

EMOTIONAL**TECH**



Royal College of Art
**INTELLIGENT MOBILITY
DESIGN CENTRE**

Intelligent Mobility Design Centre.

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Foreword

It would be hard not to know that we are witnessing a shift in the perception and design of vehicles; first as products, then as elements of a service, and now as an aspect of the complete mobility experience. Or that this transformation has been driven, in part, by the invention and adoption of technologies and applications such as artificial intelligence, open data, autonomous navigation, high-speed telephony and integrated personal devices.

What can the RCA – the world's leading art and design university – contribute to the imminent arrival of intelligent and autonomous mobility? You may well ask...

We believe that the future of intelligent mobility isn't just about design or about technology; it is about technology, design, people and culture, combined. Our design-led approach is key to unlocking this new technology for both autonomous and intelligent mobility. We recognise the importance of design intelligence (cumulatively historical precedent, philosophies and

methodologies), to represent why design is fundamentally different from engineering or technological development, and what it can bring to the table. We know that design can unpack the challenges and opportunities of new technologies and pull all the strands of enquiry together, demonstrating that it's not just technological advances but how they are applied that matters.

At the RCA, we work in a creative space in which we experiment, test, understand and interpret: it's creative leadership in a design research and development space, based on user experience. We know the technology to develop autonomous vehicles is on the horizon, and our research shows that the challenges are not with the technologies themselves (people can adopt technologies, as evidenced by the success of smartphones) but with the understanding of how people will work with new innovations, the sorts of products and services that will arrive from them, and whether the technology will be adopted by all sectors of the population.

In a sector where attention has been focused for decades on brand, the focus has shifted to technology. Increasingly industry needs to understand both the creative space and the design intelligence that drives innovation as a key to survival in a world where traditional product development models are being disrupted by the pace of technological change. But we recognise that intelligent mobility isn't just about the automotive industry, it is about transport in the broadest sense, including people and goods, the built environment, and how planning and policy address the shift in mobility.

In the field of automotive design, the RCA has delivered the world's leading programme, working with industry and policymakers, for over 30 years – training the designers of the future. The 35 alumni design directors in global mobility corporations from Jaguar Landrover, Volvo, BMW, Audio Group to Rolls Royce and Bentley are testament to the relevance of our knowledge and experience. The RCA is the only art and design university involved in government-backed UK trials of this imminent

technological change towards intelligent mobility, which will affect all our lives.

The new concepts of mobility services that have been imagined and tested – including vehicle-sharing, high-speed urban commuting and robotic delivery – interface with changing attitudes and expectations on the part of users. For them, the adoption of any particular mode of transport depends on affordability, driving experience, style, personalisation, comfort, privacy and utility. There are some areas of particular sensitivity, such as the future of shared transport – and the extent to which will people can be persuaded to forsake their private cars. So intelligent mobility is not without consequences. The UK car industry alone employs 170,000 people and delivers 4% of GDP, which means that the effects of disrupting that economic model have implications far beyond the sector. For us, it's also about exploring the wider implications of a technological product: city planning, architecture, leisure spaces, healthcare provision are all within the compass of these developments.

Intelligent Mobility Design Centre

The future of intelligent mobility at the RCA is embodied in the Intelligent Mobility Design Centre (IMDC), addressing the challenges posed by autonomous mobility and the shift in mobility. The RCA will be working at the centre of manufacturers and technologists who need to understand the dramatic changes in the industry.

This requires a multidisciplinary approach to innovation-led progress, working across design disciplines with technologists, engineers, the automotive industry, the built environment sector and government agencies to research and design the challenges and opportunities for intelligent mobility across all of these sectors. Future partners will be companies that need to understand the cultural change around the technological innovation.

IMDC will provide insights and real data about human culture and behaviours, desires, wants and needs that are crucial to future mobility developments. This is the uniqueness of the centre, and its

understanding of people and culture. In doing this, it will harness the whole College in its research and project work, as one in a network of centres that support each other and work collaboratively across intelligent mobility, material futures, inclusive design and robotics within the context of the world's leading art and design university.



Intelligent Mobility

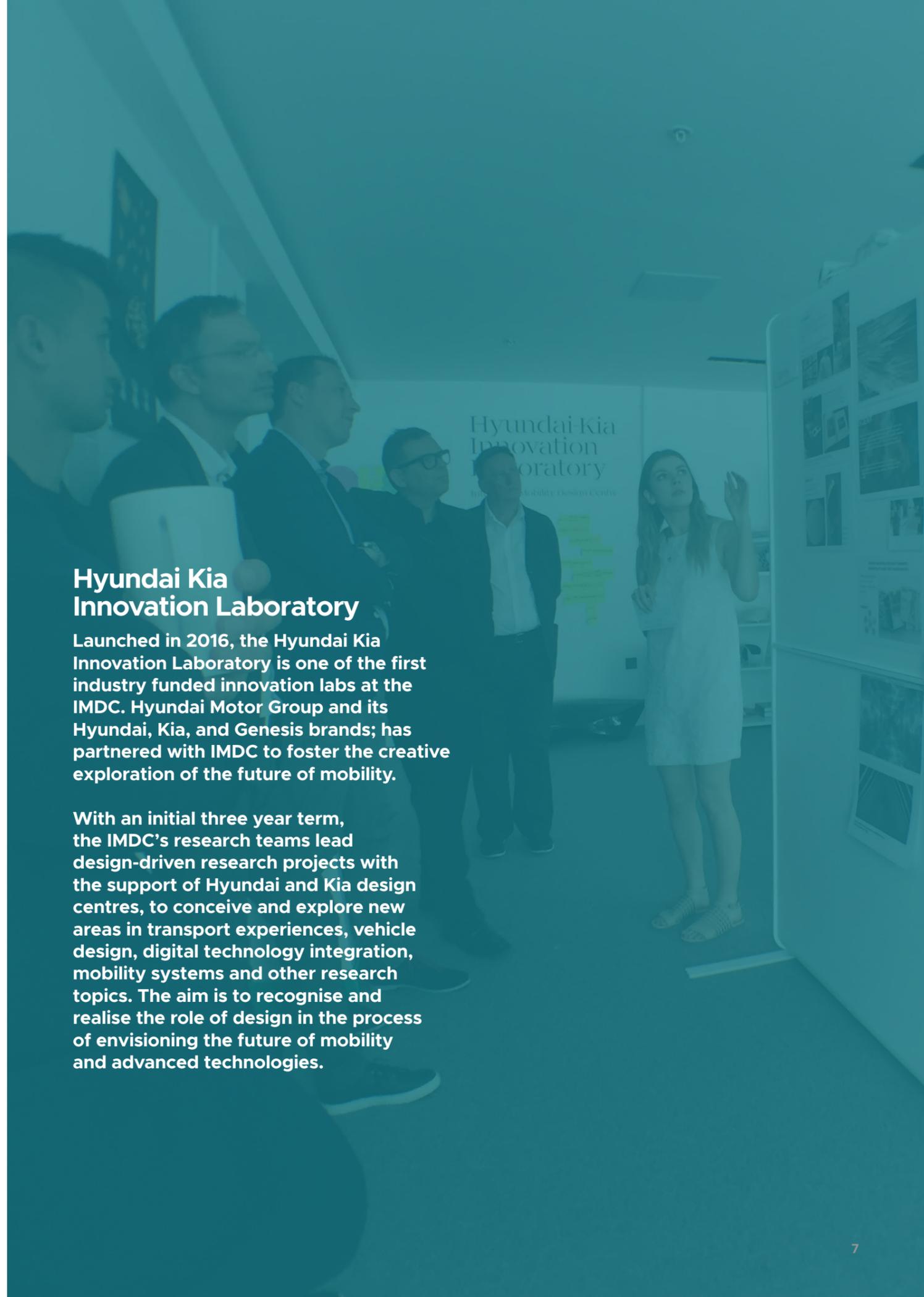
Professor Dale Harrow

Director of the Intelligent Mobility Design Centre

Hyundai Kia Innovation Laboratory

Launched in 2016, the Hyundai Kia Innovation Laboratory is one of the first industry funded innovation labs at the IMDC. Hyundai Motor Group and its Hyundai, Kia, and Genesis brands; has partnered with IMDC to foster the creative exploration of the future of mobility.

With an initial three year term, the IMDC's research teams lead design-driven research projects with the support of Hyundai and Kia design centres, to conceive and explore new areas in transport experiences, vehicle design, digital technology integration, mobility systems and other research topics. The aim is to recognise and realise the role of design in the process of envisioning the future of mobility and advanced technologies.



Emotion People Technology

The Emotional Tech project applies emotional design as a research approach for investigating how people feel about state of the art and new emerging mobility technologies. How technology influences people at an emotional level and what factors can be improved in the design process has received little research attention and been rarely implemented in urban mobility. We explored the interactions and experiences of people and vehicles from the perspective of 'emotions as affective artefacts'¹ which tackles 'emotion' as a conduit to help with problem-solving, decision-making and sense-making. Users generate emotion as a way to minimise errors, interpret functionality, or obtain relief from the complexity of a task.

The study focuses on subtle details of people's emotional transitions during, before and after journeys, and during long term use of mobility services. The

researchers, designers and electronic engineers worked together to create concepts exploring what innovation opportunities could be applied to bring cutting edge technologies into real world use. Emotional design as an important human-centred design approach has been used to create interactions between designers and users' through the design process, which strongly influences the outcome of the study.

The research direction reflects on future market change, targeting current tangible problems and real users. The results will inspire technological innovations in production and manufacturing and create new services to fit the current market niche and user experience demands.

¹ Frank Spillers, 2004. Emotion as a cognitive artifact and the design implications for products that are perceived as pleasurable. Experience Dynamics. USA.

The critical user scenarios include moving from an anxious state to relief the first time driving an unfamiliar car, settling into the car for an upcoming long journey, and an engaging service model to enable people to change vehicle parts and materials after purchase.

The project is design-led research that uses inclusive design methodologies as well as visualisation and prototyping skills to generate, test, verify and rectify the innovative concepts, encouraging user engagement in the ideation and feedback processes. In this project, 'Design' is mainly represented as tools to demonstrate the potential innovation opportunities with realised user needs instead of drawing a finished vehicle concept. Three concept demos were produced to capture stakeholders and users' feedback. Once the feedback was collected the designers worked on developing the user experiences for each of the concepts. In conclusion we delivered three videos to demonstrate optimised experience designs for real world use, focusing on the topics

Pre-journey Preparation, Journey and Time Perceiving, and Circular Vehicle Upgrading.

In the next chapters, we are going to unpack our research process and show our design results as follows:

- **Chapter 1 Technologies and Interactions, Mobility Scenarios and Emotions** explains why we started considering a project linking emotion and technology.
- **Chapter 2 Ritual, Experience and Emotion** discusses why we started focusing on rituals in transport scenarios and what we mean by vehicle related rituals.
- **Chapter 3 and 4 User' Insights** shows the findings from telephone interviews we conducted to investigate what people think about transport related rituals and what the rituals mean to them.

- **Chapter 5 Enactment Workshops Around Mobility Rituals** summarises the initial findings from our workshops with car users and the definition of key ritualistic vehicle scenarios.
- **Chapter 6 and 7 Designing Ritualistic Mobility Experiences** describes how we came up with specific ritualistic vehicle scenarios that allowed the designers to play with and create novel ideas, as well as the three focused concepts delivered from the ideation session.
- **Chapter 8, 9 and 10 User Study and Design Inspirations** elaborates on the findings from the follow-up user studies after the initial defined design concepts, these user studies offer evidence to the designers to help them clearly understand users' demands under specific circumstances. This process is critical for designers when they are going to deliver a real world application.

- **Chapter 11 Potential Research And Design Opportunities** paints a picture of future potential project directions according to the research findings.

You can find useful workshop tools and our published paper about defining ritualistic driver and passenger behaviours in the **Appendix**.

You can find our video content and an overview of the project at emotionaltech.rca.ac.uk

1.

Technology and Interactions, Mobility Scenarios and Emotions

We explored the topics: Emotion, Smart technology and Mobility. We wanted to find design opportunities for applying technology in everyday transport. We looked at several areas including digital ownership, human-machine interaction and the mobility manufacturing trend moving from vehicle making to service creation.

We considered areas such as wellbeing; happiness and commuting; infrastructure topics such as hyperlinked cities; first and last mile issues; social concerns such as population growth and future unemployment. We observed how products are made using existing and emerging technologies. And we explored how to satisfy users' demands and fulfil their expectations using emerging technologies.



Workshop with
Hyundai Motor Group



1999

AIBO
Entertainment robot, with speech recognition and vision. It can interact with people triggering emotions. The new model in 2017 has been proven to be capable of forming an emotional bond with users



2000

ASIMO
Human assistant with basic movements, functions and voice responses. Human emotions could be generated when people interact with it



2001

MINI COOPER
The dashboard design gives a sense of joy



2005

GOOGLE MAPS
Journey planner which has greatly enhanced people's journey planning experiences



2010

RENAULT DESIGN STRATEGY
Renault separated its range into more emotive segments rather than vehicle types; designing around the themes of love, family, exploration, play, work and wisdom



2011

EMOTIV
Brain measuring and control technology for measuring people's emotions



2011

NEST
Self-learning thermostat that connects personal devices with home temperature and security



2011

SIRI
Personal voice assistant with gender options and amusing responses



2013

TOYOTA FV2
Conceptual vehicle designed to read the driver's emotions in order to create a physical and emotional connection



2013

GOOGLE GLASS
Personal assistant allowing hand-free activities



2015

APPLE WATCH
Personal device that incorporates fitness tracking and health monitoring



2016

UNI-CUB
Seating assistant and personal mobility device, which enables free movement similar to walking



2016

SEMCON SMILING CAR
Autonomous concept car that communicates safety information to pedestrians



2017

HONDA ROBOTICS
Concept robot for moving people and things that is designed to express non-threatening emotions



2017

HONDA NEUV
Uses an 'emotion engine' to detect the emotion behind the driver's judgements



2017

OLLY HOME ROBOT
Home robot with personality, which understands the user's emotions and adapts to the world around it



2017

AMAZON ALEXA
Personal assistant with functions such as voice interaction, making to-do lists and others



2017

SIDEWALK LABS
Google's smart city concept aims to have a constant flow of data to enable the optimisation of services

To understand product developments in relation to Emotion, Smart technology and Mobility we created a timeline illustrating them. It shows the role of technology as an influencer to products and mobility, as well as how these support our daily lives. Emotion has been considered in the design process, transferring the focus from styling to seeking to create an emotional bond between the user and the device.

Timeline shows products using 'smart technology' and some with 'emotions' considered in the product development, fundamentally they are all technology driven



Key words from the workshop with Hyundai Motor Group

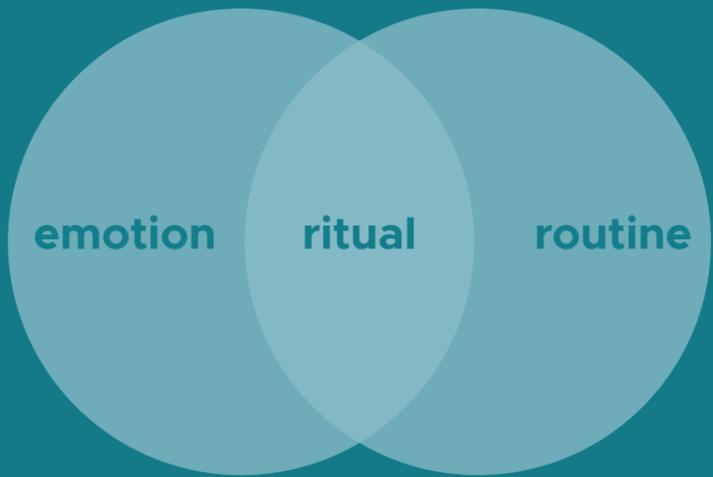
In order to collect industrial viewpoints on people, emotion and technology, we held a workshop with employees from different departments within the Hyundai Motor Group in Germany, exploring the connection between applied technologies and people's emotions, and considered how their behaviour is affected.

We looked at what daily interaction points people have with objects that have technology embedded, such as digital communication through personal devices, mobile phones or computers, making electronic payments, and pleasurable activities such as engaging through social media, watching media and listening to music amongst others. We identified negative aspects of today's vehicle related technology, for example - inefficient in-vehicle interfaces, failed communication between vehicles on highways and automatic operational corrections during driving. Based on the findings we looked at potential design opportunities to optimise user experience.



**Technology & Emotion Workshop
Hyundai Motor Group**

2.



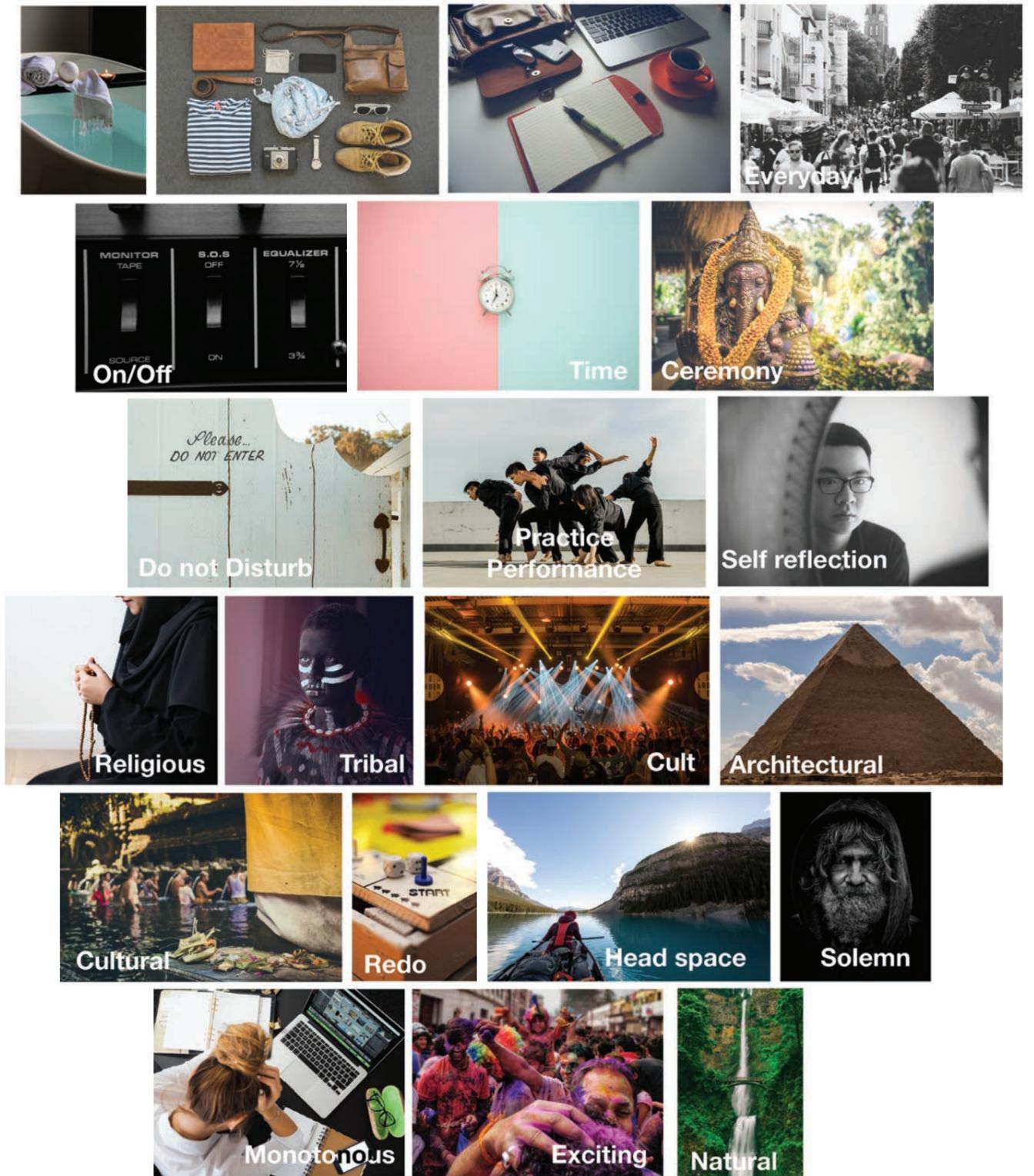
Ritual, Experience & Emotion

A strong theme that came from the workshop with the Hyundai Motor Group was rituals in daily routines. The rituals we identified are a set of fixed, meaningful actions that people use to create a sense of control and feelings of safety and comfort.

To explore the theme of rituals in daily routines we created personas and imagined these users in various transport situations. We detailed what actions we thought people might do, why, and what they might mean to them. Many rituals centred around entertainment, communication, safety, comfort, creating memories with friends or family and placing of possessions, beverages and food. The diagram opposite (*research teams definition of what makes a ritual*) is an outcome of our research into what makes a ritual.

We visualised people in different transportation scenarios (walking, cycling, driving, and using public transport) as a way to scope for possible concerns people may have, as well as rituals they

may adopt or perform in response to their vehicle's environment. By envisaging the preparations that individuals, couples, families and groups may make before travelling - checking weather forecasts, routes, and transport information updates also making sure that personal effects, consumables and entertainment are organised - we realised this was a way for people to be informed, plan for unexpected events and take control. For example, parents would be concerned with ensuring that children were ready to travel and safely secure in the car, with snacks and entertainment to keep them occupied.



Moodboard
Exploring the characteristics and meanings of rituals

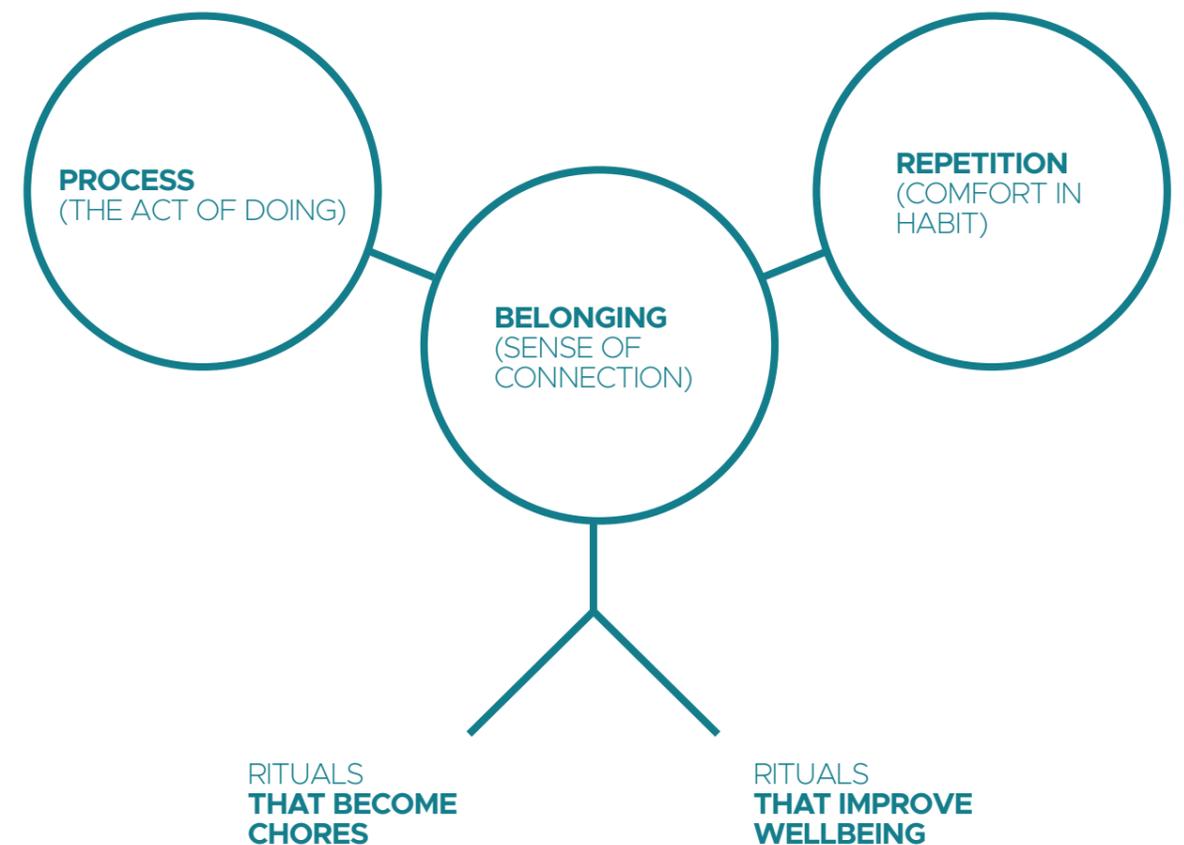
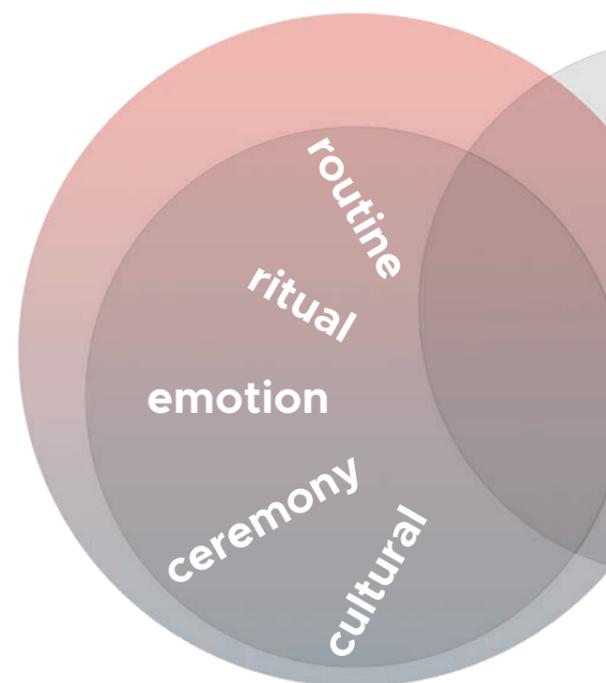
“ **Ritual:**
alleviates human
anxiety¹ ”

“ ...rituals help
people understand
the world, cope
with transitions,
express strong
emotions and build
their own life story² ”

Rituals have meaning attached to them; performing a sequence of actions helps people to deal with change, focus in the moment and feel reassured, subsequently reducing feelings of anxiety or stress.

Ritualistic behaviour in relation to transport use seems to be an important factor in establishing trust between the user and the mode of travelling. In many scenarios when people feel a loss of control it is because there is no two-way communication between the machine and humans.

In summary the ritualistic driving experiences we define in our research are repeated, symbolic, meaningful behaviour or performance to aid emotional transition, reduce stress, refresh and reset the mind.

