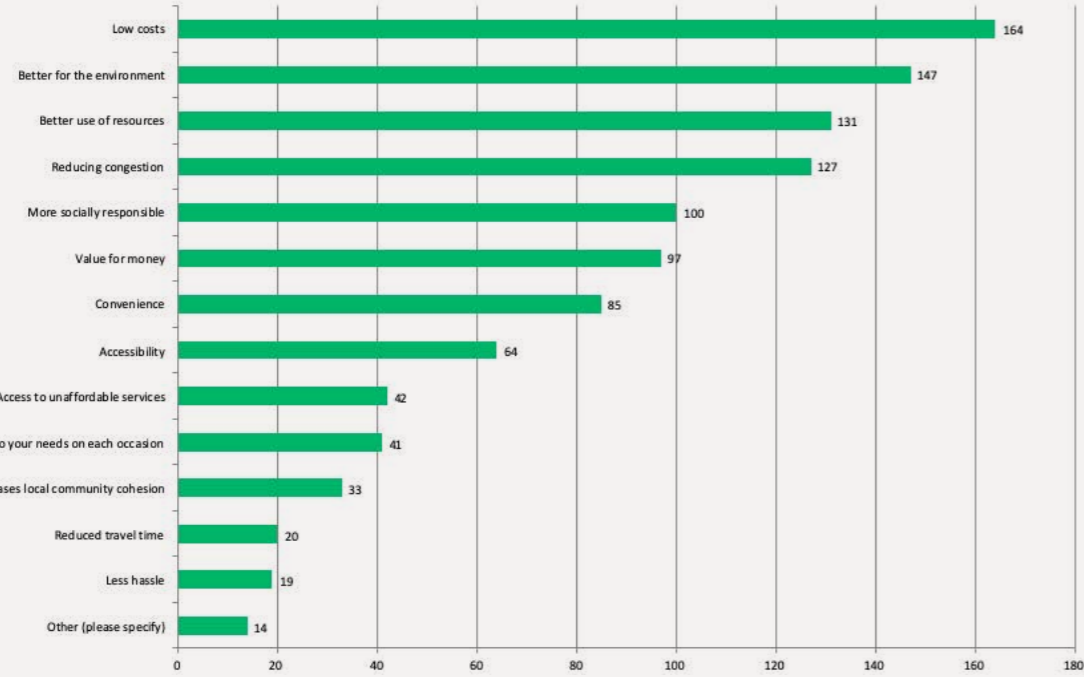
Why are you not worried?



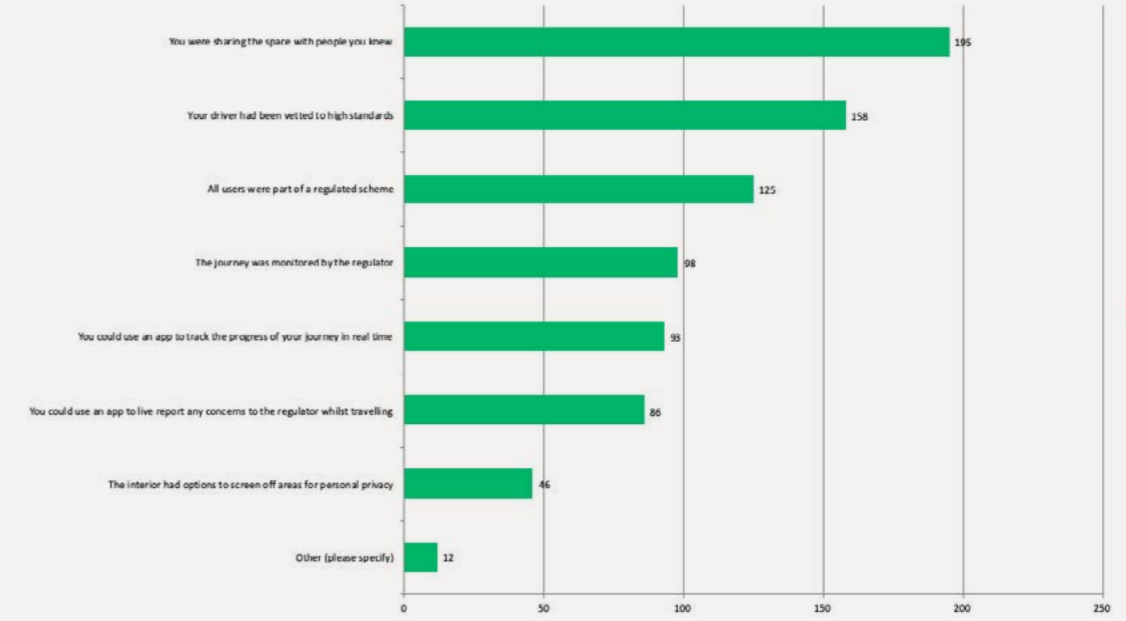
What are the top 3 barriers preventing you from wanting to share the possession(s) identified in question 11 & 12?