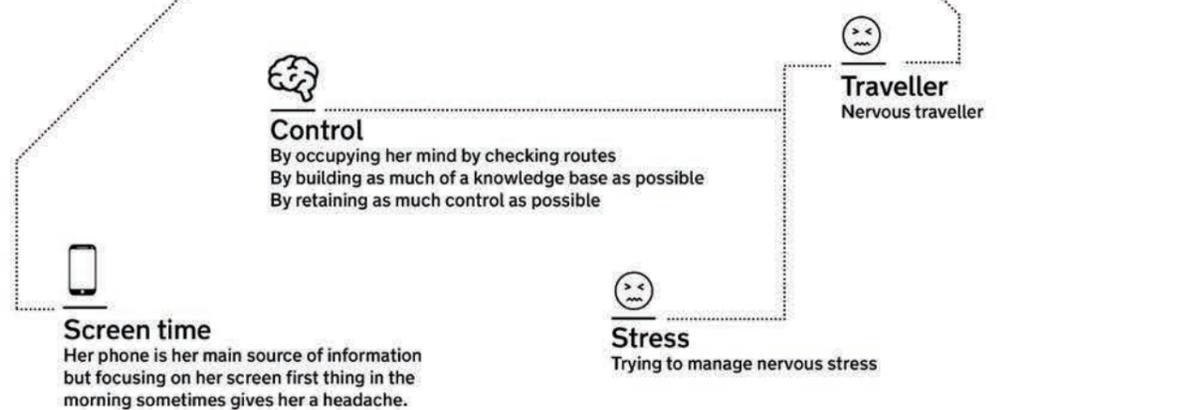


IMDC's definition of rituals
The circles represent key elements that make up rituals;
these can either feel like chores or improve wellbeing

1 Bronislaw Malinowski. 2013. Magic, science and religion and other essays. Read Books Ltd.

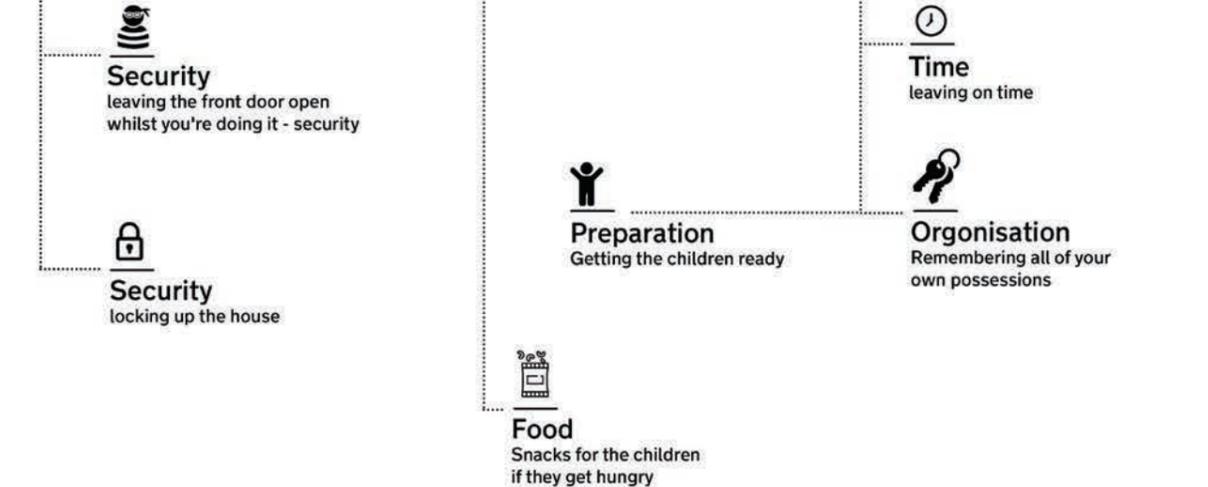
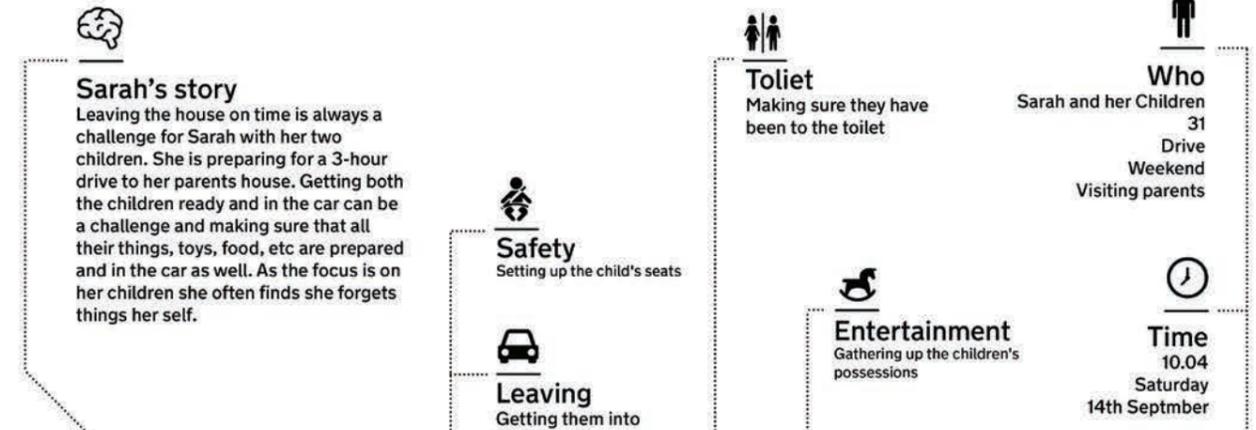
2 Kursat Ozenc and Margaret Hagan. 2014. Ritual Design Lab. Retrieved August 10, 2018 from <https://ritualdesignlab.org/>

01// Before you travel



*User-type scenarios
Based on real world journeys*

02// Family travel



*User-type scenarios
Based on real world journeys*

03// Travelling to work



David's story

David drives to work every day. He lives in a suburb where the transport network is good. But he likes to drive in the morning as it offers him time to build himself up before work. Between home and work is one few times of the day he has to himself. Being a confident driver, he uses the journey to prepare himself for the day ahead or even daydreams.



Religion

Charm or religious icon for protection and safety



Air freshener

Clean space



Who

David
37
Drive
Every weekday
Travels from home to work



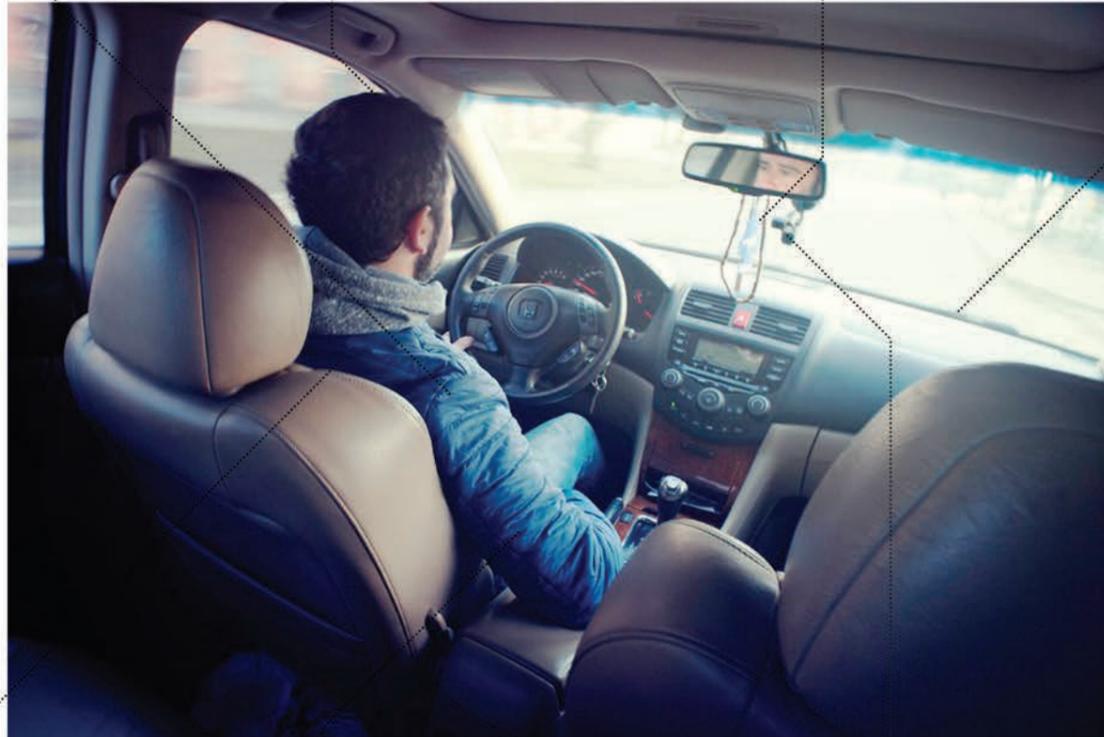
Time

07:13
Wednesday
2nd October



Focus

Focusing on driving - no distractions.
Preparing for the day ahead.



Short journey

Short journey to work. no need to take a jacket off.



Seating position - relaxed.
One hand on the wheel



Personal space

Driving is time alone is used as a part of his routine. Family pressures mean he gets little time to himself as a result likes driving alone.



Music

Radio on in the background. Helps motivate him for his day ahead and helps wake up in the morning.



Navigation

SATNAV not in use because he knows the route off by heart



Headspace

Space to have some freedom



Protection

Safe / protected - personal space

*User-type scenarios
Based on real world journeys*

04// Tempory shared space



Ian's story

Ian has just arrived at the train station for a business meeting. His train was delayed and he has already had to push back the meeting. He's stressed that he won't make the revised time and does not want to be embarrassed. To help him relieve the pressure he tries to assist the driver in navigating the city. He knows this city well and knows that the rideshare apps often use slower routes.



Navigation

Using a phone to get secondary information to suggest other routes to the driver.



Time

Managing time
Having a rush



Traffic

Stress levels caused by traffic, lateness, or poor directions



Alternative routes

Considering other transport options. Trust needs to be built across a journey.



Who

Ian
63
Being Driven
One-off
Travelling to meeting



Time

10:37
Monday
4th August



Giving directions

Taking Control



Passenger control

lights
temperature
seat belt
seats
charger
music
navigation
driver



Ownership

transferred digitally when a passenger is invited into the car?



Ownership

transferred when a passenger is welcomed and details are confirmed by the driver?



Ownership

transferred when payment commitment is made?



Driver

Multi tasking; concentrating road, passenger's directives, driving



Trust

comfortable having a stranger in you're space

*User-type scenarios
Based on real world journeys*

05// Travelling home



June's story

June has been meeting some friends for a drink after work. Her start of the week has been much busier than expected and her boss has given her an extra deadline that needs to be completed. She didn't want to cancel meeting her friends as she doesn't want to feel like her work is ruling her life, so she has been for a drink even though she probably should rest after a busy couple of days. By the time it gets to 10pm she is exhausted and has to call it a night.



Sound

Most of the noise shut out using headphones



Frustrated

Tired

Wants to shut out the environment around her

Nothing of interest in the carriage



Who

Jane
28

London Underground - Piccadillyline
Every weekday
Travels from home to work



Time

22:36

Tuesday 26th March



Asleep?

Or listening attuned to the tube stop announcement



Vision

Eyes closed
light shutout

*Observation

why is she tired
How is she isolating her self?
what are the reasons for that?



Alertness

Sitting in a priority seat



Navigation

She has outsourced her travel and most of her navigation to the underground.



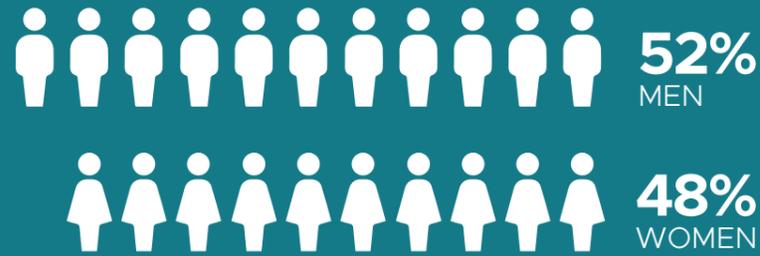
Safe

Bag held for security to make up for her eyes being closed. Other people on the tube make it harder for a thief to operate - Trust between tube users.

User-type scenarios
Based on real world journeys



3.

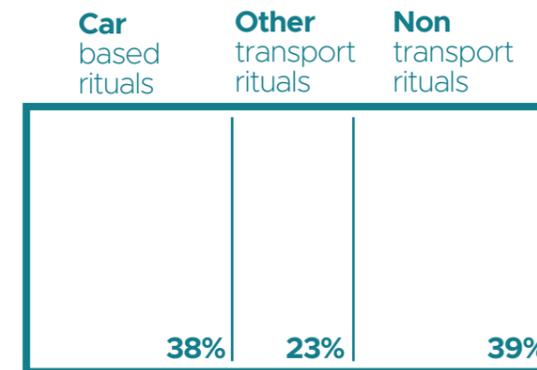
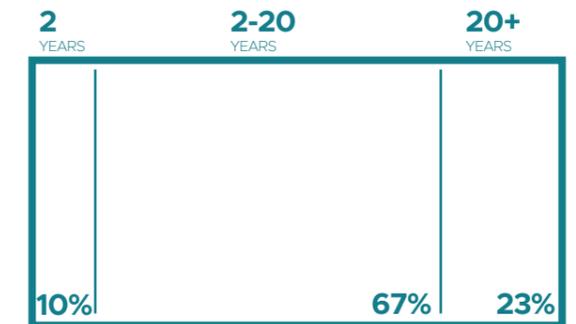
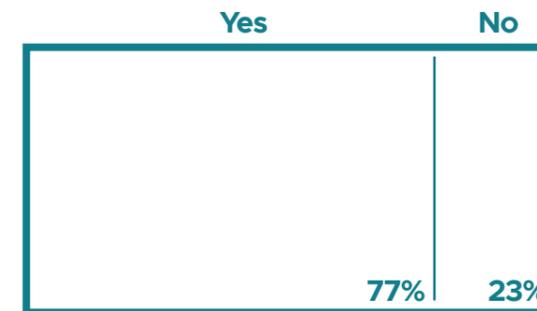
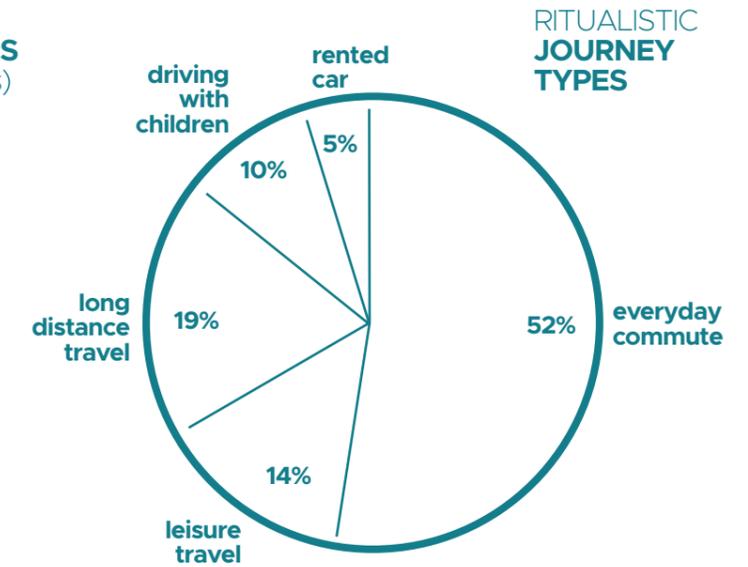
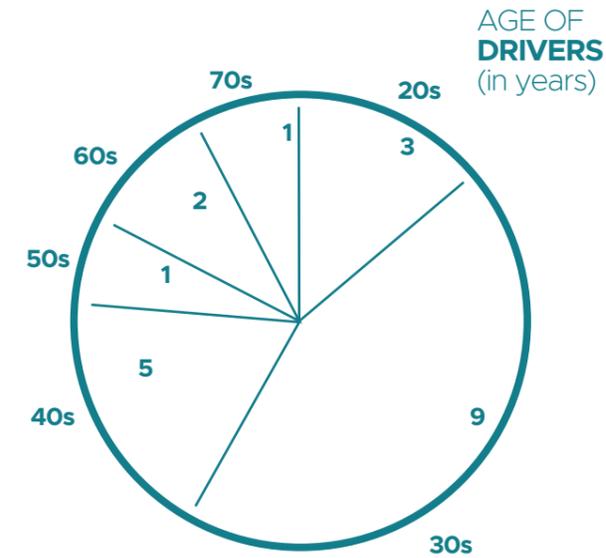


Users' Insights: Daily Transportation Habits

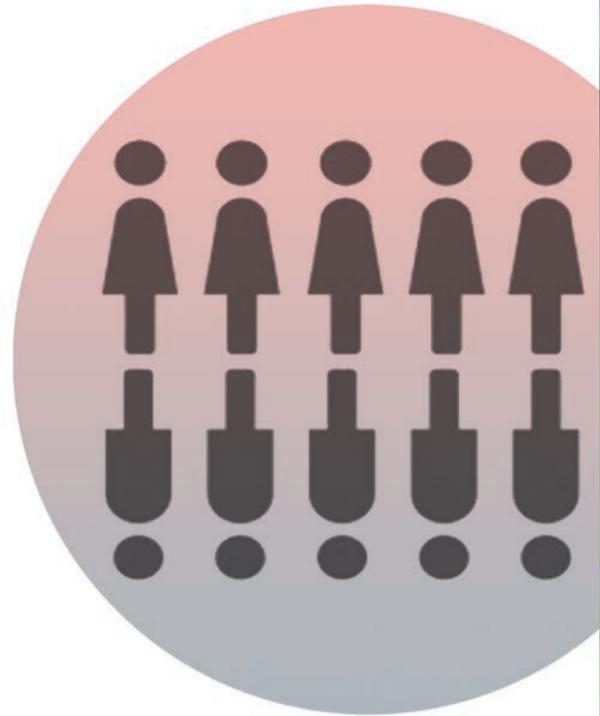
We wanted to know what rituals people perform in different transport scenarios. To gather data we conducted telephone interviews and asked people if they had any particular routines. We found common themes: Preparation and Control, Transition, Bubble space/Me time and Relationships. This corroborated what we had thought.

When we asked people about their everyday rituals we discovered who made them, what they did, where they made them and when they carried these out. We created the infographics (see illustration on the right) that shows the data we gathered.

We asked participants about their daily rituals and habits when using different methods of travel – walking, cycling, driving, and using public transport. We wanted to understand better the purpose of these rituals in relation to their everyday journeys.



Data from telephone interviews



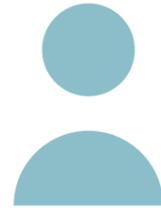
Preparation.

Pre-travel preparations were a common routine or ritual amongst travellers. Everyone we spoke to conducted some kind of sequence of actions before driving to mentally prepare and feel in control of the experience. Participants said doing these actions increased their confidence and helped create a pleasant space for passengers and themselves. People we interviewed stated that their pre-travel routines enabled them to mentally prepare, focus and build up to the start of their day.



“ I always sit in the same place on the train ”

“ I usually organise my bag for the day. I usually do it the night before. But, I always check it again before I leave ”



M.B.

M.B feels in control by checking the weather, train times, his bag and folding bike before his commute.

Daily commute: cycle and train
Duration of commute: 60 plus minutes
Age: 40s
Marital status: married with children
Occupation: project manager
Gender: male

“ I listen to music downloaded when I am on the move, door-to-door ”



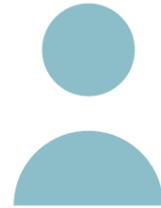
Y.R.

Transition.

When people are driving or commuting they are in the process of transitioning between places. Many viewed this time as an opportunity to gather their thoughts, decompress and psychologically prepare for arriving at their destination. For example, one commuter said she listens to music on her commute to work to uplift her mood, but is more reflective, perhaps playing podcasts, on her return journey at the end of her day. People mentioned an emotional transition that occurs during the journey both to the destination and on returning, a way of preparation for being in the next space.

Daily commute: tube
Duration of commute: 10 – 30 minutes
Age: 30s
Marital status: single
Occupation: doctor
Gender: female

“In terms of rituals it is the podcast ... that just chills me out on a drive...I get some time on my own without a toddler running around”



C.H.

Daily commute: walk, bus, car and tube

Duration of commute: 10 – 30 | 30 – 60 minutes

Age: 30s

Marital status: married with children

Occupation: child psychologist

Gender: female

Bubble Space / Me Time.

People emphasised the importance of time to themselves or me time when travelling. Some described feeling in a bubble while being in their own world in a public space. A popular way of achieving this is to listen to music on personal devices blocking out any surrounding noise. One person describes his walk to university as him being in a sound bubble as he makes the journey. Some drivers said they like to focus on driving well and derive satisfaction from this as well as enjoying their own company. Similarly, another driver said she enjoys some time on her own after driving her children to nursery allowing her to recharge.

“It is better if my children are in a good mood and having a chat. If they don't want to go to school they can create a bad mood in the car”



T.R.

Relationships.

Different social interactions are experienced by people when using public or personal transport methods. We considered the relationship vehicle owners have with their car and the social interaction they have with others whilst driving. Those with families said that in-car time created space for them and their children.

Daily commute: car/taxi

Duration of commute: 60 plus minutes

Age: 40s

Marital status: married with children

Occupation: taxi driver

Gender: male

4.

Users' Insights - Driving and Passenger Related Rituals

To better understand driver and passenger associated in-car rituals and what sequences they followed we shadowed people's journeys as they prepared to drive, whilst driving and after their drive. To document what the participants did we recorded their in-car preparations and interactions using video, audio and photography.



*Researcher and participant
discussing journey rituals and emotions*

Before Journey

Before participants got into their car we measured their emotional state of mind using Plutchik's wheel of emotions¹. Prior to their journey they experienced emotions such as anticipation, pleasure and interest towards what the journey will bring. Once inside the vehicle we observed and recorded their individual sequences of preparation before starting to drive. Before starting to drive people settled into the car, adjusted the seat, placed personal items, checked that the mirrors were correctly positioned and turned on the radio or entertainment systems, as well as air-conditioning or heating.

¹ Robert Plutchik. 2003. Emotions and Life: Perspectives from Psychology, Biology and Evolution. American Psychological Association.

Before The Journey WHEEL OF EMOTIONS

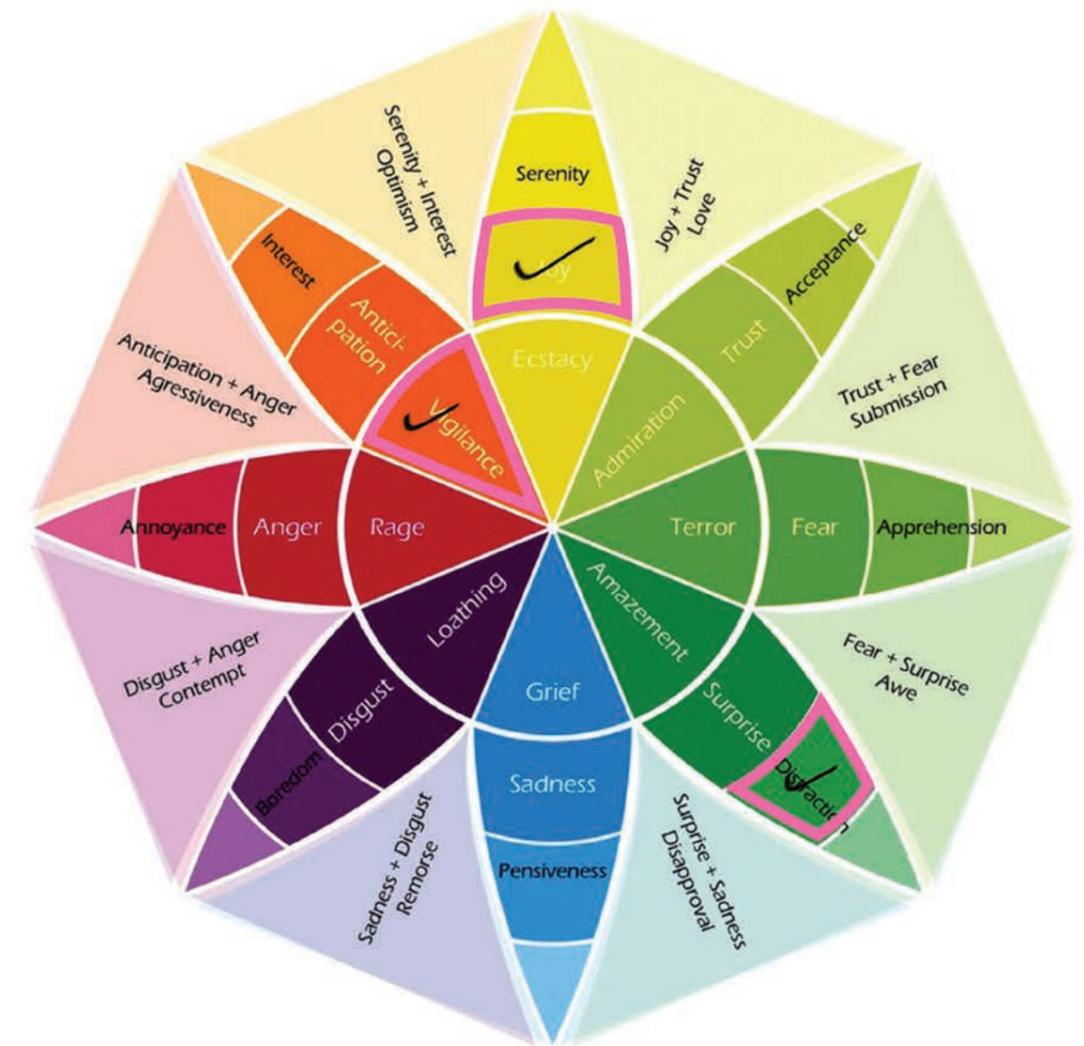
Name:

Place:

Weather: Grey (no rain)

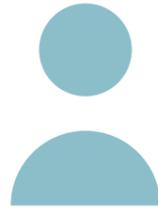
Date: 16.08.2018

Time: 16:00



Plutchik's wheel of emotions. Filled in before and after journey to measure mindset of participants

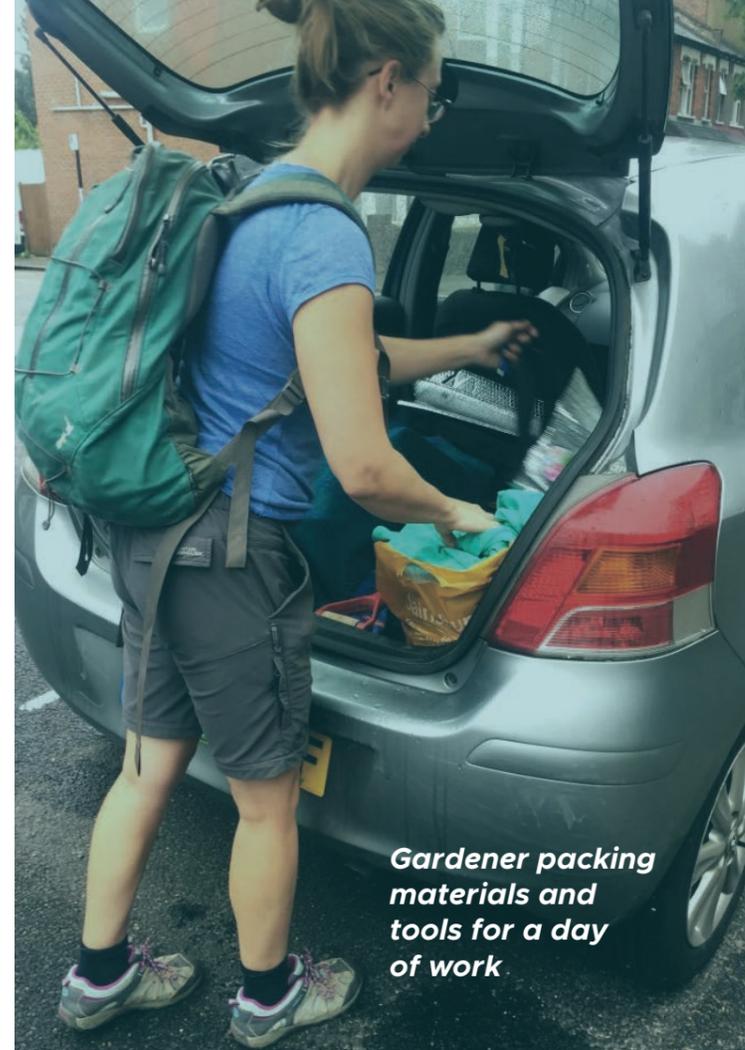
“He is called Norman Harris because he is a sensible 5-door hatchback, and he is silver... he has a personality... a little bit boring, but he’s also got a fun side”



J.R.

We asked the participants if they considered their vehicle had a personality and whether they had given it a name. Both men we spoke to had not named their car and did not associate it with any gender, one stated that he considers machines to be genderless. The female drivers we shadowed had named their cars and thought of them as either male or female. J.R. considers her ‘reliable, attractive, sensible, boring car with a fun personality’ as male and calls him Norman Harris or Yarris.

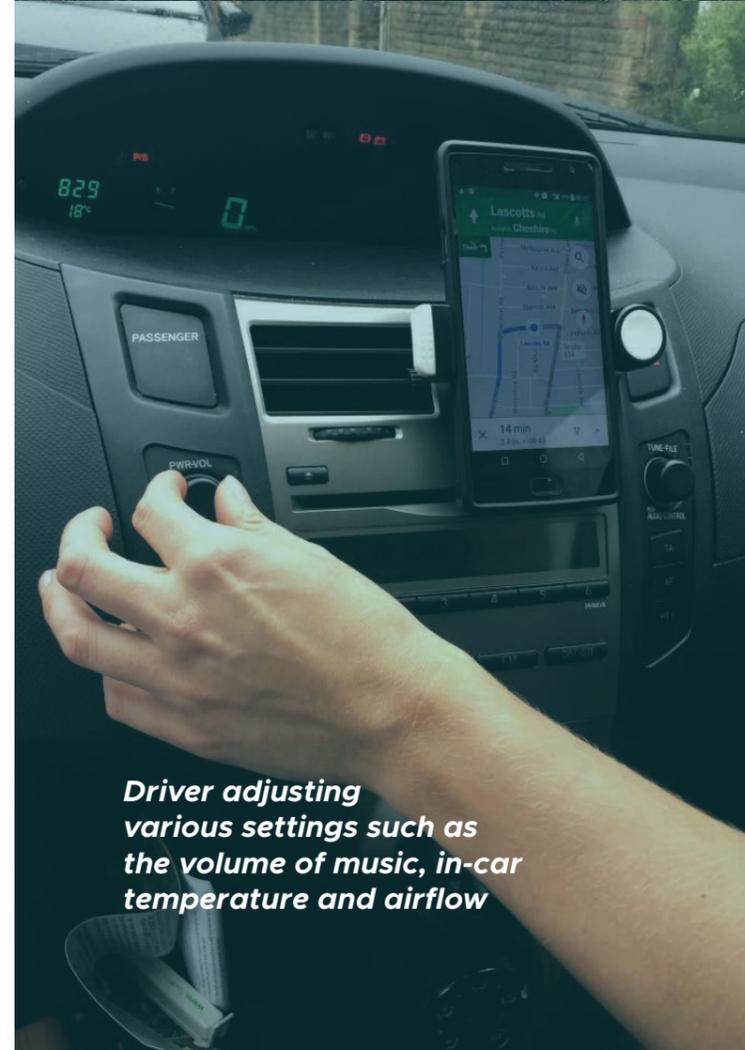
| | |
|-----------------------------|--------------------------|
| Daily commute: | car |
| Duration of commute: | 10 – 30 minutes |
| Age: | 30s |
| Marital status: | single |
| Occupation: | gardener (self-employed) |
| Gender: | female |



Gardener packing materials and tools for a day of work



Participant placing backpack in the boot



Driver adjusting various settings such as the volume of music, in-car temperature and airflow



Mother folding childrens buggy to fit in the car boot



“ I would probably check google maps to see kind of where I know ... then I can kind of judge how far I've got ”

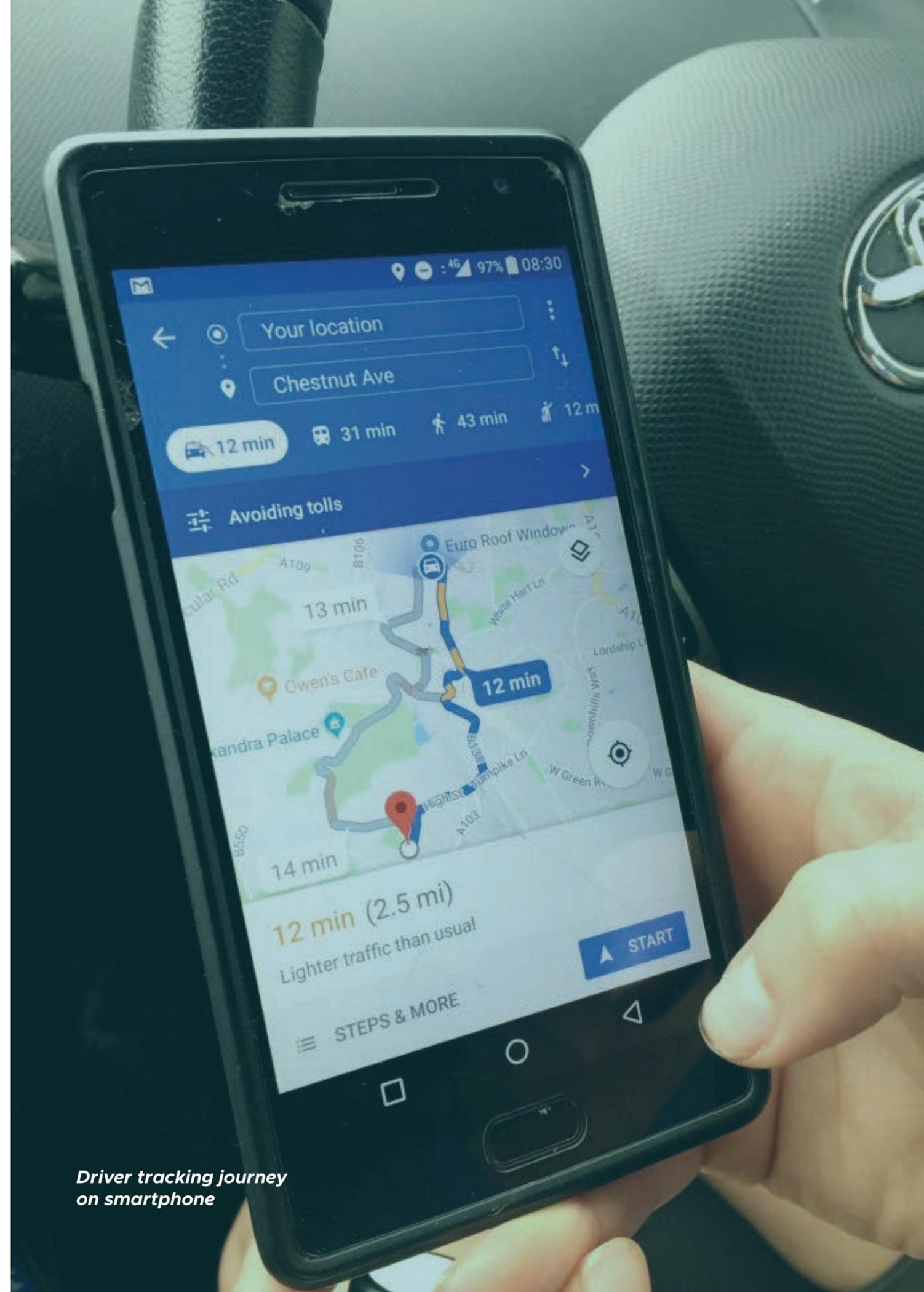
During Journey

During the journey we found that communication between a driver and their vehicle is an important factor in making them feel connected. The information the car provides helps them feel in control.

We discovered that people use various ways to track their journey's progress: using apps, satellite navigation, maps, landmarks and analogue clocks as tools to do so. When people were preparing to drive to a new destination many planned their route using Google maps¹ or app's such as WAZE². They also used these to track their journey's progress as well as looking at the clock or satellite navigation systems, people like to be informed as to how much longer they will be driving. C.H. monitors the progress of her journey through recognisable landmarks, in unfamiliar territory she consults maps to chart her progress.

¹ <https://www.google.co.uk/maps/@51.4969264,-0.1992243,13z>
(accessed 9th January 2019)

² <https://www.waze.com>
(accessed 9th January 2019)



**Driver tracking journey
on smartphone**

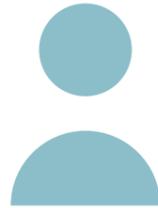
Many people said they use their daily commute to transition their mindsets in preparation for their working day or returning home, often while listening to music. One driver said she enjoys her “*me time*” commute through north London, admiring places such as Alexandra Palace, which calms her mood and makes her feel fortunate.

Communication between the user and their car is an important factor for drivers to feel connected, supported and in control. People we spoke to said this could be through looking at the instrument panel, radio screen or monitoring the fuel consumption; receiving information from the vehicle gives them a sense of control.



An example of a driving ritual, second-hand CD's the driver plays on long journeys

“This particular car is very clear, it’s very driver focused. Things are angled towards the driver so the panels, obviously the instruments are very clear. It’s not cluttered”



After The Journey

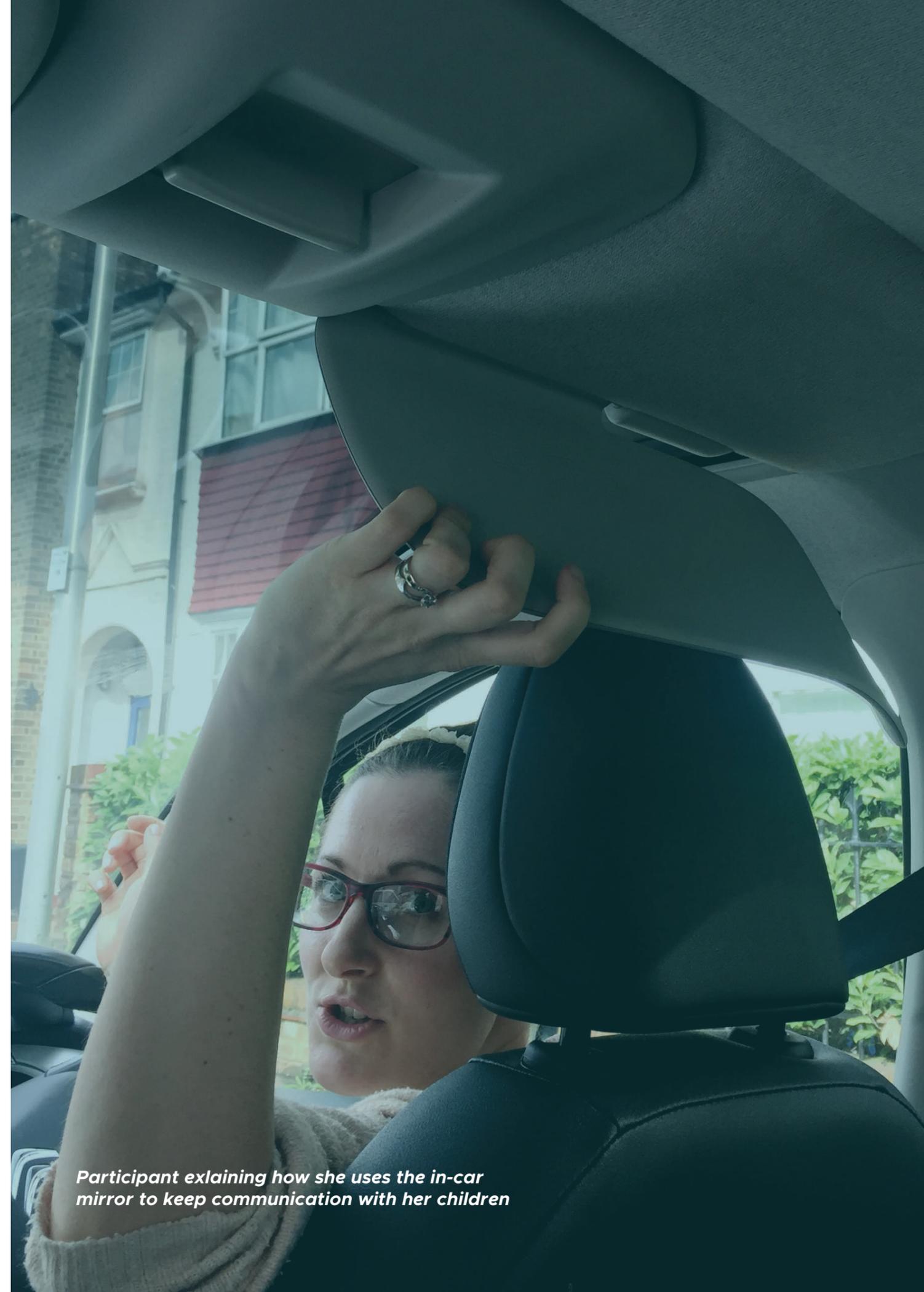
When they had completed their journey participants said they felt relieved, relaxed, calm, happy and had sense of achievement.

Your Own Car

We then asked participants which parts of their vehicle they felt particularly connected to. Many said they felt linked through the tactile contact they had with the steering wheel and seat. One driver said he feels that the seat ‘hugs’ him and a mother we spoke to said she feels most connected to her in-car mirror because it allows her to communicate with her children sitting in the back seats.

M.H.

| | |
|-----------------------------|--------------------------|
| Daily commute: | car, bike or tube |
| Duration of commute: | 10 – 30 minutes |
| Age: | 30s |
| Marital status: | single |
| Occupation: | financial markets trader |
| Gender: | male |



Participant explaining how she uses the in-car mirror to keep communication with her children



“*...Everything is very direct and if you make an input you know what it’s going to result in. So from that point of view it feels like it is communicating what’s going on in the road...*

”



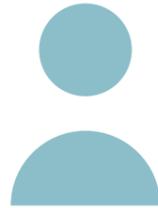
“*The seats in this car... Once you sit in it, it’s pretty cosy... it feels like you are supposed to be here... Because they are slightly around you as well, so you can’t really move around... So that makes it feel kind of focused... when I sit here I feel like I am ready to go somewhere.*

”



Participant driving, he feels particularly connected to his car through the seats

“ I have thought about ZipCar ... But then, no ... it's too much hassle... You have to find a parking space, you have to make sure you find the right place to park at the end of the day... They won't come and pick up the car at the end of the day, will they? – No! ”



M.G.

Car Sharing

When we asked people if they would share their car, the majority answered 'no', their reasons were the freedom and spontaneity they have if their vehicle is available at all times and set up as they prefer it to be. Their willingness to share their car also depended on the closeness of their relationship to the sharer and that this was something they would do with family and friends, people that they know and trust.

Three of those we interviewed had at some time used the car sharing scheme Zipcar¹ or Zipvan². One driver said he would use this service, another has used both in the past but prefers the convenience of owning her own vehicle and one said that he found Zipcar too much 'hassle'.

| | |
|-----------------------------|-----------------------|
| Daily commute: | car |
| Duration of commute: | 30 – 60 minutes |
| Age: | 50s |
| Marital status: | married with children |
| Occupation: | sales |
| Gender: | male |



Participant reflecting on car sharing services



Participant explaining opinions on car sharing

¹ <https://www.zipcar.co.uk> (accessed 15/01/2019)

² <https://www.zipvan.com> (accessed 15/01/2019)

Car Servicing & Purchasing

We asked people to tell us about their latest experience with having their car serviced. Most tended to be loyal to the vehicle's brand dealership citing 'trust', 'satisfaction' and 'convenience'; even though it could be more costly, they felt it was justified. One new owner used a garage recommended to her as she felt she could trust them.

Buying A New Car

Purchasing a new vehicle was something people looked forward to and tended to do after two to four years of ownership. People gave their reasons for doing so as reliability, upgraded functions and in-car technology, as well as adapting to the changing needs of family members. C.H. would consider upgrading her vehicle by customising elements of the interior, such as the seats, in order to suit her better physically, improve comfort and be more welcoming by being heated. She would also like change the materials inside her car and use ones that look and feel more luxurious.


C.H. *“These seats are just not comfortable and the seatbelt does not fit me... I don't really fit the car... The seats are a bit too long for me... So maybe a shorter seat... And a softer cushion...”*

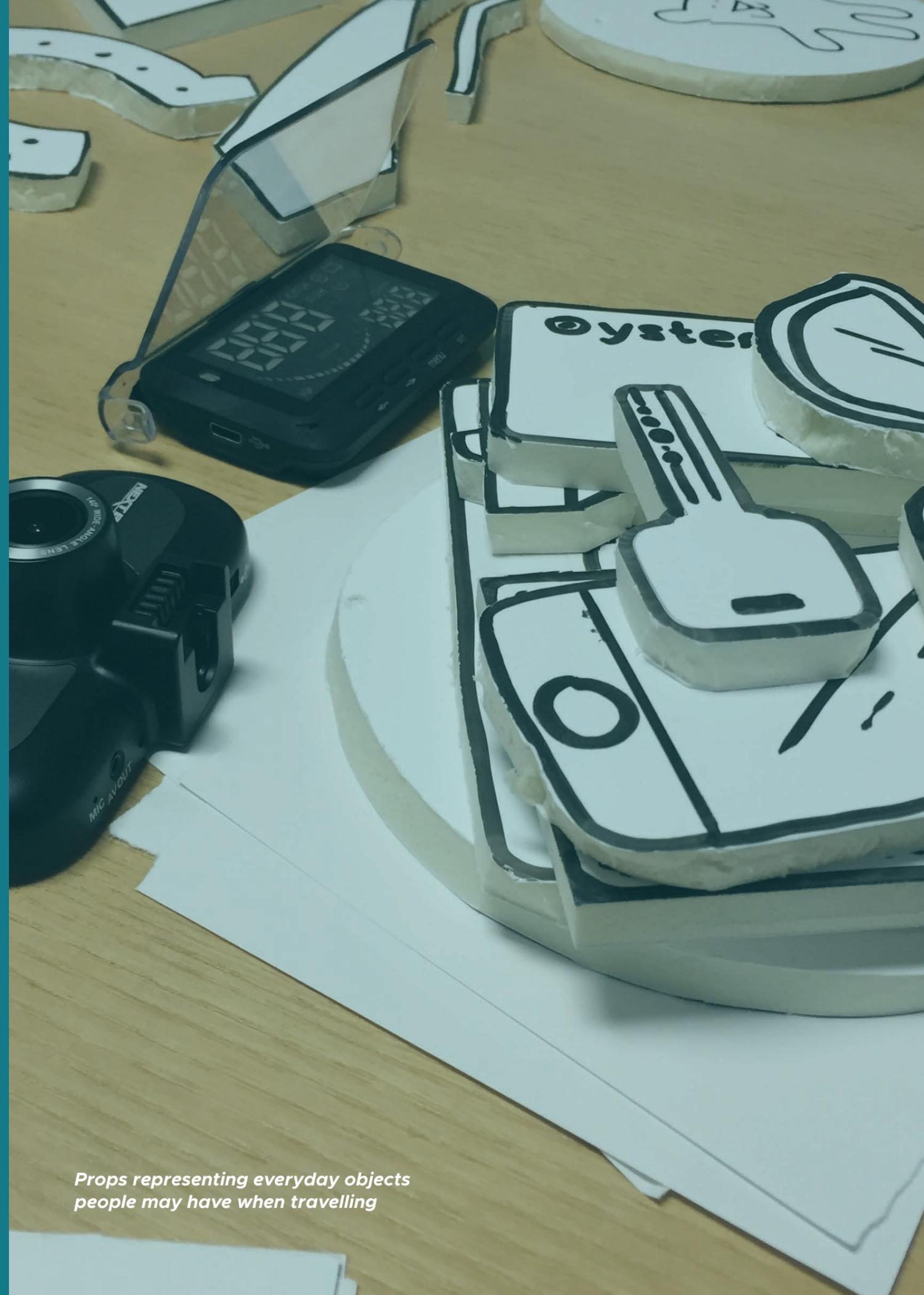

C.H. *“The dashboard feels a bit plasticky.. So maybe I'd have it covered in leather or something... It just feels a bit more expensive and looks a bit nicer...”*


C.H. *“...I would want a colour and material that doesn't stain because I eat in the car a lot...”*

5.

Enactment Workshops Around Mobility Rituals

After the telephone interviews and in-car observations the designers and researchers held three separate workshops with invited participants. These we called Ritual, Experience and Emotion workshops. The goal was to collect examples of ritualistic behaviours that people make when interacting with mobility, to help us better understand them.



Props representing everyday objects people may have when travelling

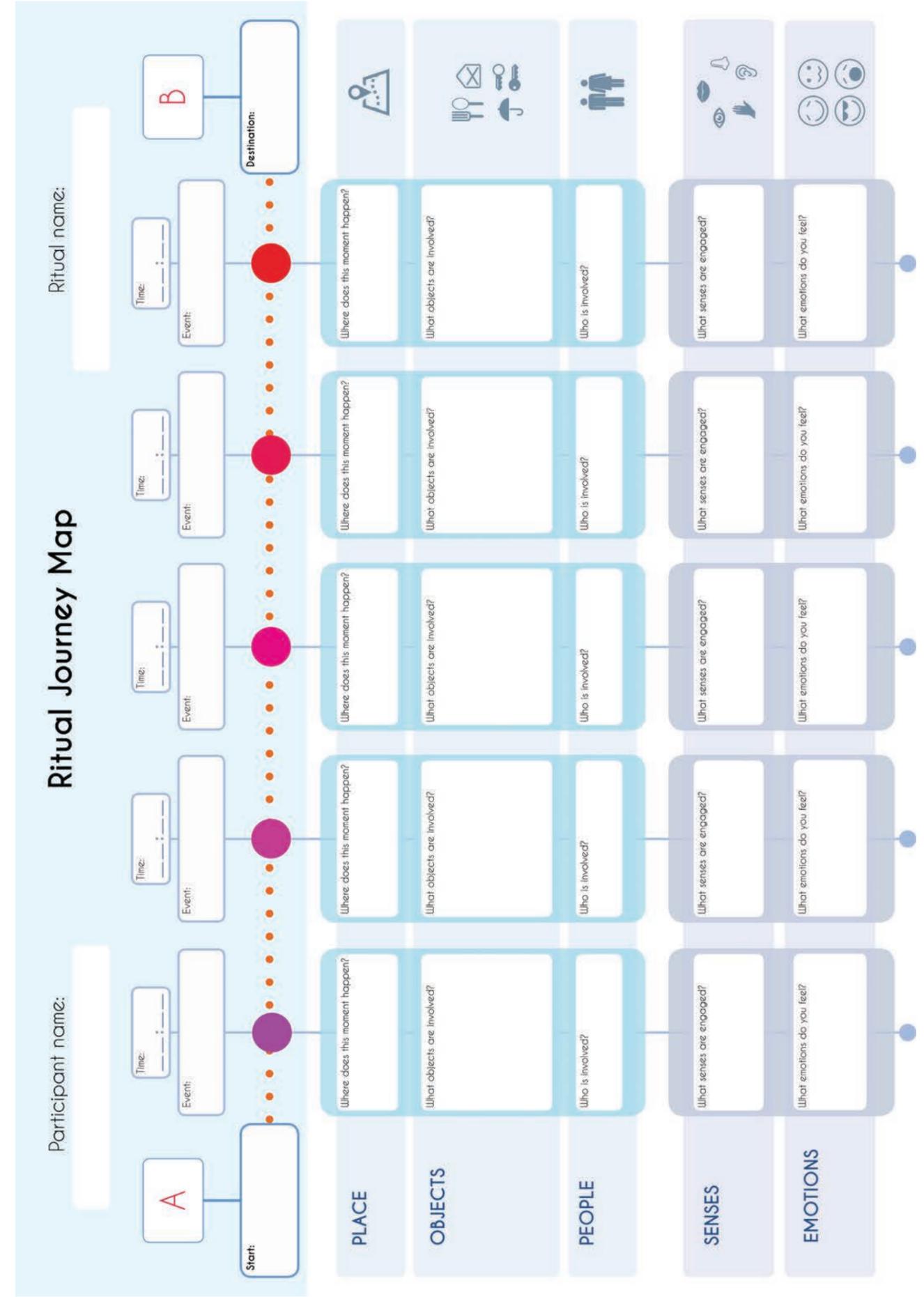
Enactment Workshops

Before we held the workshops we identified three categories that would help us unpack the user experience; these were Conditions – the time, place and objects involved; Emotions – the senses and emotions felt; and Meaning - what the ritual means and why they perform it.

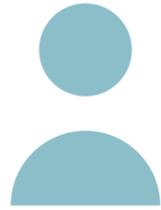
In the Rituals, Experience and Emotion workshops we asked participants to consider their everyday travelling situations as well as longer journeys to an unknown destination. Before attending the workshops they were asked to bring one or more objects (or representation of) that they associate with a meaningful action they often repeat when travelling. We dissected each person's journey into step-by-step stages to analyse their user experience.

We recorded these on our Ritual Journey Map under the headings: Place – where the moment happens; Objects – what objects are involved; People - who is involved; Senses – what senses are involved; and Emotions – what emotions

were experienced. We provided cardboard props representing items people may be concerned with when preparing to drive, such as glasses, mobile phones, coffee cups, keys etc; these were intended to represent technology, personal effects and in-vehicle objects; they were used as tools to prompt participants to recall what they do.



“Putting on my watch allows me to draw a line under what I have been doing...”



S.J.

Before travelling people made preparations, they organised their belongings, as well as themselves and others. One participant said his ritual of amassing personal effects from around his apartment into his bag before leaving home culminated with putting on his watch, signifying he is ready to leave.

The emotions many described were feelings of anxiety, apprehension and stress. One mother said that she feels anxious and distracted before a long journey with her partner and children. She is concerned that she will forget something and organises food, clothes, toys and books to entertain the children as well as ensuring that she has keys, her mobile phone and charger with her in the vehicle.

However, others felt happy, excited and full of anticipation as they prepared for their journeys. One driver explained his pre-driving ritual centred around his car as he cleaned the windscreen and windows, switched on the satellite navigation, dashboard camera, heads-up-display and radio.