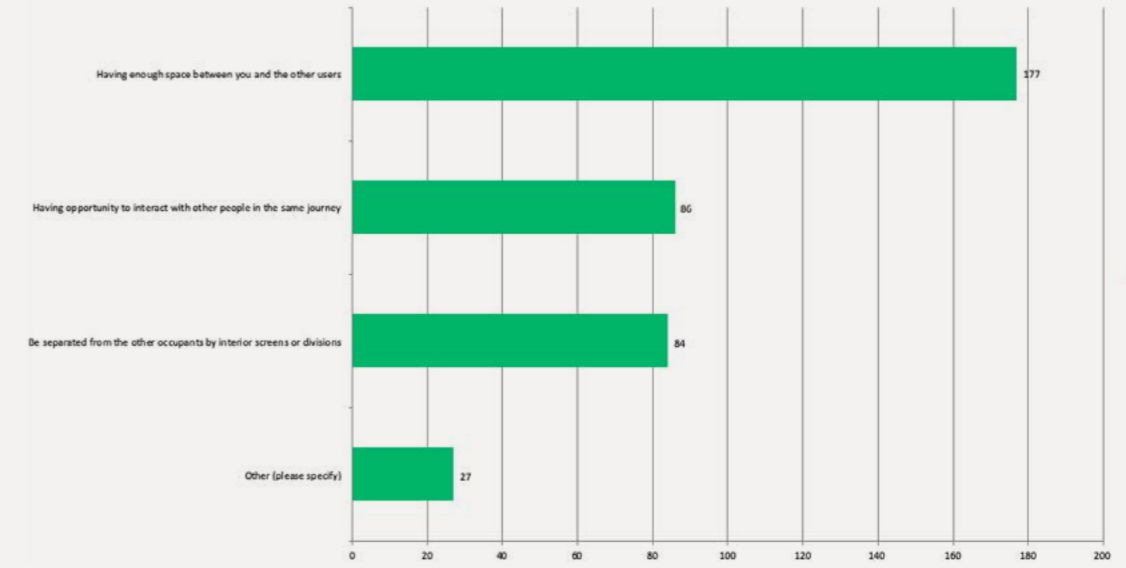
What key benefits do you perceive the vehicle/ride-sharing schemes have?



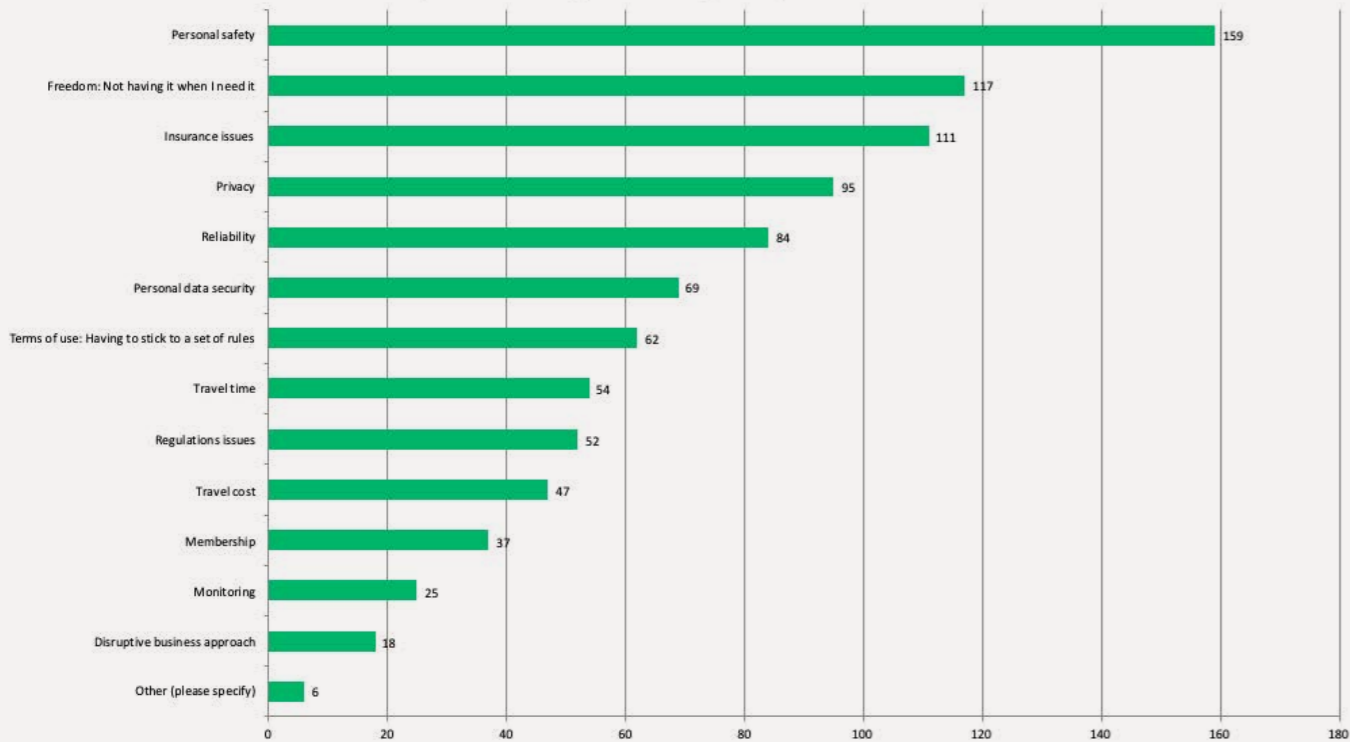
Would you trust using a shared vehicle if:



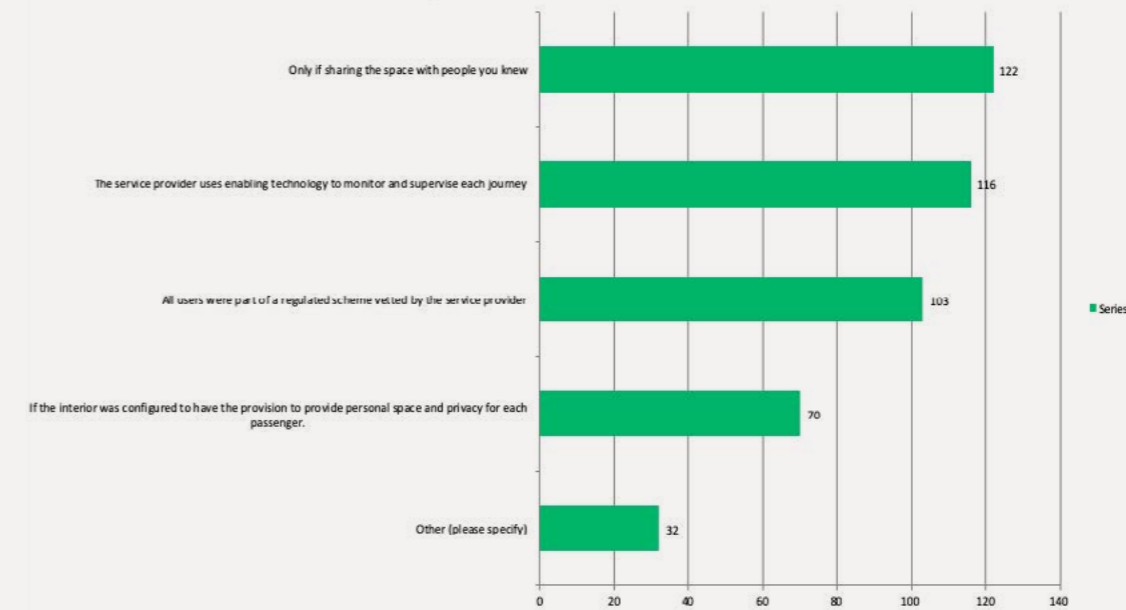
Under what circumstances would you feel comfortable using a shared vehicle if you didn't know the other users:



What key concerns do you have regarding shared vehicle schemes?



Would you trust a shared autonomous vehicle?



RESEARCH TEAM AND ACKNOWLEDGEMENT

The MORPH core research team includes Dr. Jiayu Wu, Dr. Sheila Clark, Ashley Kennard, Daniel Quinlan, Katrine Hesseldahl and Sam Johnson. The service designers are Hyojin Bae and Nayoon Lee. The concept designers are Patryk Musielak (NANO), YoungJae Kim (MOSEY), Jiaheng Wei (ENROUTE) and Dinesh Raman (SPARE**VROOM**).

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