- Daily commute:** tube and bus
- Duration of commute:** 70 minutes
- Age:** 30s
- Marital status:** married
- Occupation:** designer
- Gender:** male

Participant's watch plays an important role in his morning-rituals



Participant's unpacked bag: Key objects needed throughout the day

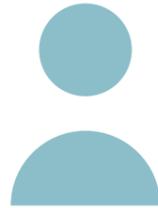


*Backpack:
Participant packs his
belongings stacked
according to when he
needs to use them*



*Unpacked bag:
Key objects needed
throughout the day*

“ I keep going to same spots checking I haven't forgotten anything ”

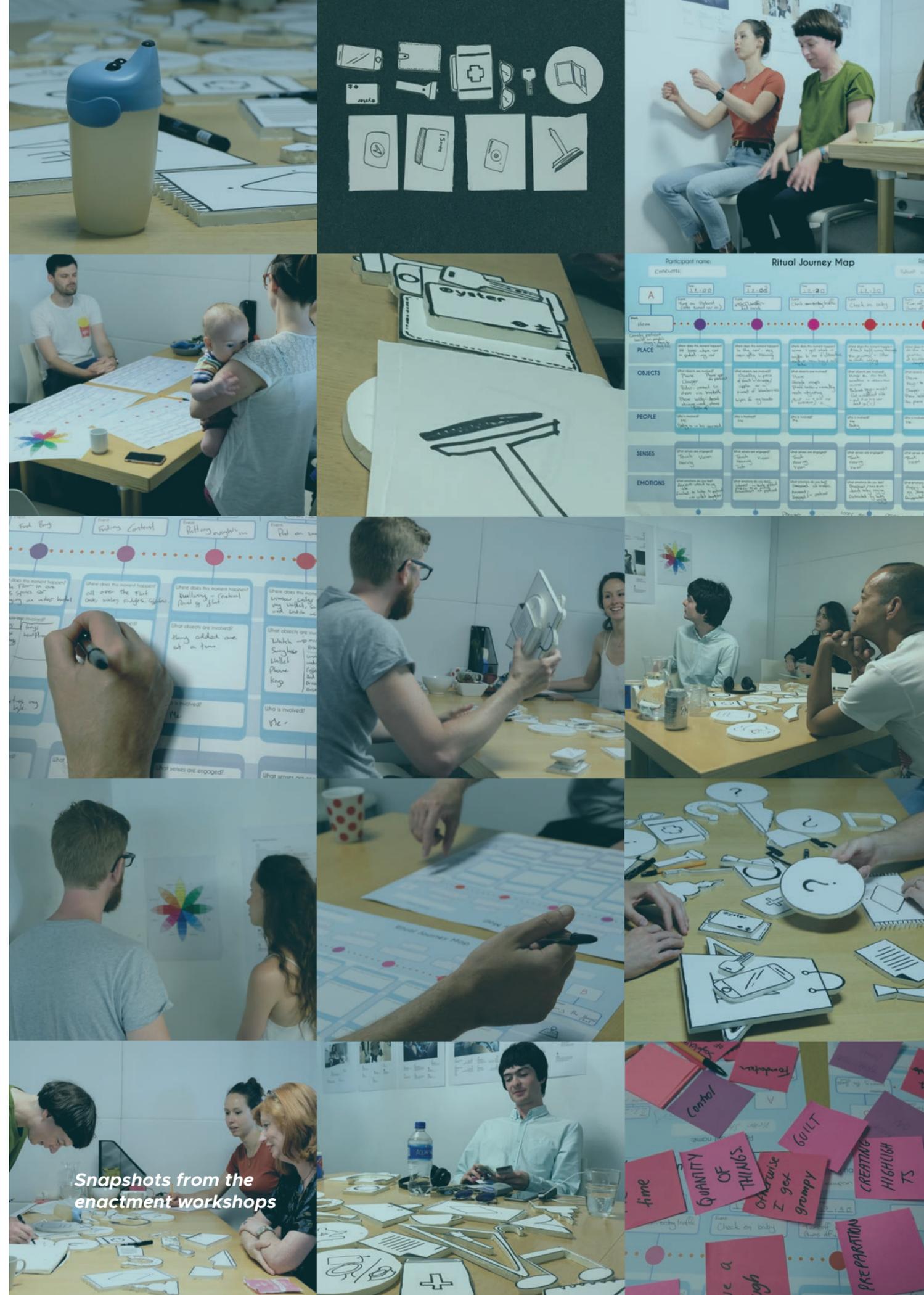


R.T.

Ensuring his car is clean, tidy and equipped gives him a sense of pride, happiness and confidence in his vehicle to perform well.

After detailing their journey related rituals we asked the participants how significant they were to them and whether they were meaningful beyond being merely functional. We found people considered them a framework for their daily lives, providing a sense of order, familiarity and control. Being engrossed in their pre-travel preparations gave people space and me time. With some preparations, such as making packed lunches or snacks for the journey, people felt they were creating something to look forward to in the future. These rituals marked liminal or threshold moments between different phases and environments occurring within their day.

- Daily commute:** bike and train
- Duration of commute:** approx 2.5 hrs
- Age:** 40s
- Marital status:** married
- Occupation:** researcher



Snapshots from the enactment workshops



The 'passenger' is offering a drink to the 'driver' from a baby's drink bottle

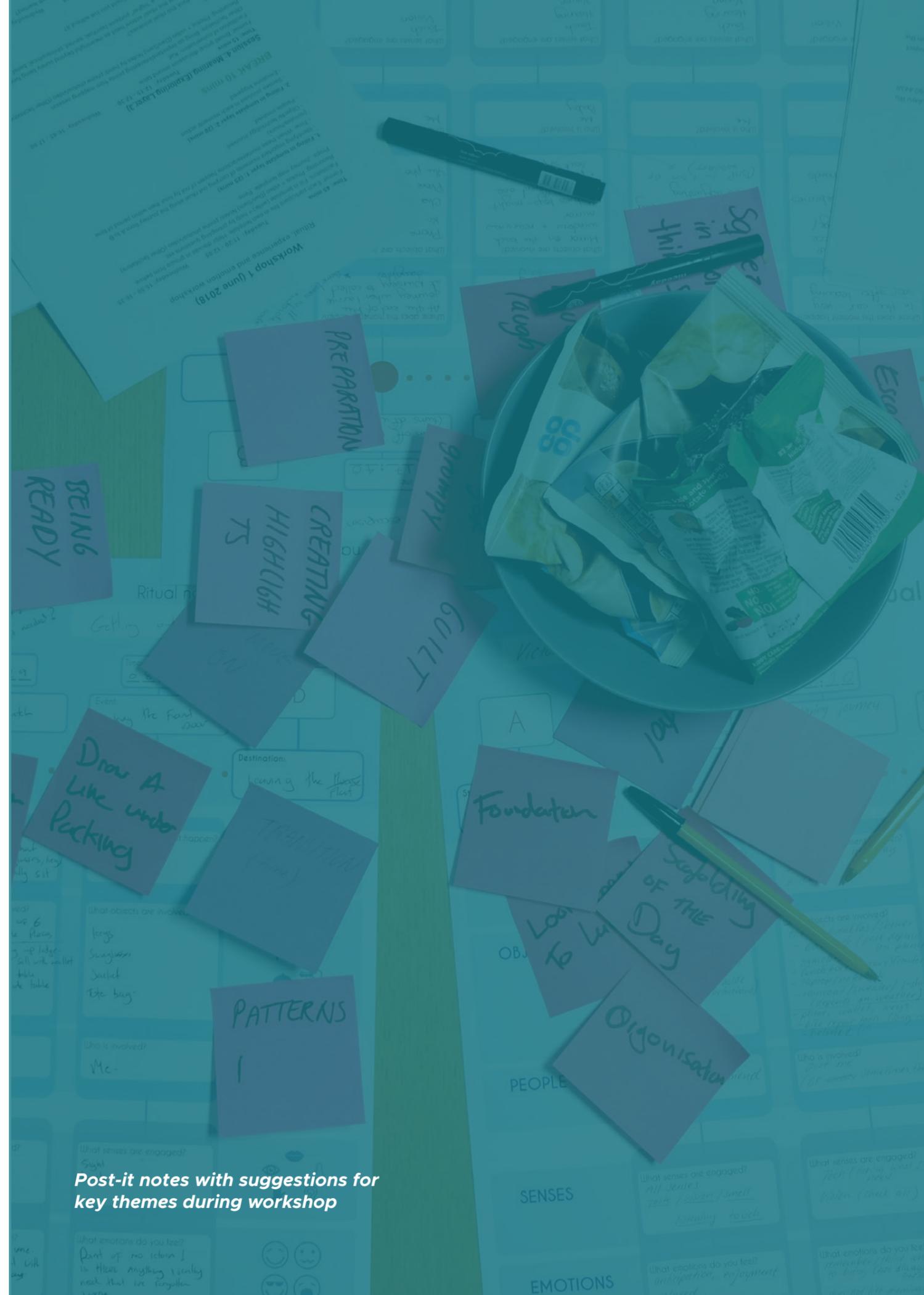




“ I feel like the car is a part of my family. I also enjoy the ride more when the car is nice and clean ”

The findings helped us identify six key themes around Ritualistic Mobility Experiences. These were:

- 1.** Physical organisation and mental preparation
- 2.** Playful in-vehicle activities
- 3.** Vehicle as an extension of the driver
- 4.** Relationships and personalisation within shared vehicle spaces
- 5.** Transitional mindsets
- 6.** Post journey events



Post-it notes with suggestions for key themes during workshop

6.

Designing Ritualistic Mobility Experiences - Key Scenarios

Following the telephone interviews, in-car observations and workshops we held an ideation workshop and created scenarios for the six key themes we had identified. Focusing on the Emotional Transition of users we imagined situations within each theme as a tool to inform future design opportunities.



*Researchers preparing
the workshop material*

Scenario Workshop

We held the ideation workshop with the design research team in July 2018. The aim was to produce a variety of approximately six to eight scenarios for each of the key themes we had identified – Physical organisation and mental preparation; Playful in-vehicle activities; Vehicle as an extension of the driver; Relationships and personalisation within shared vehicle spaces; Transitional Mindsets and Post-journey events. This would enable us to explore them at a deeper level and was based on information we had collected from the interviews and workshops we had previously held. These had given us insights and points of interest which we used to inform the creation of the scenarios. We questioned how we might identify ideal ritual experiences that people have in the context of transport and what these might look like.

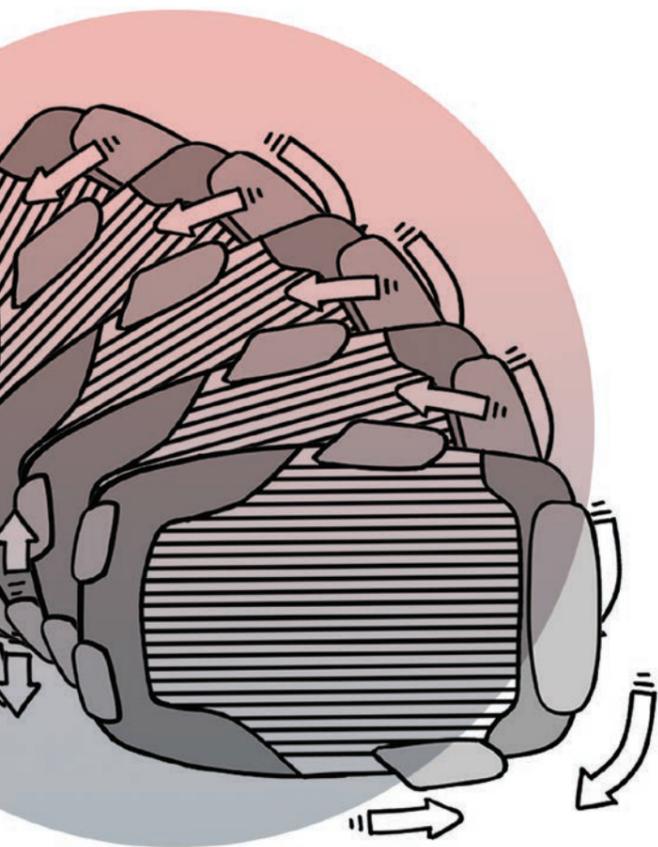
We used the method of creating scenarios to help us imagine how possible futures may develop and as a tool to generate ideas. A process such as this can help with understanding and illustrating how people

experience products and services on a deeper, more contextual level as well as how their expectations change over time.

Scenarios are often based on trends, which are developments that already appear to be influential in society and are expected to become increasingly important. Usually, the creation of scenarios starts with identifying uncertainties that may be relevant in the future and determining what paradigm the different scenarios are based in. We used a layered approach to serve as building blocks or things to keep in mind when fine tuning the scenarios. The three layers : Conditions – actions, time, place, objects, technology and people involved; Emotions - the senses involved and emotions triggered along the way; Meaning – what people think the ritual achieves, why they do it and their awareness of performing it.



Researchers discussing ideas during scenario workshop



We wanted to find scenarios that we consider interesting and think may have potential design opportunities. In addition we sought scenarios that represent a spectrum of experiences, for example; religious versus secular or solitary versus communal. Also, scenarios that are played out in different future paradigms for example: in a future where all cars are accessed rather than owned and where all vehicles are autonomous rather than driven by people. In making these scenarios we intended to scope for future design possibilities and to select three to four of these for further development into prototypes.

The workshop was held one morning and divided into six sessions. Firstly, the project was introduced and secondly the scenario method was discussed. The third session looked at the ingredients of the scenarios, alongside a summary of those previously discovered, followed by an analysis of the telephone interviews and the journey-map workshop. In the fourth session we discussed the main trends relevant to this project. To

begin this we introduced future paradigms and future forecasting, then we gave a brief presentation of the background research that we had conducted. We next discussed the future contexts we are potentially operating within: what reality or belief in the future are we imagining, is it dystopian or utopian, and how far forward do we want to explore?

We presented the trends that we had identified: Connectivity – everyone and everything is today more connected with global networks and the Internet of things; Transparency and Visibility – the increase in data is recording our activities, making our lives more available to others; and Merging – the digital and physical worlds are increasingly overlapping. We also noticed an increase in Customisation – regarding services and products as users become involved in the process of making the product. In addition we identified issues that are recurring and relevant themes, such as Climate change, Moving towards the end of oil and how we use resources due to population growth and increased consumption.



Notes and photographs from the ideation workshops organised on the wall

In the next part of this session we looked at and discussed paradigm dimensions that products are always created in, with a balance on a scale somewhere between the polarities. We presented these on the wall. Participants could add to the list if they thought some were missing. The paradigm dimensions we used are shown on the right.

We discussed the suggested dimensions and future paradigms in relation to what we perceived to be probable futures and trends. For example, between which polarity in the paired paradigm dimensions is future mobility most likely to be positioned.

After a break we worked individually drawing quick, comic strip style, scenario ideas of ritualistic experiences that one or more people have described they performed in a vehicle. When this was completed we worked collaboratively creating scenarios based on individual ideas. These we made by identifying the paradigm (the main trend of the future) in which the scenario will sit; then the context was identified, determining – when it is

happening, where, what objects and who is involved. Next we considered what actions are performed in carrying out the ritual. Lastly, we discussed what the ritual achieves and what meaning or belief system is attached to it.

In the final session we selected the scenarios that we found the most interesting and consider hold potential design opportunities. We were careful to make sure that those we picked represented a spectrum of experiences.

Future Mobility -- Paradigm Dimensions

Connected.....Isolated

Ownership of data.....Data free to all

Customised/bespoke.....Mass produced

Online identity.....Physical identity

Sharing economy.....Ownership economy

Circular economy.....Disposable economy

Flexible employment.....Traditional employment

For everyone.....For the few

Synthetic.....Natural

Dense living.....Spacious living

Congested transport.....Easy movement

Driverless.....Human drivers



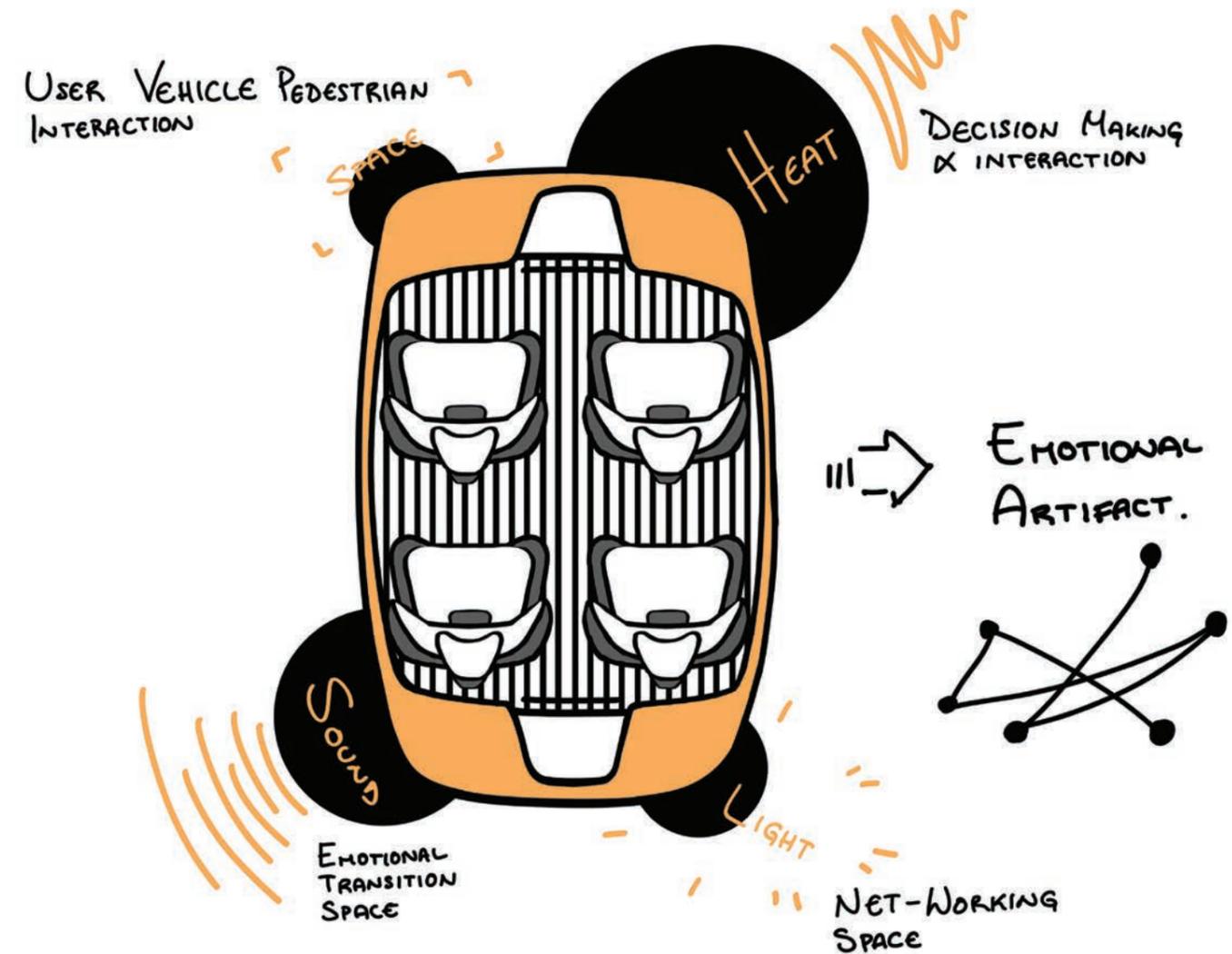
“The main thing about this ritual is feeling the responsibility about my car as a driver. When I don't clean and take care of it, I think that the car is not happy”

Ideation Workshop - Physical Organisation and Mental Preparation

We wanted to discover how people prepare for and relate to their journey before starting out. To do so we explored the practical and psychological preparations that people make before a car journey. The key points of our discussion were: what type of organisation do people usually make to prepare for their drive and is there a sequence that they follow? Additionally, we looked at the benefits of driving-related rituals and what aspects can be retained, adapted or encouraged as greater levels of automation are used in vehicles. We also discussed opportunities for reverting digital elements to analogue and if this could support the driver's pre-drive rituals and experience.

Potential Design Scenarios Include:

1. A driver is making physical in-vehicle organisation to psychologically prepare for driving. In three years time cars will help you to prepare for your journeys.
2. One driver (M.G.) we had spoken to who drives to work every weekday uses a range of gadgets that he has bought which give him a sense of protection and control. After attaching a heads-up display – to monitor speed accurately – and his satellite navigation device to the dashboard, he cleans the windscreen and the vehicles level 3 camera lenses ensuring both have clear vision. These checks and the order in which he conducts them are important to him – looking after the car makes him feel the car will support him. This ritual helps him organise his space before setting off and gives him peace of mind while driving.
3. In five years time cars will be able to drive themselves. However, drivers will still need to start the car, programme their destination and ensure it travels the correct route.



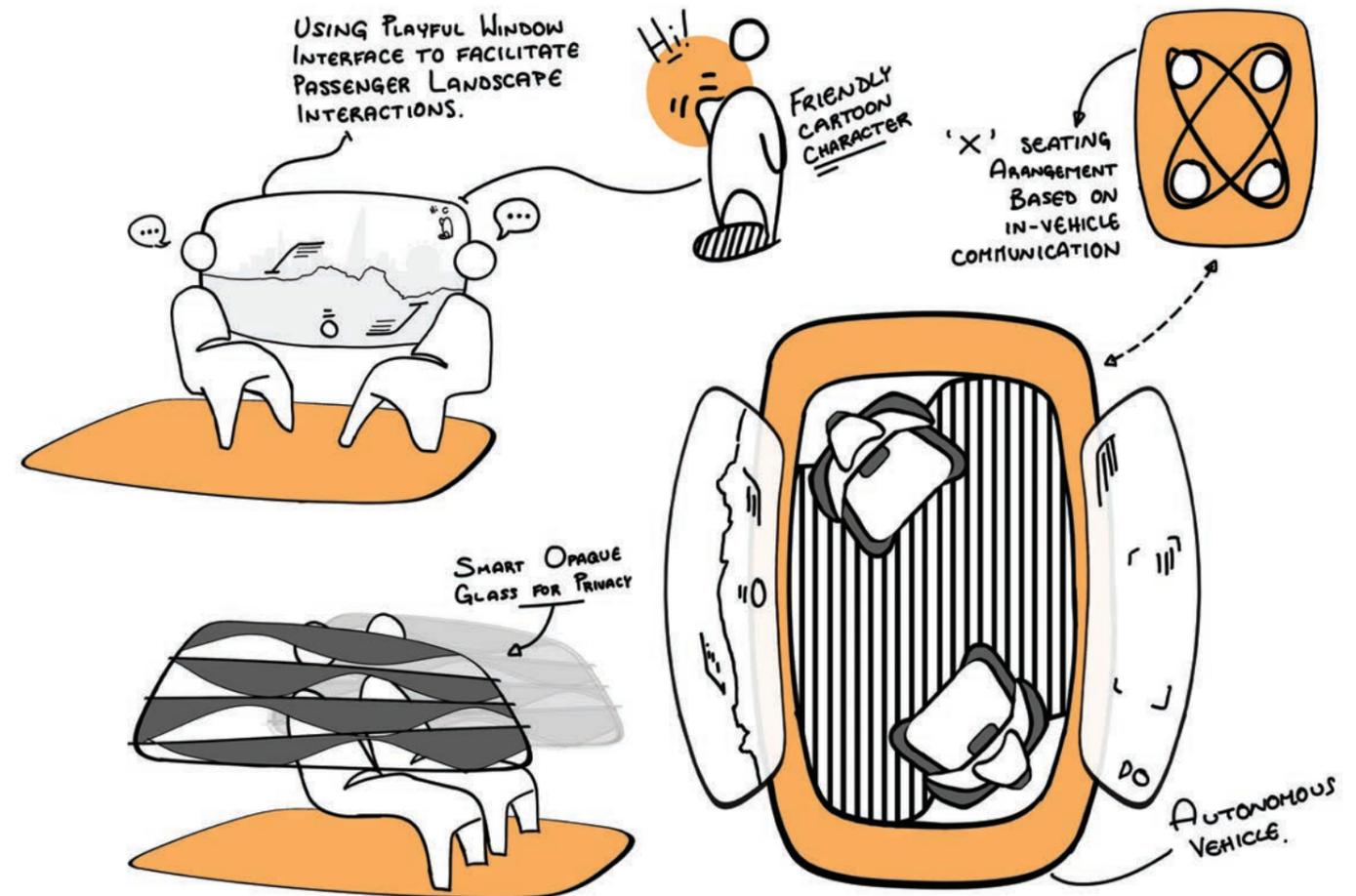
Sketch:
Physical organisation
and mental preparation

Ideation Workshop - Playful In-Vehicle Activities

We questioned how we might encourage interaction between the vehicle's occupants and the passing cityscape or landscape using playful elements. We explored how games or playful activities could encourage drivers and passengers to interact and be entertained within the car as well as with the changing views outside of the vehicle. Currently, drivers are occupied with the necessary actions to control the car – steering, accelerating, braking, gear changes, navigation and making manoeuvres – which require physical and mental agility. However, with increased levels of driverless technology there is less for drivers to do, which provides opportunities for Playful in-vehicle activities.

Potential Design Scenarios Include:

1. Using games or playful elements to encourage passengers to entertain themselves. In three years time taxis and ride-sharing schemes will still be operated by drivers.
2. Using games or playful elements to encourage passengers to interact with other passengers. In 2025 long-distance journeys on motorways will be conducted by driverless cars. These will be designed to engage people during their rides through connectivity and physicality.
3. Using games or playful elements to encourage passengers to interact with scenery. In three years time all new cars will be continuous and connected but still driven by people. Vehicles will use this connectivity to encourage the occupants to interact with the environment around the car.
4. Positive distraction during the journey to reduce stress and anxiety. In seven years time the inside of cars will have a level of flexibility allowing the occupants to create a comfortable, calm space according to their preferences.



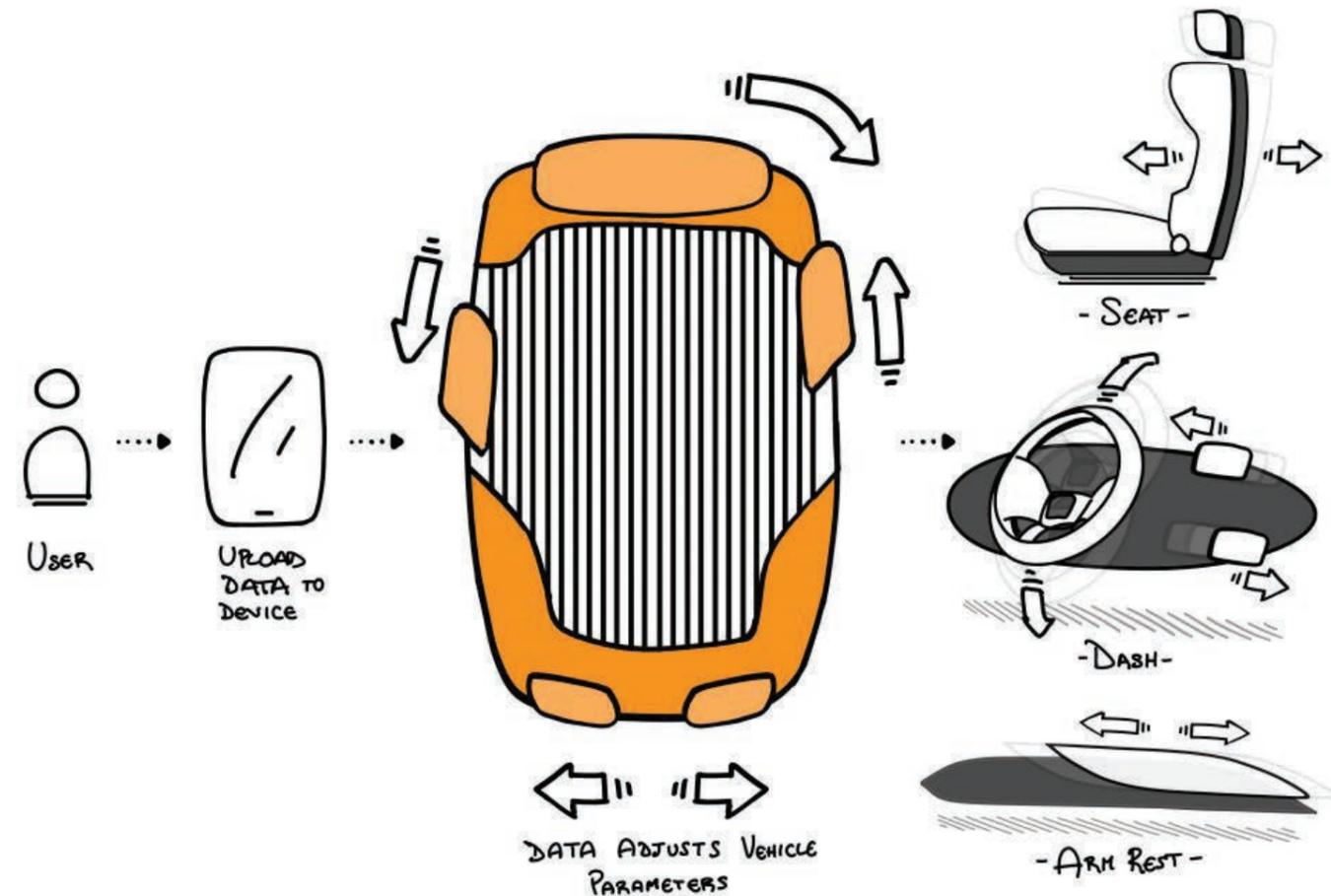
Sketch:
Playful in-vehicle activities

Ideation Workshop - Vehicle as an Extension of The Driver

We focused on the relationships that people have with their vehicle as an extension of their identity and body. Cars are inanimate objects, devices to support people, yet many feel that they have a relationship with theirs. This can be through the tactile experience of connecting with the steering wheel or feeling enveloped by the seat. The appearance of a person's car can also be perceived as an extension of their identity or personality, which suggests a relationship beyond merely considering it an inanimate object.

Potential Design Scenarios Include:

1. Vehicle as an extension of an individual's body. Future vehicles will be able to tailor and adapt the driving experience to enhance the feelings and emotions of the driver.
2. Vehicle as an extension of an individual's identity. By 2025 technology will allow vehicle interiors and exteriors to adapt and become changeable extensions of the driver's identity.



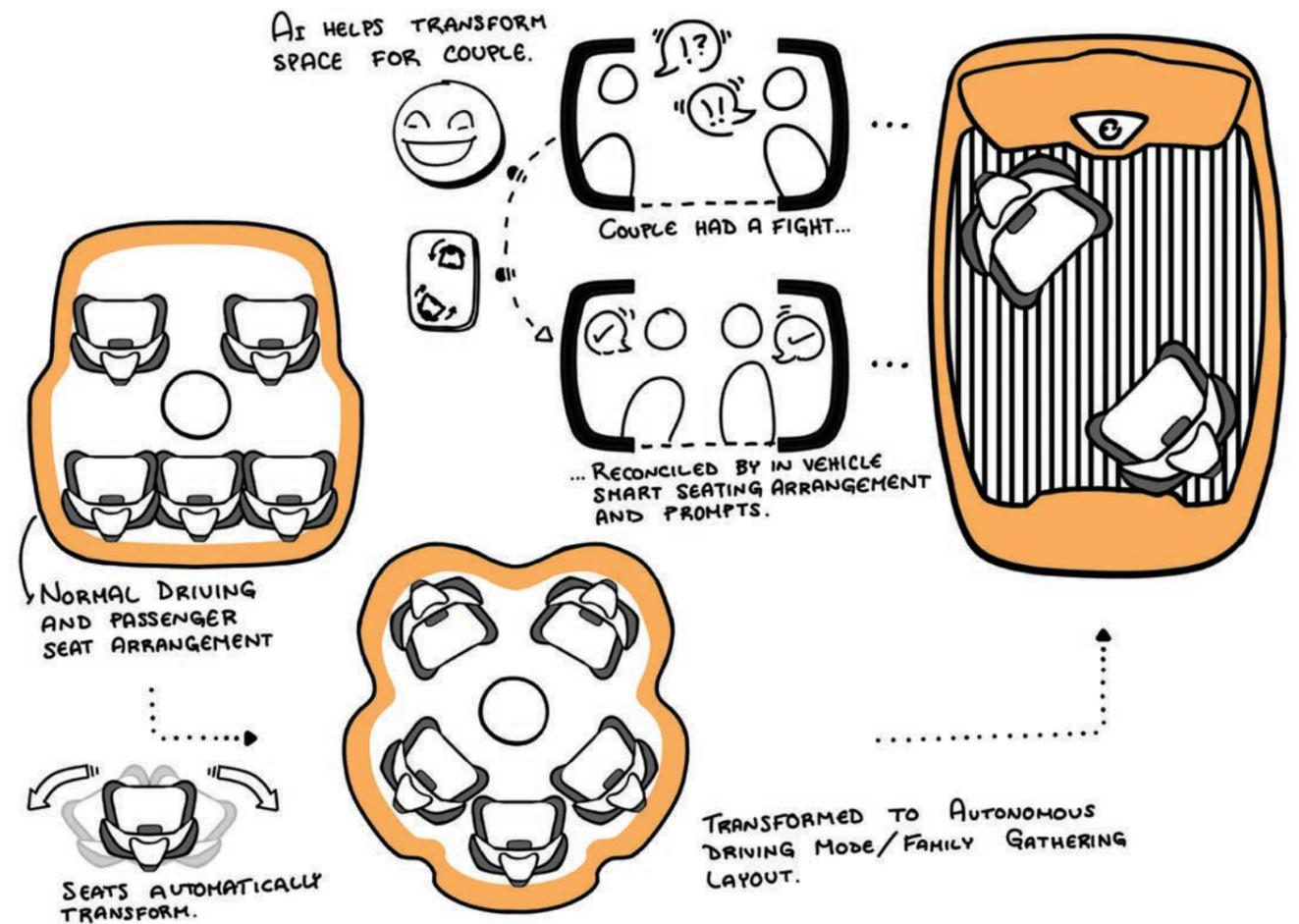
Sketch:
Vehicle as an extension of the driver

Ideation Workshop - Relationships And Personalisation Within Shared Vehicle Spaces

In this session we considered how interior spaces in different forms of transport with multiple passengers are shared social spaces. These areas are continuously shifting as drivers, passengers and objects negotiate with each other and navigate within the space. However, the way a family or friends utilise in-vehicle spaces differs from the way strangers do. This led us to look at how drivers and passengers personalise these shared spaces.

Potential Design Scenarios Include:

1. Negotiation and agreement of the use of the shared space in the car with strangers. In five years time vehicles will be able to adopt privacy settings to help passengers feel safe and secure in temporary shared spaces.
2. Negotiation and agreement of the use of the shared space in the car between family members.
3. Negotiation and agreement of the use of the shared space in the car between a couple.
4. Personalisation of a hired vehicle interior. In the future, vehicles will be able to offer greater flexibility in their interior spaces, providing greater levels of flexibility, allowing users to personalise them.



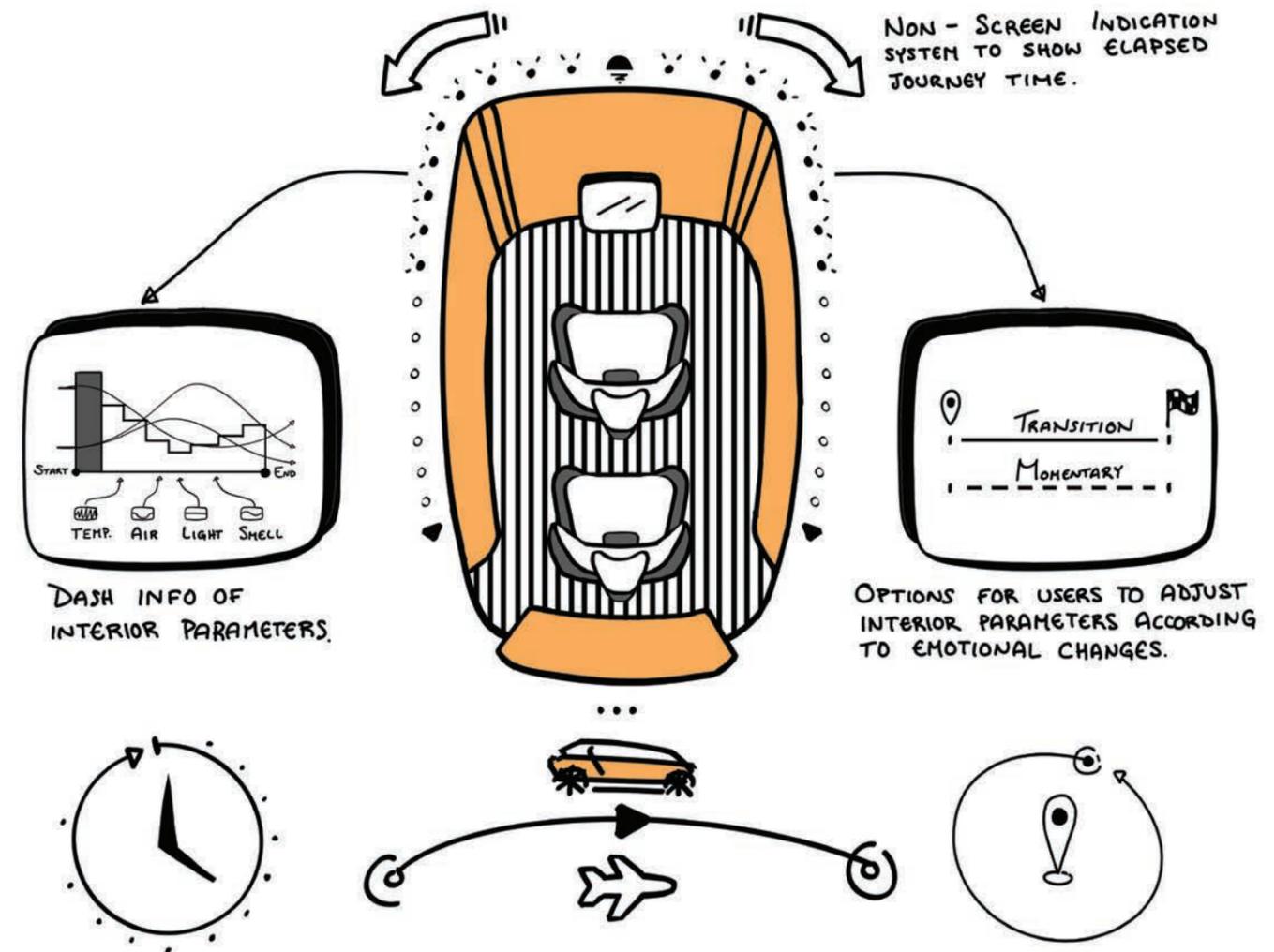
Sketch:
Relationships in temporarily shared
and personalised vehicle spaces

Ideation Workshop - Transitional Mindsets

We explored how journeys can enable people to make psychological and emotional transitions while they travel. Transitioning from one place to another allows time for people to decompress, clear their mind and reflect. From a design perspective we discussed whether the interior could modify itself to complement the mood of the occupants or adjust to create a space that supports people to prepare for arrival at their destination.

Potential Design Scenarios Include:

1. Mental transition enables an individual to clear their mind from recent emotions. In seven years time airport hubs will be offering fully driverless connection vehicles between city centres and airports, which will provide greater levels of access.
2. Mental transition enables an individual to create their own space and time to enjoy 'me time'. Imminently, private cars will support on the move meditation and be wellbeing spaces that help individuals focus their minds and manage psychological burdens.
3. Mental transition enables an individual to easily shift from one emotion to another. In three years time active facial recognition will be ubiquitous in all new vehicles. It will have the ability to link to an individual's smart device and use data from outside of the car to adjust the space inside it.



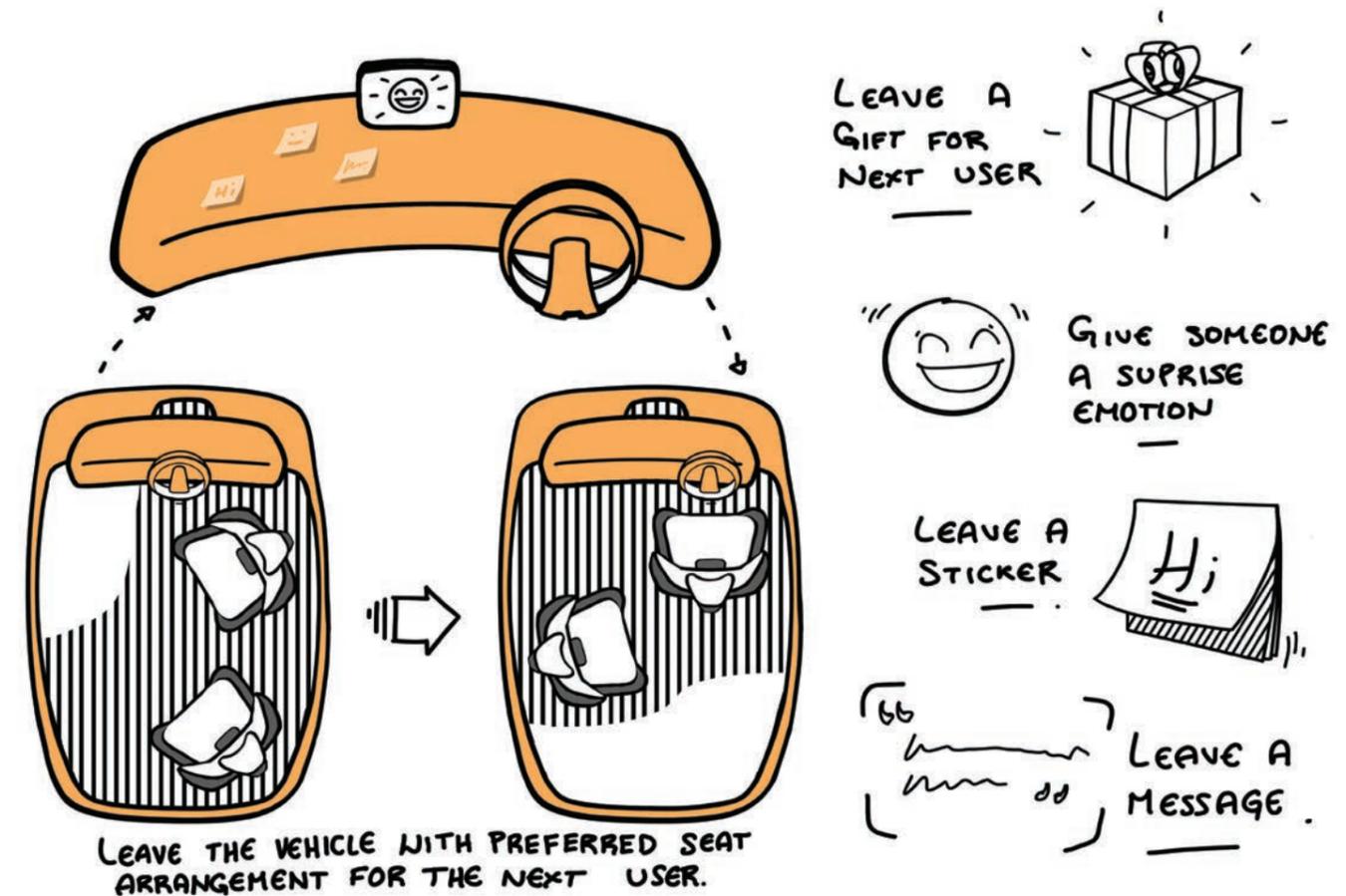
Sketch: Transitional mindsets

Ideation Workshop - Post-Journey Events

Our research has suggested that ritualistic experiences happen before, during and after journeys. We explored ideas for vehicles to prompt meaningful, post-journey, ritualistic actions, particularly in the context of the increasingly prevalent sharing economy. With these questions, we explored ideas around neighbourhood communities or close friends and how they could socialise using shared vehicles. A small gift, a warm greeting message or a preferred space organisation left for the next users, prompted by the in-vehicle information system, could be developed.

Potential Design Scenarios Include:

1. Car sharing environments that encourage occupants to clean the car after use. In three to five years time digital platforms will exist for local communities to co-own and share cars.
2. A car that provides support for the driver and gives closure at the end of the journey. In three to five years time vehicles will be able to provide emotional assistance for people who have been travelling for long periods of time alone. The use of Artificial Intelligence (AI), Virtual reality (VR) and Augmented reality (AR) will provide reassurance, practical assistance and assist with end-of-journey preparations to help people transition between travelling and their next experience.



Sketch: Post-journey events

7.

Designing Ritualistic Mobility Experiences - Demo Creation

We were invited to exhibit at the London Design Festival 2018, which gave us an opportunity to develop design concepts based on our findings and test them with the public. We made installations to represent how we imagined the three key themes: Pre-journey preparation, Communication when driving and Circular vehicle upgrading services.



*Models on display at the
London Design Festival*

Ready...Steady...Relax

To demonstrate the theme Pre-journey Preparation we developed the concept Ready...Steady...Relax. We produced an animation showing how a driver could interact with the car when using a vehicle-sharing scheme. The concept is designed to support and help people to set up an unfamiliar car by following prompts regarding the order of preparation, safety checks and adjustments presented to them. The information is displayed on the dashboard and personalised for the driver. Their startup routine or in-car rituals are supported by highlighting what procedure they need to follow in a vehicle. This makes them feel welcome, comfortable, safe and focused for the drive.



Dashboard display model: Assisting the driver's startup routine in a shared vehicle

Driving Whisper

To demonstrate the theme Communication When Driving we made a lighting installation concept Driving Whisper representing the measurement of time and journey progression. We developed a subtle experience, by dimming and increasing light in the dashboard area. The users are discretely updated as their journey progresses without having to check or calculate. It was designed so that it would not distract from the action of driving.



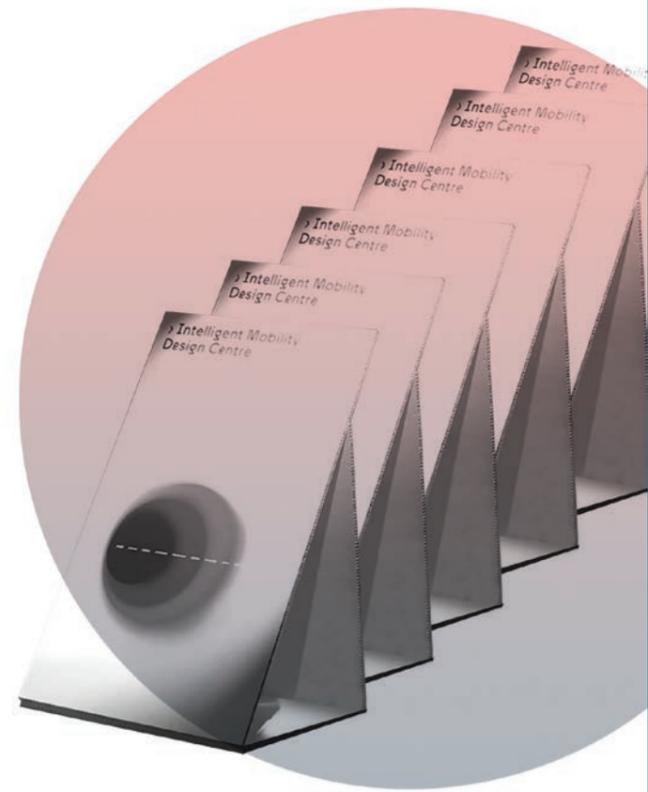
Lighting installation representing the measurement of time during a journey

Motoring Makeovers

The theme Circular Vehicle Upgrading Services was developed into the concept Motoring Makeovers. We created an interactive display where visitors could use a tablet to experience our concept for a circular material upgrade system. This would offer a more environmentally responsible recovery of materials and allow people to customise their car interiors. We had a physical display of various materials that people could choose from, which were ethically and sustainably sourced. When they held the tablet over a material sample, information about it was shown on the screen, such as the country of origin, environmental credentials, ethics and end-of-life recovery options. After selecting materials and component parts they were able to use the tablet to augment reality and visualise their material choices on the tablet.



Visitor interacting with circular material upgrade concept



Public Response To The Exhibition

A diverse range of people visited the exhibition: mobility industry professionals, enterprises, students from schools in London and city dwellers. They provided constructive feedback and comments. The reaction from the mobility experts was centred around the development these concepts could lead to in terms of product advancement. The Motoring Makeovers scenario received the most interest because of the concepts potential for creating a market niche, after-market upgrades and personalisation. The Driving Whisper concept developed to communicate and guide users through subtle, sensory indications was positively received. The concept Ready...Steady...Relax received feedback related to people's own driving experiences, there was interest in shortening the process and reducing the startup sequence steps.



8.

User Study and Design Inspirations - Pre-journey Preparation

We conducted three consecutive user engagement workshops after gathering public feedback on the concepts demonstrated through the videos and interactive displays that we exhibited at the London Design Festival 2018. This was to allow us to conduct research into people's driving related rituals and user test the prototypes we had made.



Workshop Focus

Our first workshop focused on the sequence of actions and placement of objects that people perform in preparation for driving, particularly in the context of vehicle-sharing schemes. The workshop was divided into five sessions: participants enacting their startup sequences and in-vehicle rituals when using their own and a shared car; showing them our designed startup sequence video Ready... Steady...Relax; building their own startup sequences on a timeline; working with our startup sequence cards, which was followed by discussion and feedback. Four people took part in this workshop, who all live in London, drive regularly and often use a car-sharing service. They were representative of different genders and their ages ranged between 24 and 40 years old.

In-Vehicle Rituals

To understand what participants did we asked them to enact their startup rituals using props that we provided. Many individuals have a specific ritual sequence to prepare themselves and the car for driving that are concerned with comfort, safety, route planning, organising possessions and mental checklists. These sequences can detract from or add to the pleasure of driving, an ideal would be to find a simple, quick and fun way to settle into a hired vehicle. In order to understand the nature and rationale for these preparation rituals we user tested prototypes of design interfaces we had developed, as well as engaging workshop participants in interviews, creative exercises and discussions regarding their current startup habits.



Participants engaged in creative workshop exercises

Workshop Discussion and Activities

The workshop began with a discussion amongst the group in response to a set of questions we gave them regarding their startup rituals. The lead facilitator asked them: “What are the most important and common actions or adjustments that you carry out before starting to drive?”. To instigate and stimulate discussion, a broad selection of images showing different in-vehicle actions and objects relating to startup rituals were laid out on the table where the participants were gathered. They then worked in pairs and were invited to enact their startup routines when using a shared-vehicle; beginning with when they enter the car, are preparing to drive and setting off on the road. They were encouraged to physically demonstrate their actions and indicate what objects are involved using the cardboard props we provided. The aim of this enactment was to prompt their memories in order to detail rituals they make and to observe any subconscious actions.

Participants Rituals in a Shared-Vehicle

When using a vehicle-sharing service the first action a user must make after booking the car is to locate, unlock and open it. All four of them said that placing their belongings, such as bags, which they put on the back or passenger seat or in the footwell next to them, was the next action. The participants then said that adjusting the seat was one of the initial actions they made after getting into a shared vehicle and most said that they checked the mirrors were correctly positioned. In the middle part of their routines people dealt with safety issues such as putting on their seatbelt and checking the fuel gauge or charge level. One of the last things they described doing was to connect their smartphone to the car, not only to charge it but so they could listen to music or podcasts. Most of the group said entertainment is an important consideration, which is provided by either music or podcasts set up on their smartphones, however, one person said she still uses compact discs. In the last stages of their preparations to drive, they turned on the satellite navigation (usually by using their smartphone via a



Images showing different in-vehicle actions and objects in relation to startup rituals for workshop inspiration



Participant describing startup ritual using props

“ I suppose you give yourself longer if you are going somewhere unfamiliar, because you are more likely to get lost ”

connecting cable or bluetooth), entered the destination address and checked traffic conditions. Nearly everyone that took part described how they spent time familiarising themselves with the in-car features and found where the various function buttons or switches were placed before setting off. Some of the participants described that they felt a level of anticipation and, in some cases, anxiety in relation to driving a vehicle they are not familiar with. The participants then described how they paused, took a moment, before finally setting off on their drive. Interestingly, they said their startup rituals vary according to the length of their journey and whether it was a familiar or unfamiliar drive. For a long unfamiliar drive people would spend time checking different parts of the car such as tyres, petrol level, water and oil before setting off. They would make sure to bring some form of map, usually on their phone and a phone charger. Finally, most participants mentioned being worried about time and would make sure to leave early in case they would get lost along the way.



Props: Objects to describe driving rituals



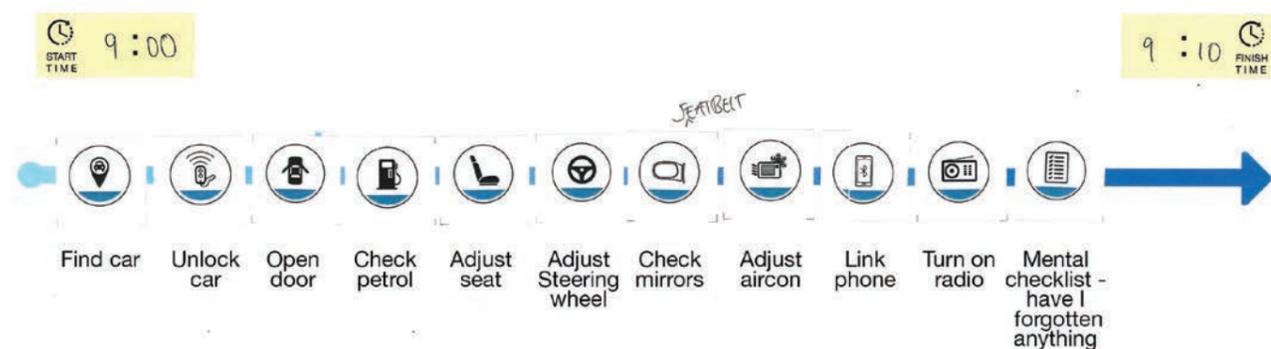
Participant describing startup ritual using props

Our Designed Startup Sequence for the video Ready...Steady...Relax

The startup sequence for a car-sharing scheme, which we made into the animated video Ready...Steady...Relax, begins by showing a user locating the vehicle, visually checking its condition, unlocking and then opening the car door, they then place their belongings accordingly and link their smartphone. Next they make various adjustments to being in the vehicle related to comfort, such as realigning the seat; and safety, for example, checking the mirrors are correctly positioned. The car is then checked to be ready-to-drive ensuring fuel or charge levels are adequate and any entertainment and navigation is set up. The last ritual preparation is to run through a mental checklist and take a moment before beginning to drive.



Stills from Ready...Steady...Relax video showing a driver's startup sequence in a shared vehicle



Startup ritual timeline made by workshop participant

Participants Building Their Startup Sequences on a Timeline

In this session we showed participants the video Ready...Steady...Relax, in order to provide context and conversation topics for further workshop activities. They were then given generic startup sequence icons of various objects or actions that could be associated with a startup sequence with text explaining what they represented. The participants were asked to organise them on a timeline to show their personal rituals and explain their rationale for doing so. Firstly, they marked the start and finish times, then they arranged the cards sequentially along the timeline according to what actions were involved and at what point. The startup procedures varied amongst participants but there were some similarities in the time they took to prepare before driving, the actions they made and the order in which they carried them out. We found that the rituals of different people were surprisingly similar. Out of the four attendees three estimated that they took ten minutes to prepare, however, one mother with children spent approximately twenty minutes doing so. The sequence designed for the video was simpler than those constructed

by the participants. They mostly agreed with the actions and procedures displayed in our video, but enjoyed adding their own personal ritual activities.



Participant building a timeline of their startup ritual

How This Service Could Work

We imagined that this service would be realised through the use of apps, lighting and sound. The user would download the app at home which would enable them to locate the vehicle, guide them towards it and the cars lights would be activated when they are close to it. The app would also allow them to open and unlock the vehicle. Lighting inside the car would suggest that they place their possessions while sound would confirm that their smartphone is connected. The car would have the capability to physically adapt to the user as it has biometric data regarding their physique and preferred driving position in the car, which could take place before they arrive. The vehicle would safety check itself to be ready-to-drive – fuel, charge and damage - with the information appearing as a checklist that only needs the driver's attention in the event of a problem. A screen would light up with options for both entertainment and navigation, which would disappear if unactivated. The last preparation before taking off on their journey would be to take a moment, prompted by ambient lighting, creating a sense of calm before driving.

Participants Responses to Our Concept

We asked if they would like a service such as this in a vehicle sharing scheme. They responded positively and saw the potential for having it, but only if it was delivered in a non-intrusive way.



Participants discussing desired startup services

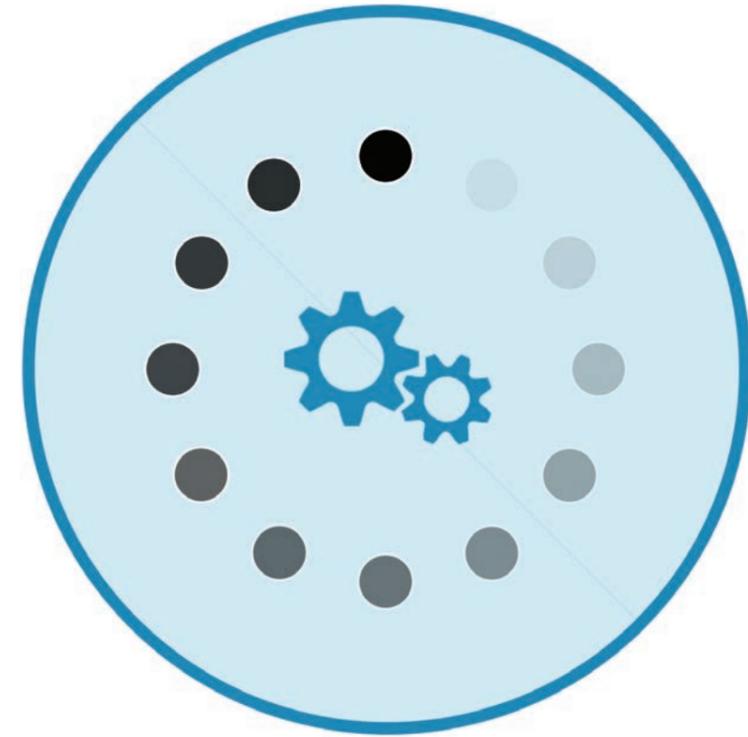


Participants Understanding of Our Startup Sequence Cards

They were then asked, “Was it easy to understand what the cards symbolised?”. In general they said they had understood what the icons meant, but there was some confusion and misinterpretation of one icon in particular, the ‘systems check’ icon. One group had interpreted this icon as being a control for the heating/air-conditioning, music/radio, windows or the Global Positioning System (GPS). The other group had assumed the icon represented ‘personal settings’ for music/podcasts, entertainment or comfort. This particular icon was, therefore, interpreted to symbolise a range of different actions. One person was unsure of the seat icon, which she had thought was for heating the seat. Lastly, they were asked about the colour coding we had used on the cards to distinguish between actions when the user is passive or active; participants had not noticed this and had no idea what the colours represented.

Startup Sequence Cards

We next showed them the four sequence cards that we had designed to represent in-vehicle prompts (see illustration right). One was concerned with comfort and represented making seat adjustments, a second represented route planning, a third was to illustrate a prompt for the car to check it's systems are ready to drive and the fourth represented a checklist for personal planning before starting to drive. The facilitators questioned the participants initially asking, “Did the designed sequence cards describe actions that you consider are important before you drive?” to which they all responded in the affirmative. Concerning the sequence of actions they agreed that the mental checklist should be the first or last thing to happen in the startup sequence. They were in accord again, agreeing that adjustments for comfort should be the second and after some discussion the two groups concurred that setting up the navigation system should be the last procedure.



“Systems check” icon unclear according to participants



Statup sequence icons



Startup sequence icons arranged on timeline by participants

What is Missing?

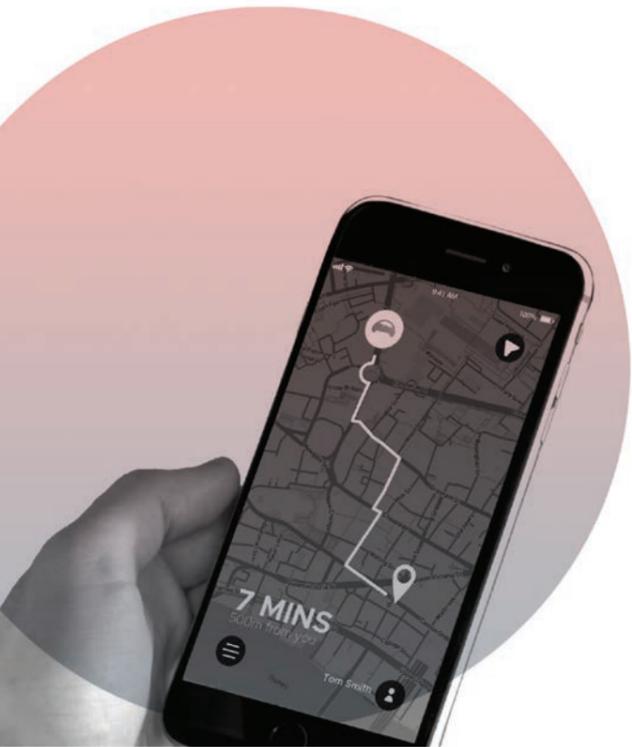
We asked what actions were missing in the startup sequence that they would like to add. Our designed startup sequence was simpler than those the participants had conducted themselves and they were mainly satisfied with the actions and procedure. One suggestion was to include fuel or charge level information to remind the driver to check before starting to drive. As we had learnt from the group discussion that the 'system check' icon had been incorrectly thought to represent a lot of different, unrelated actions, we thought this could explain why they did not think there were any actions missing from our designed startup sequence.

Would You Be Interested in a Service Like This?

We then asked participants if this was a service that they would be interested to have in a vehicle provided by a car sharing scheme. Their response was positive, they saw its potential and were interested in such a service, but only if it was provided in a non-intrusive way. Some reservations were aired about how much communication and interaction there would be with the car and how this would happen, with 'being told what to do' strongly disliked. Most expressed a desire be able to set personal preferences regarding how and what would be communicated. They could envisage how this service might become a nuisance.



Participants discussing preferences for vehicle communication



Conclusions

We concluded that people wanted to receive the information in an inconspicuous way that did not need them to actively interact with the vehicle. We learned from their feedback that our suggested startup sequence contains steps they consider relevant as part of such a ritual. However, there were reservations as to how they would like to interact and communicate with the vehicle, with a distinct aversion to being told what to do strongly felt by the participants. Clarification of the meanings of the icons was also mentioned as being needed.

Ready...Steady...Relax

After all the user studies we designed a concept to demonstrate users' preparation processes before starting to drive. This concept is presented in a short film Ready...Steady...Relax, which shows a user making themselves comfortable in a rental car that is part of a vehicle-sharing scheme. As the customer books the car through an app, their profile information and preferences – such as lighting, size of information on the dashboard screen, audio levels, driving

posture and biometrics is sent to the chosen rental car in order to better accommodate the driver. The app would enable the user to locate the vehicle, guide them towards it whilst the car's lights would be activated when they are close to it. It would also allow them to open and unlock the vehicle. Lighting inside the car would suggest that they place their possessions while sound would confirm that their smartphone is connected. The driver then accepts the pre-programmed posture adjustments as well as choosing from a curated selection of their favourite entertainment. The vehicle would safety check itself to be ready-to-drive - fuel, charge and damage - with the information appearing as a checklist that only needs the driver's attention in the event of a problem. A screen would light up with options for both entertainment and navigation, which would disappear if unactivated. The last preparation before taking off on their journey would be to take a moment, prompted by ambient lighting, creating a sense of calm before driving.



Interfaces from Ready, Steady, Relax video

9.

User Study and Design Inspirations - Journey and Time Perception

This was the second of our three user engagement workshops that we held after gathering public feedback on the concepts demonstrated through the videos and interactive displays that we exhibited at the London Design Festival 2018. This was to allow us to conduct research in people's driving related rituals and user test the prototypes we had made.

*Participants noting
long journey rituals*



Workshop Focus

At this workshop we focused on people's perception of time and their progression during long, unfamiliar journeys. We selected five participants on the criteria that, they lived in London, were different genders and were of various ages (between 23 – 64 years). In common they all held a drivers licence and had, at some time, made long, unfamiliar car journeys outside of London, which we defined as lasting over two hours.

Workshop Exercise

The workshop was divided into five sessions: participants emotions, senses and perception of time and progression on along unfamiliar journey; discussion around our moodboards showing visual representations of space and time; how participants track time on a journey; showing them our film *Driving Whisper*; an immersive light experience and user testing our in-car lighting system. Firstly, we asked participants to briefly describe a long, unfamiliar journey they had made with an emphasis on how they experienced it through their emotions and senses. We used this exercise to focus their thinking on the topic, acquaint themselves and to give each of them a concrete scenario to reference in the following sessions.



Participant explaining time perception during a long, unfamiliar journey

Emotions and Perception of Time on a Long, Unfamiliar Journey

In the second session we discussed the moodboards we had made, which consisted of images representative of space and time, also of progress indicators that are used on a variety of journey types, as well as pictures relating to long, unfamiliar journeys. The function of this collection of images was to inspire conversation, widen thought patterns and serve as reference points in the group discussion. Participants described a range of emotions that they had experienced when driving to an unknown destination some distance away. These included positive emotions such as curiosity, anticipation and excitement. Conversely, they also described negative feelings of apprehension, stress, anxiety, tiredness and annoyance.

Tracking Time on a Journey

Estimating the elapsed journey time when driving to a new location affects mood and emotions; anxiety about being late, stress and tiredness can contribute to loss of attention and lapses of concentration. Clocks, landmarks and navigation tools can visually show the progression of the journey, but they take attention away from the road. When questioned: 'How do you keep sense and track time when driving?' participants said they used indicators such as natural light, route information on apps or maps, signposts, as well as their own signs of physical or mental tiredness rather than using conventional clocks. The most used app was 'Google Maps'¹, but some mentioned 'Waze'² and 'Maps. Me'³.

1 <https://www.google.com/maps/@51.4968653,-0.19892513z> accessed 26/03/2019

2 <https://www.waze.com/en-GB/> (accessed 26/03/2019)

3 <https://maps.me> (accessed 26/03/2019)



Participant discussing moodboard with progress indicators



Emotions from Immersive Driving Light Experience

In the next session we gave them an immersive driving experience in a room we illuminated with different colours of light each lasting for three minutes. The aim was to measure participants emotional responses to a variety of coloured lights while simulating that they were driving. The room was set up with five seats facing a large screen on which we were playing a video with audio showing the view through the windscreen of a car driving. Each person was holding a prop representing a steering wheel so they could become immersed in the experience by imagining they were driving. They were asked to record their emotions after each coloured light had been tested, which were red, green, white, blue and yellow. After each coloured light had been shown, participants selected the three strongest emotions that described how driving in each light experience had made them feel. We used a black and white version of Plutchik's 'Wheel of Emotions'¹ to help them identify and choose what emotion they felt.

¹ Robert Plutchik. 2003. Emotions and Life: Perspectives from Psychology, Biology and Evolution. American Psychological Association.



User Testing Our In-car Lighting System

For the final session we displayed our prototype of an in-car lighting system designed by the team, which intends to give users a sense of distance and time during long, new journeys. The participants gave us feedback on their opinions of the light installation, considering the earlier discussions about perceptions of time and progression on a long-distance journey. We asked them whether they found the movement logical and if they could understand it intuitively. None of them felt that they understood what the light was trying to communicate, or what it was supposed to do, however, they liked it visually.

People did not think the movement of the light from the outer edges inwards, following a line into the middle, was logical. Some felt it was suggestive of the vehicle coming to a halt, or showed an intensity...

“*like turning the volume up or turning the volume down*”

“*I admire it but I don't really understand how it works... I think with a bit more context I might appreciate it more*”

Participants reviewing lighting system prototype

“ They were a bit too similar and wishy-washy. They were a bit hard to identify one from the other ”

However, people voiced several associations connected to the colour and shape of the light.

“ When the light vanishes into that small point it reminds me of driving on a motorway at night because there is nothing going on ”

When asked whether the colour scheme evoked how they would like to feel on a journey people found the colours beautiful and calming but did not relate them to driving. Some liked that they were subtle and gentle whilst others considered them to be weak and difficult to understand.



Participants reviewing lighting system prototype

Participants Feedback

They were then asked to contribute any suggestions towards how the shape, movement and colours might be altered to better suit the ideal driving experience. It was mentioned by several that the light was too subtle and abstract in its communication and could be more understandable if it was accompanied by other clues such as a voice or text on a screen. In considering the colours they all agreed to disagree with each voicing very individual preferences, ranging from a greater liking for muted, subtle colours, to preferring bright traffic light colours. Most agreed that whatever movement and colour was used, it should be consistent.

Conclusions

From the feedback we received we concluded that people would prefer some level of personalisation and choice in how time and the journey's progress is displayed to them. We identified two design directions: one offering a subtle, abstract sensorial experience and the other a more concrete interface with clear information and signalling. We learnt that people have a preference to have information located on the dashboard or steering wheel and that they associate the colours green and white with more positive, calm emotions. They want functionality, not gimmicks, more detailed information for long journeys and less so for short ones. People also liked some form of self-representation embedded in their interfaces; either precise images such as a photograph or something simpler, such as a dot lighting up on the display.

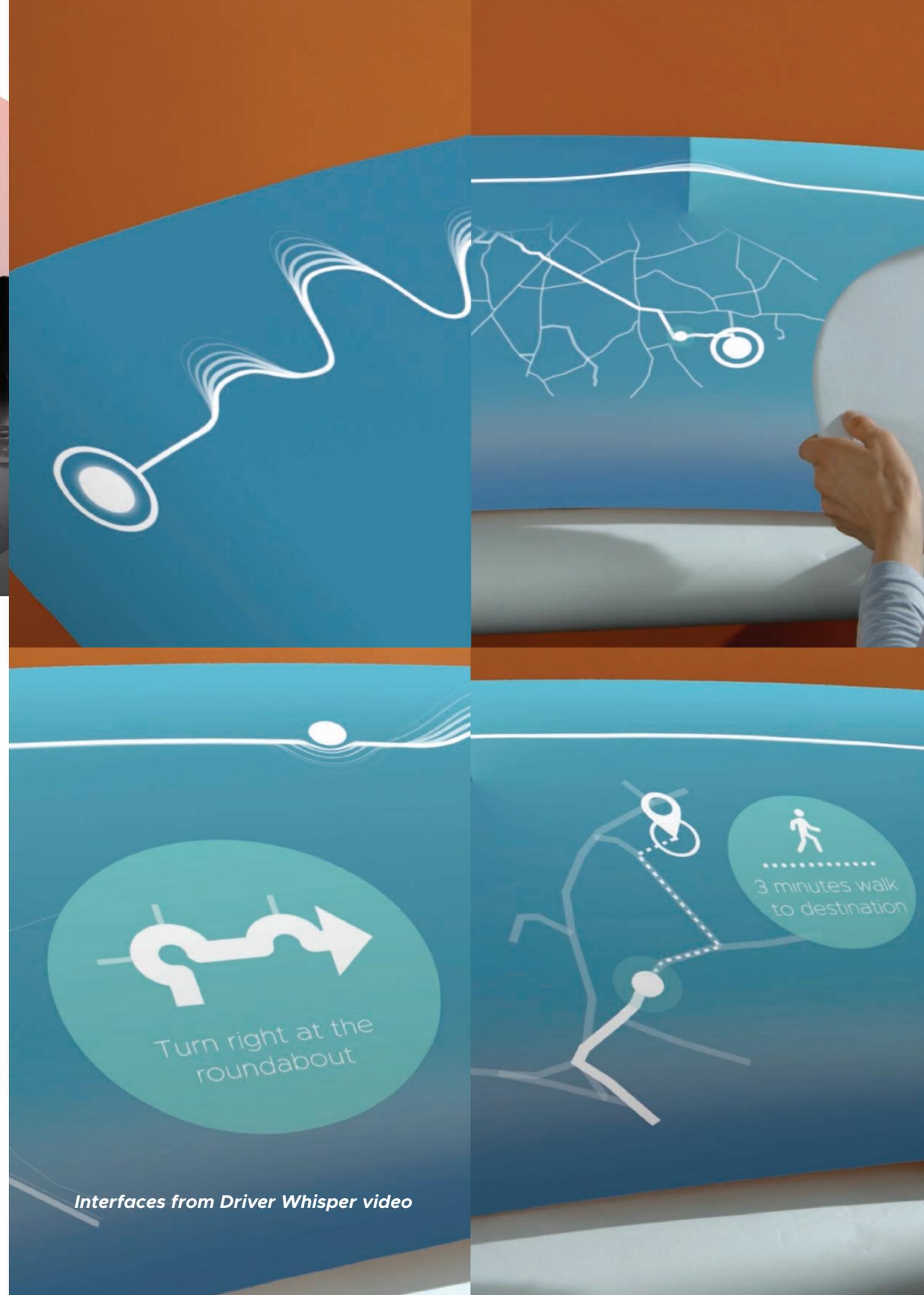


Participants reviewing lighting system prototype



Driving Whisper

After the user studies we designed a concept to demonstrate user's perception of time and progression on a long, unfamiliar journey. This concept is presented in a short film *Driving Whisper*, which follows the experience of a driver on such a journey. The driver enacts with a dashboard interface that is designed to provide them with a sense of time, movement and progression on their journey in order to relieve anxiety and increase their sense of control. The dashboard interface's simplicity, organic curves and soft colors provide only the necessary amount of information for the driver, and only when the information is relevant and needed.



Interfaces from Driver Whisper video

10.

User Study and Design Inspirations - Circular Vehicle Upgrading

This was the third and last of our user engagement workshops that we held after gathering public feedback on the concepts demonstrated through the videos and interactive displays that we exhibited at the London Design Festival 2018. This was to allow us to conduct research into users' relationships with their car and related rituals and user test the prototypes we had made.



Participants discussing car upgrade and customisation preferences

Customisation and Upgrade Car-Service Packages

We explored how automotive companies could build closer, long-term relationships with their customers by offering new car-service packages that include customisation and functional upgrades.

Changing Car Models

We found that people want to change their cars every three to four years for various reasons: these may be due to changes in their family life, end of payment plans, in order to upgrade technology and for just wanting to have something new.

Customisation and Upgrade Subscription Service

Having a subscription based service that enables owners to alter and refine their driving experience at key points during their ownership period, offers opportunities for increased revenue and the recovery of vehicle parts and materials to support a circular economy. Providing an engaging service model would allow customers to access and compare information on

sustainable material options that they could then select for their vehicle interior. This cycle could operate alongside the lease period of a new car, however, we have not determined the length of each cycle.

Tailoring Your Vehicle

The key factor in this scenario is that it allows people to adjust and adapt the vehicle to their needs after purchase, they can then 'tailor' the vehicle and be informed about material choices. It offers opportunities for automotive companies to continue to develop their relationships with their customers. We conducted this workshop to gain a better understanding of users' needs and their preferences in relation to a possible service package, and to user test an interface prototype designed by the research team for personal car interior customisation.



Participants discussing preferred Upgrade and Car Service Packages

The Participants

The five participants taking part in this workshop were of different genders and in an age range between 27 and 67. All of them live in the London area, regularly drive, own their own car and have owned more than one. They were all regular users of various subscription services such as entertainment platforms, car-sharing services, food boxes and gym memberships amongst others. Some of them had experience of buying a new vehicle through dealerships.

The Facilitators

The workshop was facilitated by three design researchers. One lead facilitator posed questions, kept time and managed the group discussions; another took notes of interesting comments from the attendees and supported the lead person; the third individual made audio and video content and took photographic records of the activities.

Upgrade and Customisation Preferences

The workshop was divided into four sessions: current car upgrade and customisation preferences; service option models; building their own service package and testing out interface. In the first session the participants discussed as a group the subject of current car upgrade and customisation preferences. When asked – ‘How often do you replace your car?’ – most of the participants said they did so every two to three years. One said she keeps hers for as long as possible, saying:

“*I tend to stick to a car until it's run into the ground because if I find something I like I tend to stick with it for a while*”



Participants discussing preferred Upgrade and customisation preferences

We next questioned them asking – what factors contributed to their decision to get a new car? The first topic that was discussed was depreciation value, with car mileage contributing to that, which seemed to be the main reason people buy a new car.

People were very aware of warranty, which was also connected to the depreciation value, with one explaining:

“For me it is the depreciation...I tend to try and get rid of it before it goes

”

“The warranty is a big thing for me because I am on my own and I don't know anything about cars

”

Whilst another said:

“If it starts to cause trouble and cost me money, then it's time to get rid of it

”



Participant describing the desire for a new car

Reasons for Buying a New Car

Participants described the desire for a new car as wanting a new product with improved technology to strengthen their driving performance. One said:

“
My main thing is technology so I want to buy a car that has all the technology in the car

”

Others in the group liked the idea of trying different car models:

“
So, I really like cars, so I just like to try different cars

”

Some people just simply like the idea of having the next model or something new; the way it feels and smells. But everyone agreed that reliability was extremely important!



Participant describing the desire for a new car

Favourite Features of the Participants Current Vehicles

They were then asked what parts of their current car they love and would like to keep, if they could? One mentioned automatic cruise control as his favourite function of his car:

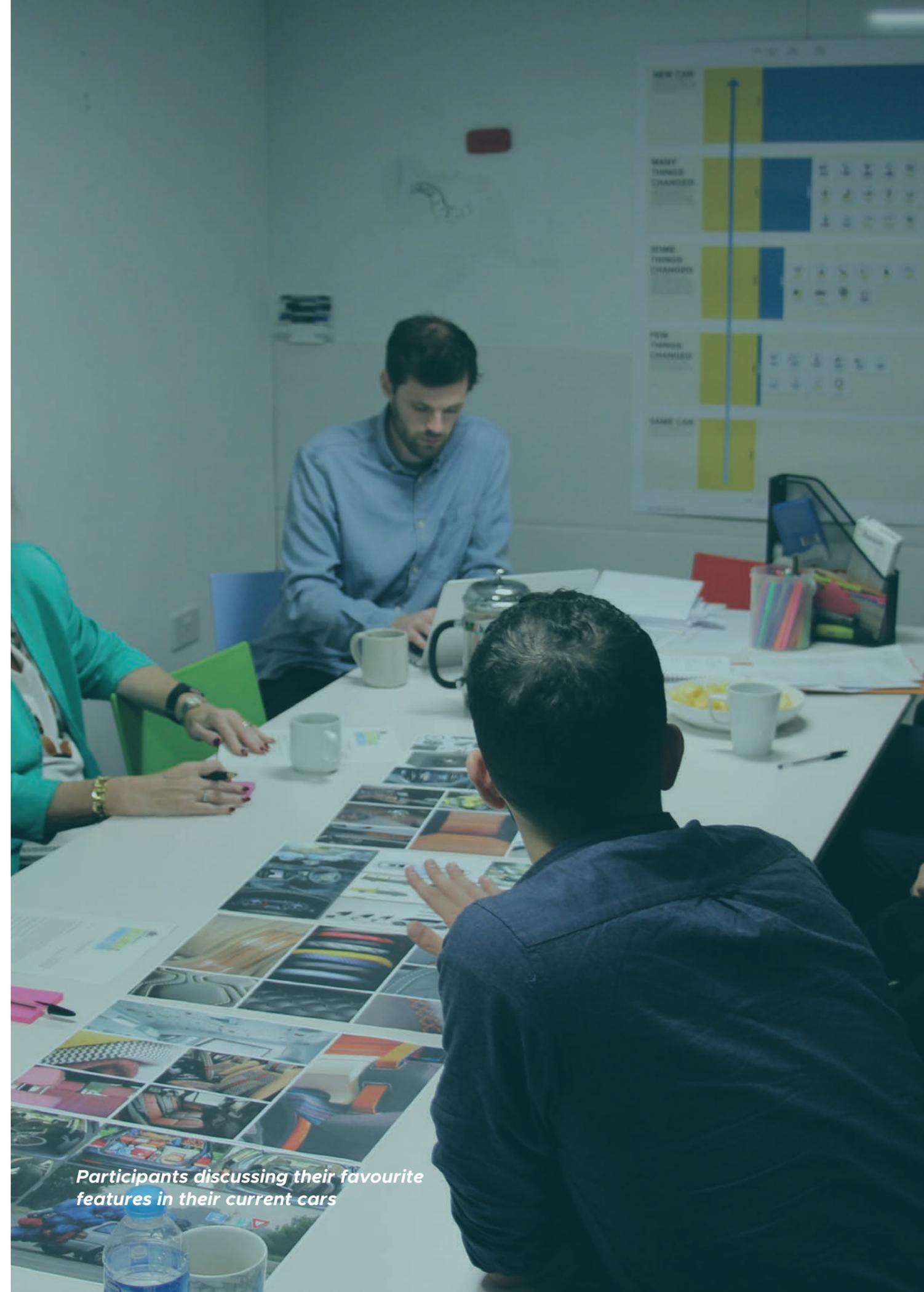
“
I have got automatic cruise control, and when in London there is so much traffic I can just turn it on and the car will drive and stop by itself. I will never buy another car without that feature - never ever!
”

Another explained her preference for a stick gear shift, saying:

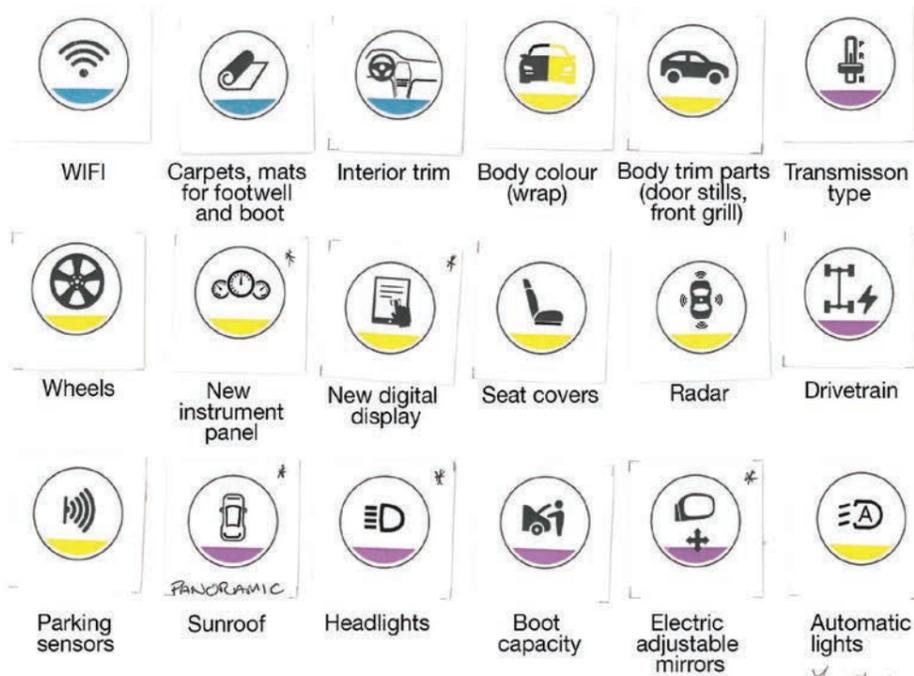
“
It gives you that feeling of power and control
”

Low emissions was important for another participant who would like this to be in a new vehicle.

“
I chose a car that has Euro 6 emissions because of... if you don't have the right emissions, then you have to pay £12.50 on top of the congestion charge if you are going to central London
”



Participants discussing their favourite features in their current cars



Example of personal ideal service package built by workshop participant

Happy to pay
£4000

Years

Blue £300
Purple £6000
Yellow £4500

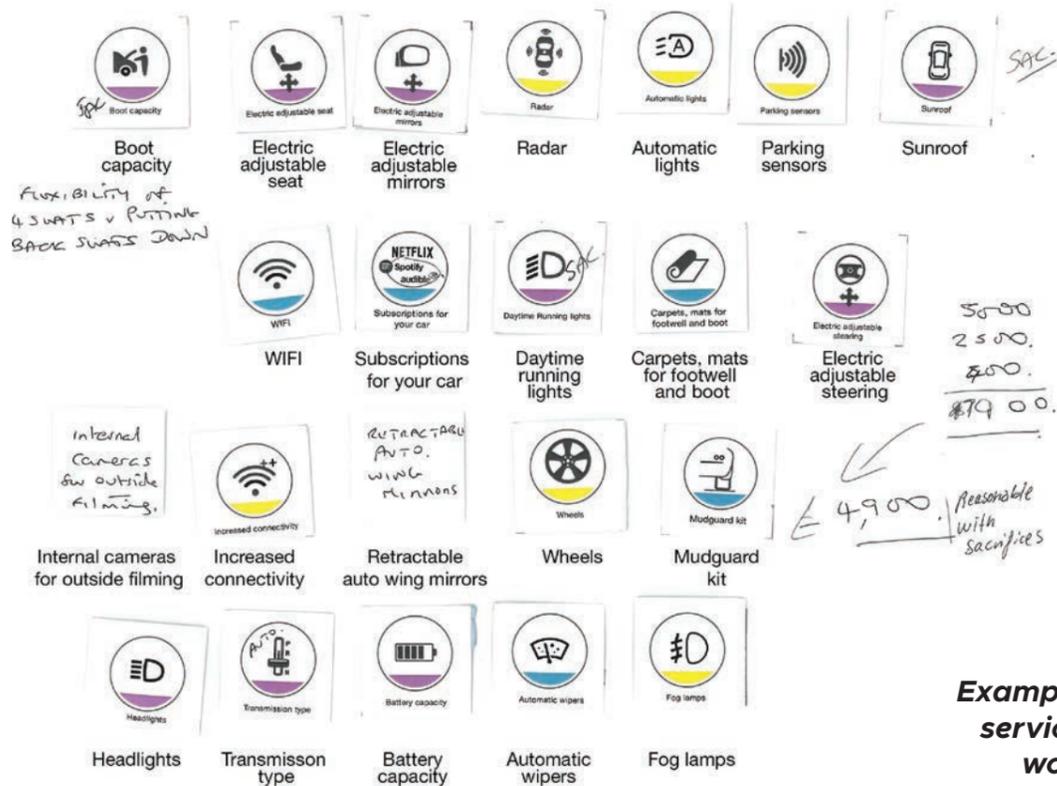
Building their Own Service Package

At the third session we invited them to build their own ideal service package. They were given sheets of white paper surrounded by A3 black frames. We provided depictions of car-part icons on small cards, which had a colour coded edge that related to the cost of the part or function. After fifteen minutes, when they each had built their desired package, we revealed to them the system of colour coding; a conversion chart that showed the cost of the icon card was also shared with them. We had three costing tiers - £££ = £1,000, ££ = £500 and £ = £100, which was inspired by the Japanese restaurant concept of 'sushi train'. The value of each person's selected cards for their package was calculated and the cost per year and then month was worked out. We only explained and shared this with them after they had built their packages so that we could discuss; why they had chosen the upgrades they had, then how they felt about the cost – do they consider it to be too cheap, reasonable or too high – and what they would be prepared to pay for their selected package?

The number of upgrades that individuals chose varied between ten and twenty four. The most popular were for having adjustable electric seats and mirrors, automatic lighting, radar, parking sensors, Wifi connectivity as well as carpets and mats for the footwells and boot areas. They often also mentioned upgrading the body colour and drive train.



Participant building their own ideal service package



Example of personal ideal service package built by workshop participant

Cost of Service Packages

The initial packages that had been picked fell in the cost range of £5,600 to £14,200. Participants then edited their selections which reduced the cost range to between £5,600 and £6,900. Most people were comfortable paying around £4,000, with one saying she was happy to pay £6,900 to upgrade her car.

Frequency of Upgrade

The discussion then shifted to the frequency upgrades may occur, which depends on which ones are being considered. Some may be relevant after six months and others after two years; additionally they would be dependant on the existing features of the car. We concluded that this complicated the ability to calculate a tailored subscription package as there are several unknown factors in the equation. However, it appears that there is a strong interest in upgrading and personalising privately owned cars.

“When I first looked at the price I wasn't very happy... but a lot of the things that I selected are things that I don't need to change... I would be happy to pay around £4000 for the package.”

“Practical things are more important than the glitz.”

“Like when they brought out the 5110 Nokia phone where you could change the face...”

“So a car could be designed so that it is very interchangeable...”

“There is a lot a stuff that comes on cars that you don't want, that you don't care about... So it's nice to have that choice to say; I don't want any of that but I want this...”

Testing Our Interface and Feedback

At the last session participants were asked to test an interface design for the selection and customisation of materials that we had developed. Tablets were installed with software, which allows people to select their preferences by hovering the device over a variety of material samples. Information such as the method of manufacture, country of origin and recycling opportunities for each material was displayed on the screen. The aim of this was to ascertain how relevant they found the information and how easy they found it to access it. After everyone had tried using the device they answered a set of questions in relation to their experience.

Firstly, we asked what information they would like to receive, the participants main concern was the durability of the material, if it is easy to keep clean, whether it is environmentally considerate and if it ethically sourced. When asked if having such information would influence their choice it seemed that if a material was ethically sourced that would sway their decision. One person said:

“
You could have a quality material and for me the difference between whether it had been ethically sourced or not would swing my decision
”

Participants, in general, liked the idea of having the opportunity to understand what they were buying, one described it as follows:

“
It's good to have an understanding of what you are buying ... To have some kind of framework for cost and value ... If it suits your beliefs about being sourced ethically
”



Participants testing tablet interface design for customisation of materials

We then asked them whether they would prefer a pre-designed package rather than having the ability to select your own from so many options? They all agreed that they preferred more choice if it is delivered in the right way. They all were very enthusiastic about playing a more active part in the design of their car.

Concerning the interface design, we asked them if they had found it easy to use and understand; they all agreed that they found it clear and that it was user friendly. They were positive about the application interface and the opportunities for having information provided about the materials, a concept they found exciting. They also mentioned the importance of touching, or feeling the materials and smelling them in order to make the correct choice.

They suggested they would like to see the chosen material applied to the relevant car parts in virtual reality, one person said:

“
The ability that you could see what this (material) looks like wrapped on a seat...Because it might look great here but wrapped on a seat it might look terrible
”



Material options for customisation displayed on table during workshop



Lastly, an option to have some sort of intelligent shopping assistant system in the app was discussed. People indicated that they would like some form of styling and material suggestions but at the same time they were also aware of avoiding the app making assumptions on their behalf, filtering options out and therefore limiting what they could have. One participant said:

“
I don't want to be put into a little box because of what I like...I want to be an individual
”

Another person suggested that a questionnaire could be useful to establish and then filter material options according to the preferences given. This idea was elaborated on further by another attendee:

“
What I would like to be able to do is to cut from say, one hundred down to have like four or five then you could smell and touch...I think that helps you focus on the ones you like without having to go through for hours
”



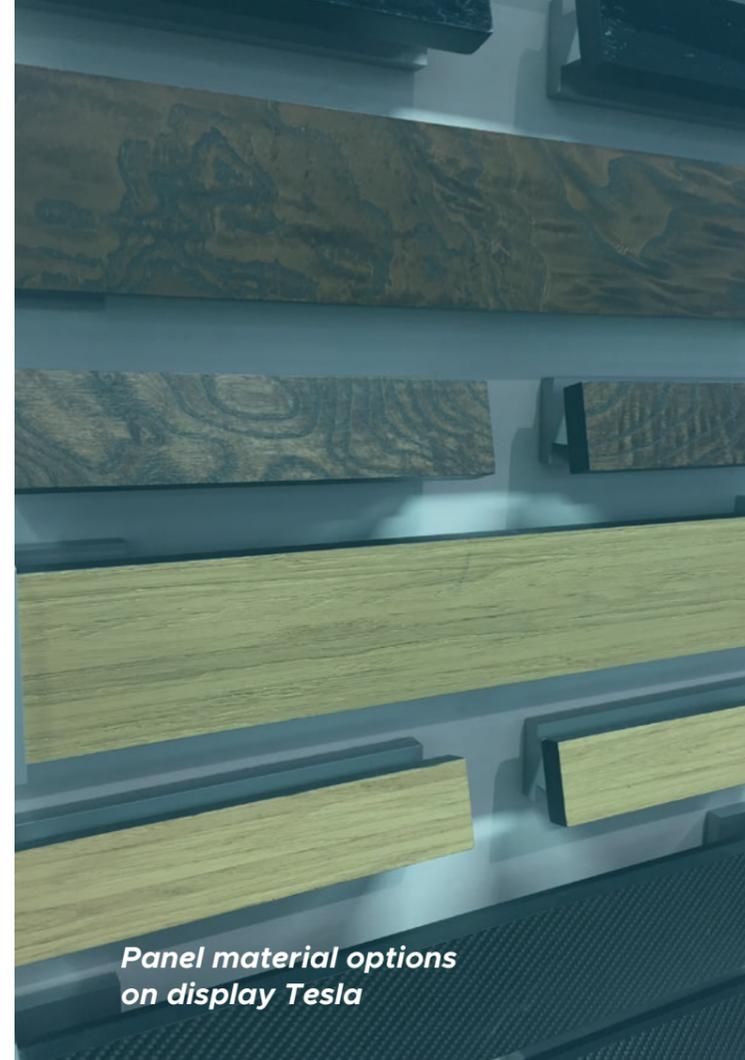
Participants testing tablet interface design for customisation of materials

Retail Market Research

To investigate contemporary customer experiences when purchasing a new car we visited car showrooms in London. In particular we looked at customisation offers relating to aesthetics and purchasing options. We went to three showrooms: Hyundai, Land Rover and Tesla. We also visited a Nespresso flagship store to look for inspiration from a different retail experience.

The three vehicle showrooms we visited were set up in a similar way: each had their various car models on display that potential customers could experience by sitting inside them; they also had wall displays of material samples and available colours to select from; and large touch screens which customers could interact with to look at customisation options and personalised payment plans. The customisation choices by all three brands offered exterior colour options for the car-body. Tesla limited the colour range to seven; Hyundai and Land Rover offered more. Tesla had the most options for interior customisation that included the seat coverings, decor and headliners.

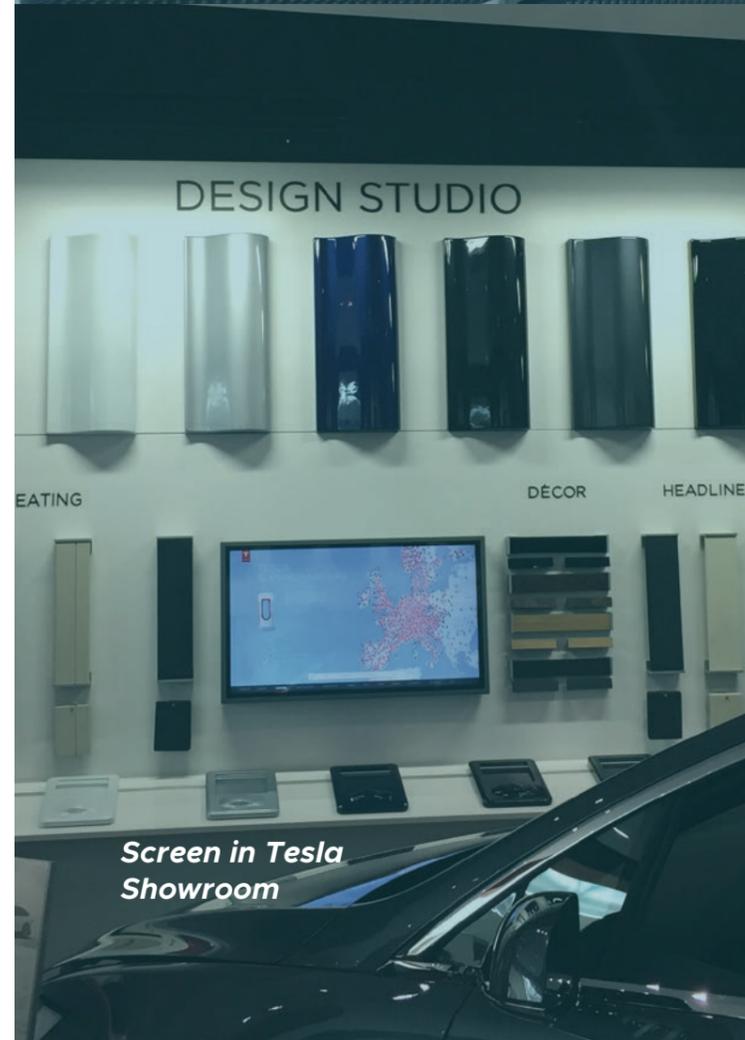
Our experiences visiting the brand's digital showrooms were varied: Tesla's was simple yet sophisticated, offering customers the opportunity to digitally edit a vehicle and then see a photorealistic visualisation of their customisation choices. They also offered a choice of sunroof, wheels and performance of the motor as part of this virtual experience. In addition they offered premium packages with extra service and technical upgrades. Hyundai provided a different service, customers could select from a large set of criteria for their vehicle, they were then presented with a selection of cars generated by the website. The emphasis was focused on price and functionality in relation to customer needs in order to find the correct model rather than customisation; they were also offered a personalised quote.



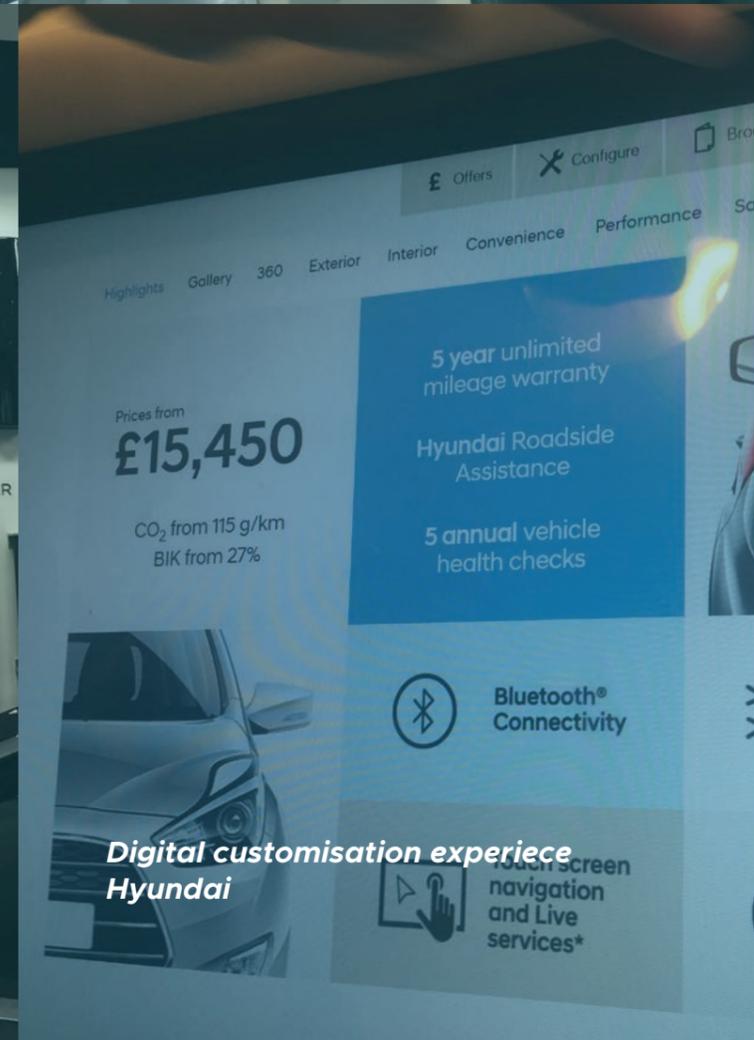
Panel material options
on display Tesla



Body color options
Hyundai



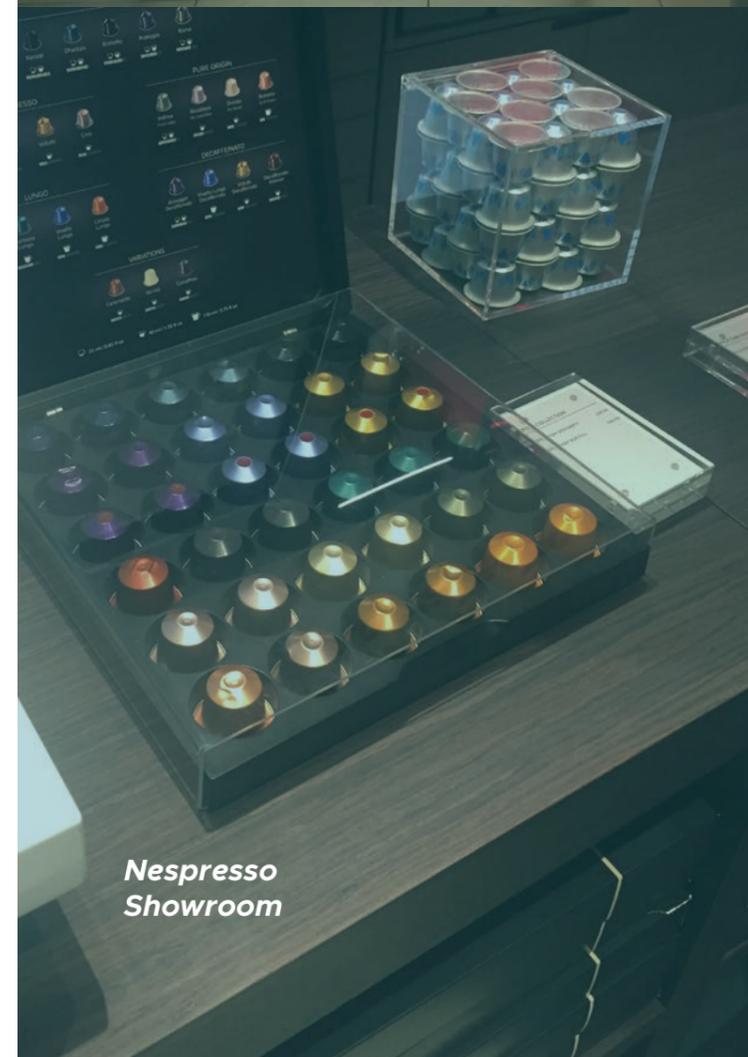
Screen in Tesla
Showroom



Digital customisation experience
Hyundai

The Nespresso store was presented in a comparable way to the car showrooms we had visited; different coloured types of coffee capsules were displayed on the walls and touch screens were available for people to customise their preferred coffee machine. They also offered a sensory experience in a 'Tasting area' where the barista gave samples of different types of coffee to the customers.

We concluded that the showrooms offer fewer options for consumer customisation than we expected. As 3D printing is freely available and companies such as Nike offer customers the chance to personally design their trainers we were surprised to see interior and exterior customisation limited to a few vehicle parts and a small range of colours. We see the potential for the implementation of technologies such as VR or AR as well as introducing sensory elements to connect the customer more to the car models in their showroom experiences.



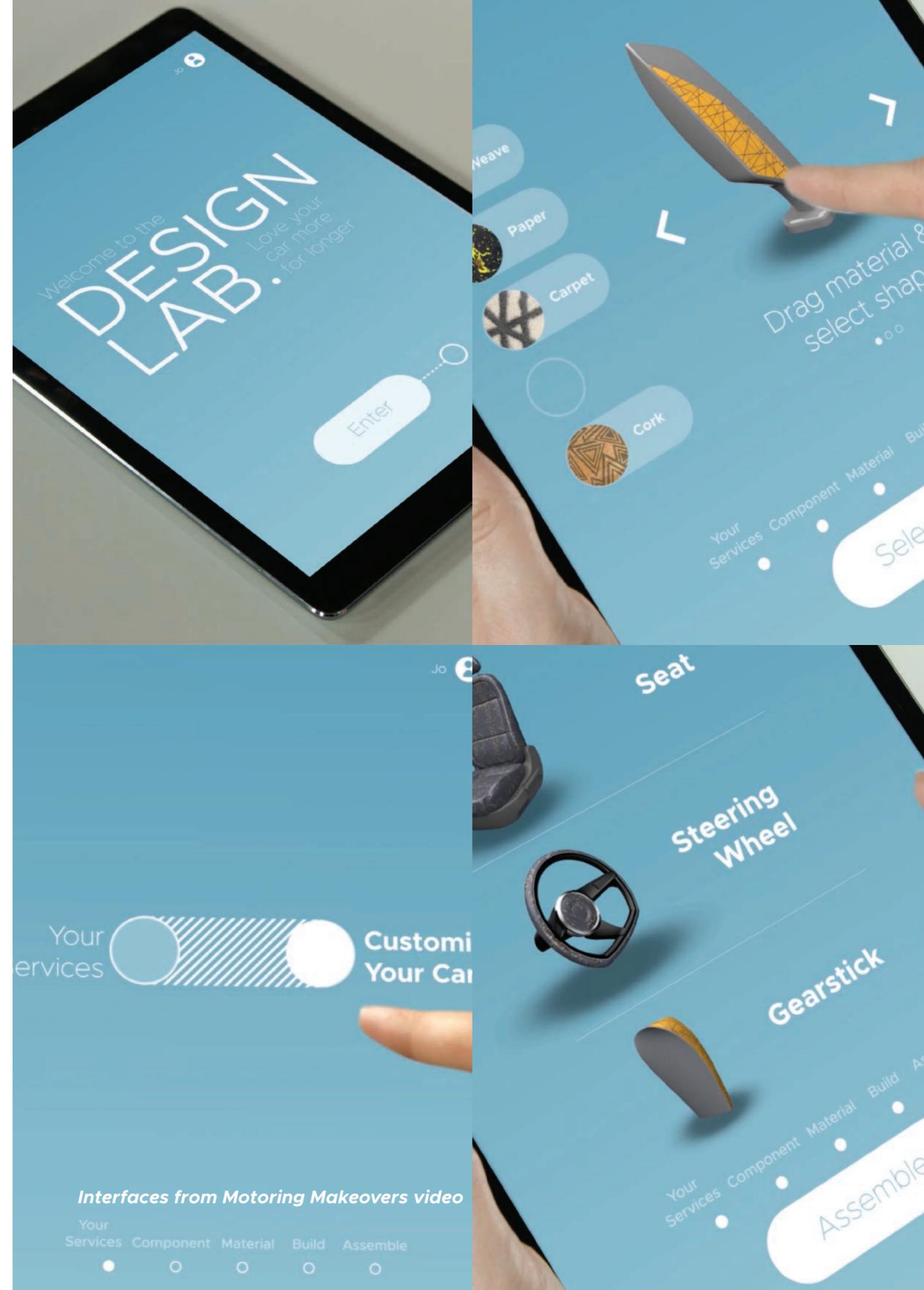
**Nespresso
Showroom**

Conclusions

In conclusion participants were very interested in having the opportunity to upgrade and customise their vehicle. Most would be content to upgrade rather than purchase a new car if that would save them money. The next steps that need to be explored are to identify exactly what would be involved to achieve such a service and to establish what the right price points would be for users to select upgrading rather than purchasing a new car.

Motoring Makeovers

After all the user studies we designed a concept to demonstrate how a vehicle user would set up their package to enable them to select services as well as customise materials and parts in their car interior. This concept is presented in a short film *Motoring Makeovers*, which shows a user building their bespoke package for a variety of car-services, annual technology upgrades and options for customising specific parts. After setting up their service package they continue to modify parts of their car by choosing new shapes and virtually applying materials on them. As they hover the tablet over the different materials available, they are offered information about the material's origins, manufacturing methods, associated ethics and sustainability factors. In order to review the outcome their selections are visualised while the individual parts and materials are assembled into their car in virtual reality.



Interfaces from Motoring Makeovers video

11.

Potential Research and Design Opportunities

Our three design concepts show how we think technological innovation could be used when designing vehicles and related services in order to support the customer. We specifically focused on improving user experiences, addressing their emotional challenges whilst driving and how the car and its connected services can adapt to accommodate changes in their lives.

Through our research we gained valuable insight and findings which suggest that through identifying subtle emotional shifts and what causes them when driving, we are able to look for feasible solutions from technology and subsequently design user friendly interfaces. We envisage numerous opportunities to build on this research, in particular - looking at people's emotional challenges regarding navigation, journey preparation and the use of shared vehicles. Additionally, we are interested in understanding how we might design vehicle services for a circular economy from a material's perspective and how

this would operate. Next we outline possible related topics for us and our readers to consider and possibly make into new research projects.

1.

To inform satellite navigation interface design, a study could be conducted to understand how different people recognise and memorise route information. Workshops could be held where participants would be challenged to find their way to an unfamiliar destination using only hand drawn maps which they produced after briefly referencing Google maps before leaving. This could lead to useful insights of people's mapping ability.



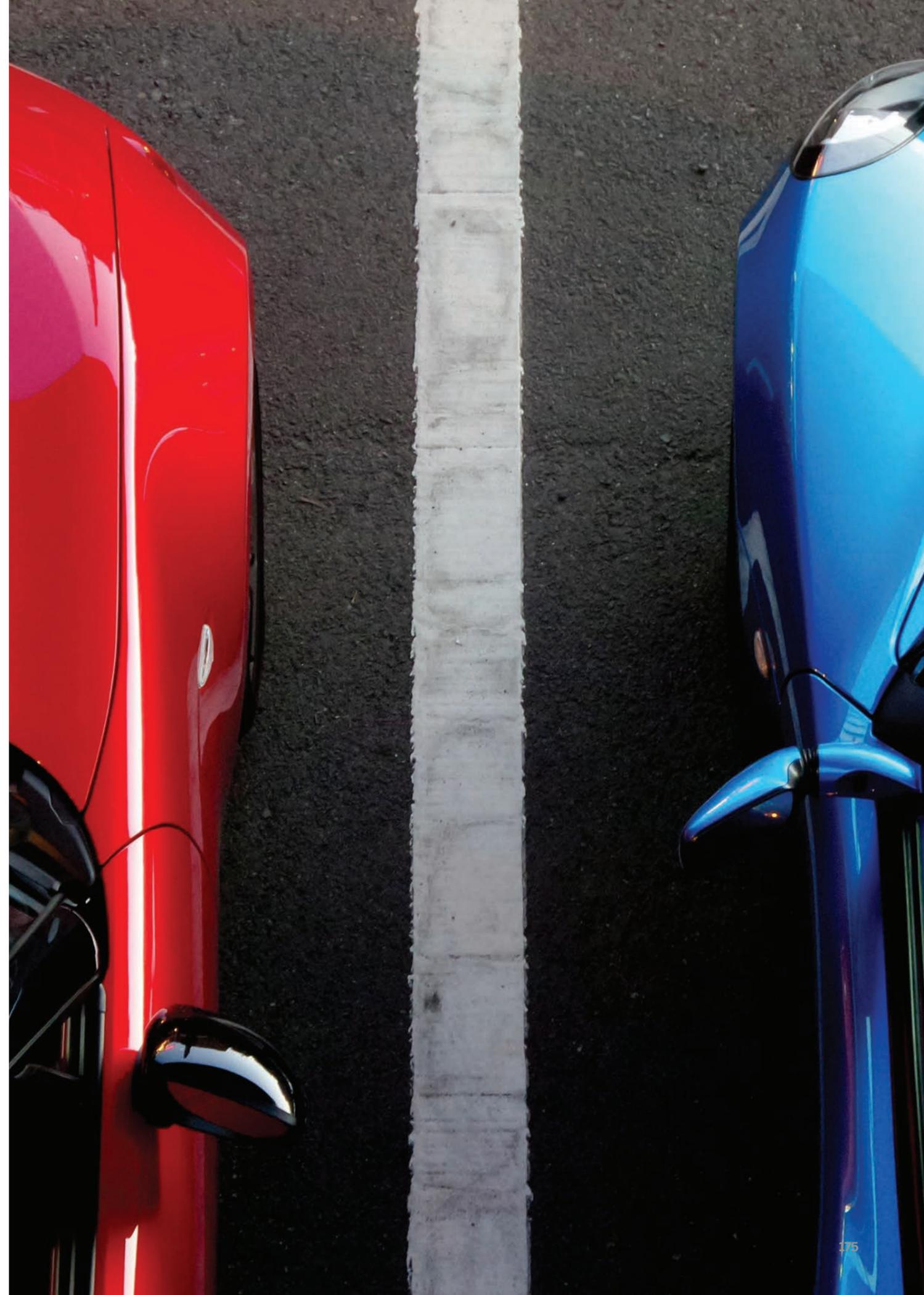
2.

As people's views on ownership change new models emerge and we see a shift towards a sharing economy. An exploration into the barriers that prevent or reasons that encourage people to use vehicle-sharing services could be conducted. Research into how friends and neighbourhood communities share vehicles could be carried out in order to develop scenarios and user case studies to support the design of future vehicles.



3.

To encourage the move towards circular and sharing economies an investigation into how vehicle owners, who may want to keep their current vehicle, could upgrade physical components, technological functions and apps. Exploring the challenges and possibilities of new services like these could help automotive companies participate in a circular and shared economy.



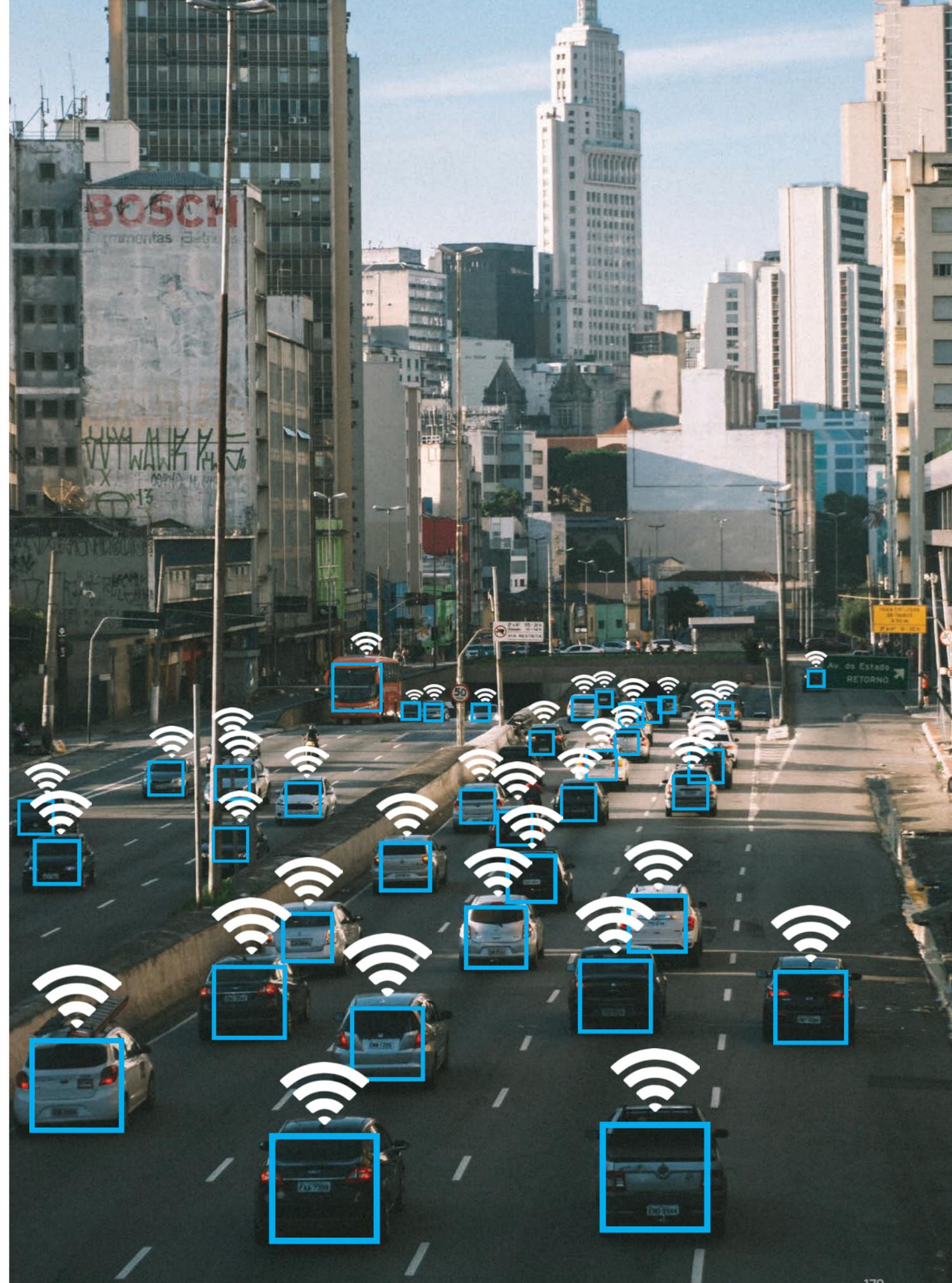
4.

Considering parking restrictions in cities and special user needs, such as disabilities, research could be conducted in order to design seamless journeys that offer door-to-door solutions in owned or shared vehicles. Investigating social networks might play an indispensable role in developing this, including peripheral services, such as apps for spotting an easy-to-access parking space.



5.

A study could be conducted into autonomous vehicle and human operation systems with a focus on giving control back to users. Before autonomous vehicles become ubiquitous and legislation is changed, users will still have to make critical decisions overriding driverless technology. Practical research subjects might include; how end-users might want to control the car when a high level of autonomy is available and how user behaviour might change from one level of autonomy to the next.



Appendix

Defining Ritualistic Driver and Passenger Behaviour to Inform In-Vehicle Experiences

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Abstract

By discovering unconscious ritualistic actions in everyday driving such as preparing for the morning commute, we seek design opportunities to help people achieve critical emotional transitions such as moving from an anxious state to relief. We have gathered and analysed data from workshops and phone interviews from a variety of vehicle and public transport users to capture these key ritualistic scenarios and map their emotional transitions. Design ideation is used to generate concepts for improving the in-vehicle user experience through redesign of vehicle layout, environment and analogue and digital interfaces. We report a set of human-centred design approaches that allow us to study the details of action, objects, people, emotions and meaning for typical car users which are indispensable for designing driving experiences and are often overlooked by the car design process.

Author Keywords

Ritualistic experiences; design ideation; driver and passenger experience; user groups; scenario mapping.

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Example Future Driving Scenario Rituals

Social or technology trend:

In 2025 more people could use vehicle sharing services instead of owning their own car, a potentially even more attractive model as society ages.

Scenario: An elderly couple who live in south London are driving to a location they have never been before in Oxford. After getting into the car, they spend 10 minutes in the front seats organising the area to make themselves relaxed and comfortable for the journey, preparing for things that might happen that they are looking forward to and that they are afraid of.

Ritual achievement: The emotional transition rituals help the couple feel safe and calm. The ritualistic organisation enables them to set their expectations and prepare for the unknown journey.

CCS Concepts

Human-centered computing: Human computer interaction (HCI): HCI design and evaluation methods: user studies

Introduction

Our research is rooted from a vision of using 'emotions as affective artefacts' [7] to explore human vehicle experiences as 'artefacts are instrumental in problem-solving, decision-making and sense-making; users generate emotion as a way to minimise errors, interpret functionality, or obtain relief from the complexity of a task'. The objective of this research is to address emotions as conduit for problem solving such as relieving stress and understanding prompts and buttons, delivering sensations such as the joy of driving, and serving as a basis for decision making such as '*Should I keep my own bubble to exacerbate my loneliness while driving?*' and other emotional transitions. Rituals for vehicle driving experiences emerged and attracted us as an unexplored area of automotive design with rich potential for improving driver's and passenger's emotional states. Ritual has grown from its traditional and religious roots and been extended into today's lose organised routine behaviour and habit as it has been argued that 'Many current definitions of ritual are unsatisfactory because they myopically restrict ritual experience to religious or mystical contexts' [5]. The ritualistic driving experiences we define in our research are repeated, symbolic and meaningful behaviour or performance to help emotional transition, reduce stress, refresh and reset the mind. Rituals are performed in a particular order whether ancient or modern, religious or secular. In the context of drivers or passengers, they use order to create comfort, feelings of safety and provide a

sense of control. Our research aims to identify several key ritualistic driving scenarios with rich design opportunities to improve driver and passenger's experiences by managing emotional transitions.

Ritual, routine and habit

Rituals are often performed without deliberate thought to the rationale that guides them. They are 'functional through their performance, apart from their content' [2]. Ritual 'alleviates human anxiety' [3], and aims to 'get those (repeated) actions right' [4]. 'Rituals can be grand, dramatic things or personal ones. Either way, rituals help people to understand the world, cope with transitions, express strong emotions, and build their own life story' [8]. Ritual can be a 'collective sense of identity and integration among participants' [1] which forms social activities and experiences and can be very personal in everyday life. Commonly people use 'rituals' interchangeably with 'routines', but there is an important difference: unlike routines, rituals have meaning. Ritual is about moment, narrative, meaning, gestures and sequence. Habits are behaviours that people repeat and are the 'invisible architecture of daily life' [6]. In an automotive context habits include fastening a seat belt and making sure the lights are switched off after turning off the engine. Our research to date has found ritualist driver and passenger experiences are mostly focusing on settling into the car, turning on music, tidying up and cleaning the car.

Methodology

In order to identify key ritualistic driver and passenger scenarios, we conduct telephone interviews, enactment and ideation workshops, and will follow up with shadowing observations. These methods are structured to involve users in the vehicle experience design

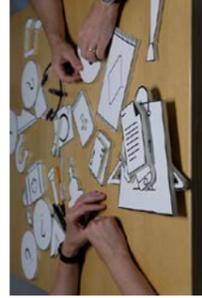


Figure 1: The cardboard props workshop participants choose and used for enacting their Journey.



Figure 2: Workshop participants showed what objects they carry for their everyday commute.



Figure 3: Journey map template participants completed with facilitators after enactment workshop role playing sessions.

process with researchers and designers, recalling and reflecting on their journey details.

Telephone interviews to capture what people think about ritual/routine experiences in general and specific ritualistic experiences regarding their daily transportation were performed with 21 drivers and public transport users (11 male, 10 female, 20 to 80 years old). The twenty-minute interviews covered transport scenarios including commutes, social travel, long distance travel, driving with children and car rental.

Enactment workshops looked for specific examples of ritualistic repeated behaviours that people perform before, during and after journeys. Six participants were invited in the workshops. Each workshop participant works with a research facilitator to go through a particular journey using a journey map template (figure 3) and are asked to recall a journey, name it, and identify events and times within it. The sessions include three layers of investigation to understand participant's driver or passenger experiences in depth. The first layer covers conditions of the experience such as time, action, place, objects (figure 2) and people. The second layer looks at the senses involved and emotions triggered. The third layer is for facilitator and participant to explore the meaning of the ritualistic experience such as purpose, meaning beyond function, and significance within the participant's life. Six people representing typical demographic groups from experienced driver to new driver, cyclist to walker have so far participated. They were asked to bring an object related to repeated personal or meaningful habits when they travelled to the workshop. During the workshop, they shared stories of rituals related to or beyond the object. Then they were asked to choose cardboard

props (figure 1) together with the object they brought to mimic the physical movements of their journey. After the enactment session, they sat down to fill in a journey map template with the facilitator and talked about the meaning of the shared ritualistic experience and reflect on achievements.

The ideation workshops immerse designers with evidence of ritualistic transport experiences collected at the telephone interviews and enactment workshops to generate future facing scenarios for individual or socialized driver and passenger experiences taking into consideration changing technology and social trends. Follow up shadowing observations will be conducted as we identify gaps in the narrative of behaviours outlined by participants at enactment workshops. This additional detail will be used to complete the descriptions of journeys and their rituals as described to the investigators and fed through to the designers using these detailed journey maps to inform their work. Such subprojects include redesigning the layout of driver's operational environments including dashboards, central consoles and other reachable items, as our understanding of the sequence of actions as drivers prepare for driving and organise their environment in the context of their rituals improve.

Initial findings

Telephone interviews

Telephone interviews were used to understand the generalities of how people think about rituals in life and transportation and to design the enactment workshops. The findings capture a cross section of the experiences of users of public transportation and drivers of private cars, a small selection of which can be found in the sidebar on the next page.

Example telephone interview findings

Where are rituals being practiced?

Car based rituals (38%)
 Other transport rituals (23%)
 e.g. bus, tube and cycling
 Non-transport rituals (39%)
 e.g. preparing an overnight bag, reading before sleep

When do rituals happen?

Before journeys (41%)
 During journeys (52%)
 After journeys (7%)

Popular drivers of ritualistic experiences

Preparation and sense of accomplishment (43%)
 Time to myself and emotional transition moments (33%)
 Power to control (33%)

Enactment workshops

Four example ritualistic scenarios related to driving and passenger experiences are briefly described below, with detailed information about their significance for mind resetting, mood transition, everyday life and wellbeing currently being collected to support future design work.

'Daily Me Time' refined from a 40-minute regular journey as a mother drives while listening to a podcast to pick up her daughter. She describes this as 'me time' and 'a nice way to end the day'.

'Escapism from everyday life' refined from a 4-hour long distance trip with one hour of preparation split between the car and home for a couple and their two daughters. The preparation becomes ritualistic as the organisation of food and childcare items creates calm, satisfaction and relief. The ritual conversation between the couple is described as time 'getting back to us', 'a therapy session' and 'getting rid of daily cr**'.

'Building confidence for driving' refined from a 2-hour stressful driving lesson. A learner driver describes coping with anxiety by arranging personal belongings, comfortable clothes, and minimising instructor conversation to aid concentration, and she always wants to look good after the stressful lessons.

'Control and safety' refined from a daily commute, the driver's ritualistic actions include switching on the satnav, dashcam, radio, head-up display and cleaning the windscreen and windows to make himself feel happy. 'I take care of the car, so it takes care of me'.

Ideation workshop

The ideation workshop ran with seven designers and researchers, generating scenarios illustrating step by step how people achieve good driving and passenger experiences, inspiring designs to fulfil their

unarticulated needs. Emotional transitions, journey preparation and 'me time' were selected from the interviews and enactment workshop as directions requiring more consideration. The designers identified four future facing themes around which to sketch image-based ritualistic scenarios for informing future design opportunities for automotive design:

'Negotiation and conversation space' designs for improving how drivers and passengers dynamically interact within the front seat space.

'Mental planning and space preparation' design opportunities for settling drivers and passengers physically and mentally in the vehicle, connecting them positively with the upcoming journey.

'Playful in-vehicle actions' addressing opportunities to use vehicle spaces to encourage people to interact with inner surfaces, sounds and the outside scenery.

'Extension of driver's body' design opportunities for improving driving interfaces such as the steering wheel, pedals, gear stick, and heads up displays.

Future work

The design research team will address the four ideation workshop generated scenarios through designs which are then prototyped to test feasibility. Follow up shadowing observations will be used to better understand driver and passenger's step by step actions and difficulties. The prototype designs will be interactive objects and video demonstrations to communicate the design for ritualistic driver and passenger experiences to help the research team gain feedback from stakeholders such as automobile companies.

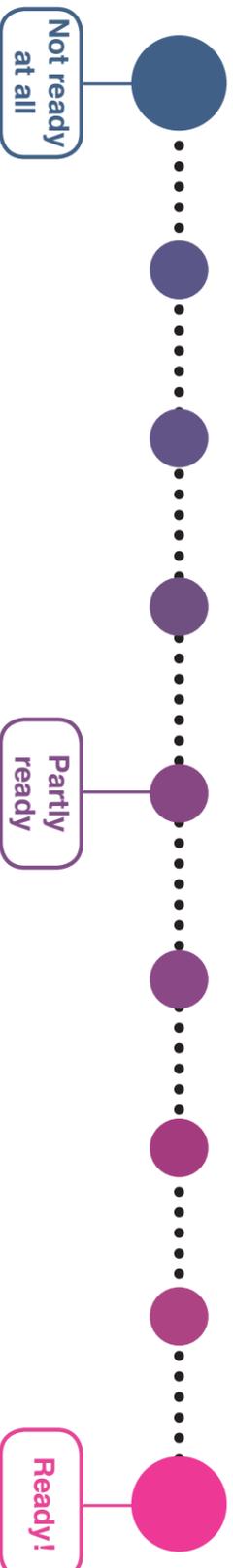
Acknowledgements

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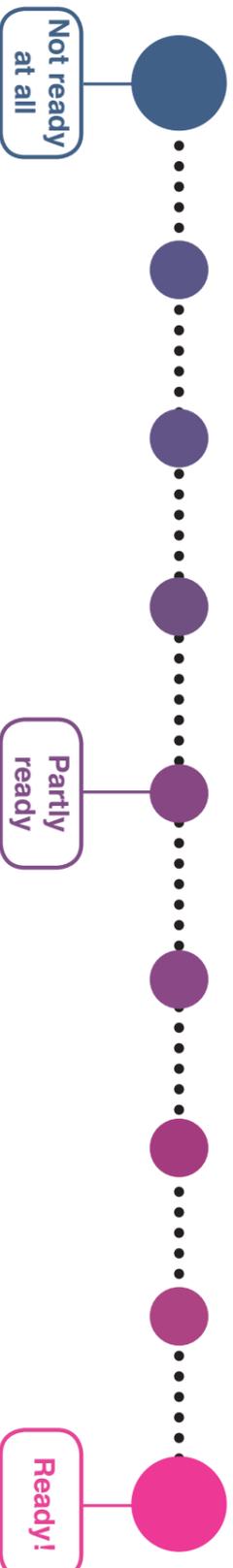
How ready do you feel for _____
at the destination of this journey?



Name: _____
Date: _____
Time: _____
Place: _____
Weather: _____

Research Tools for Driving and Passenger Related Rituals

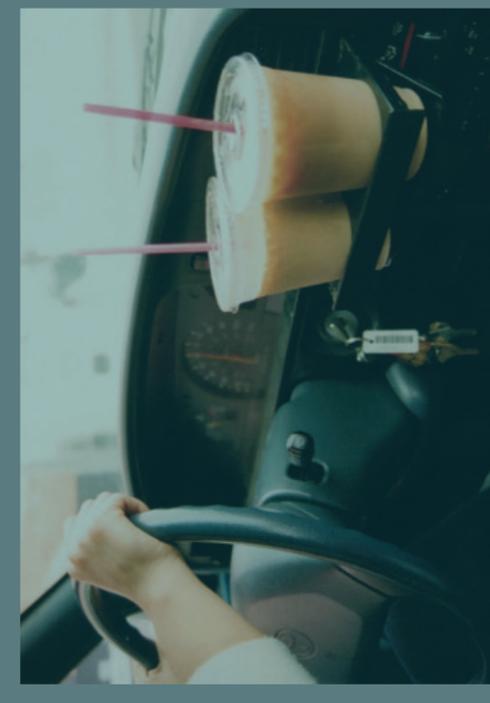
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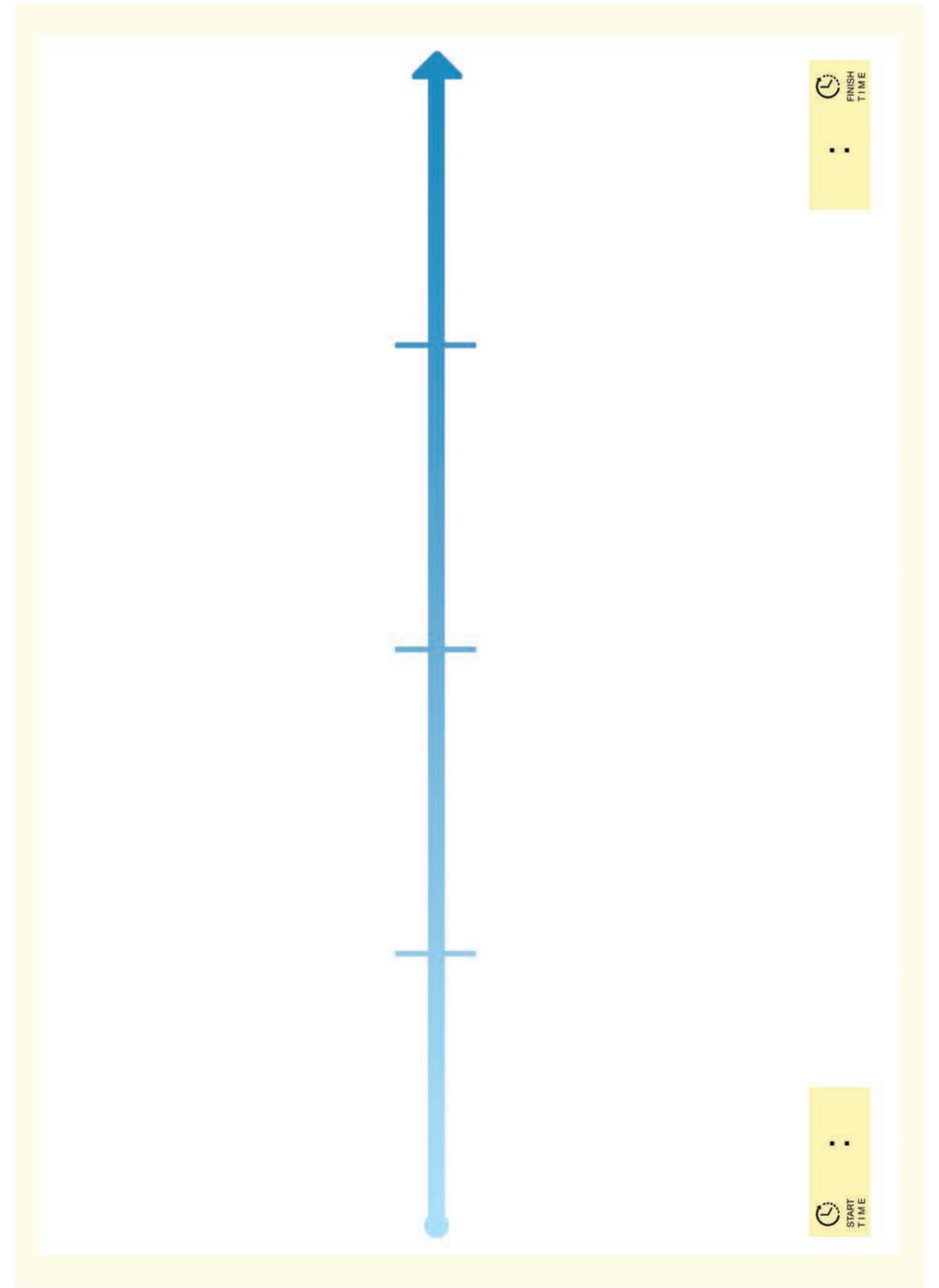
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Research Tools for Driving and Passenger Related Rituals

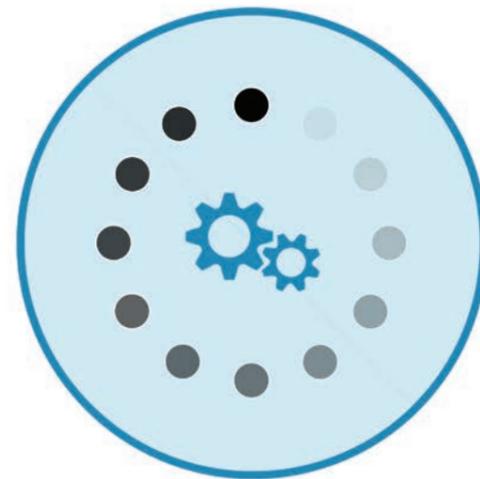
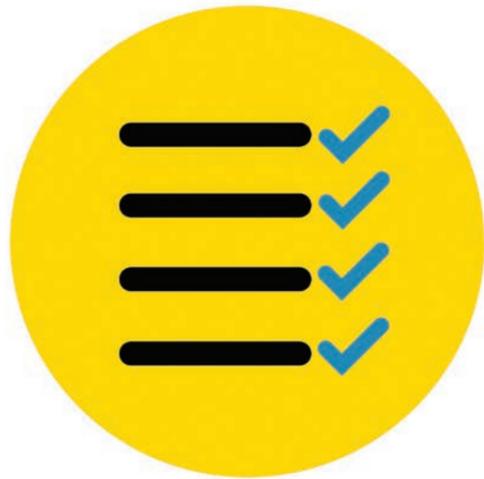
Workshop Tools for Pre-Journey Preparation



Workshop Tools for Pre-Journey Preparation



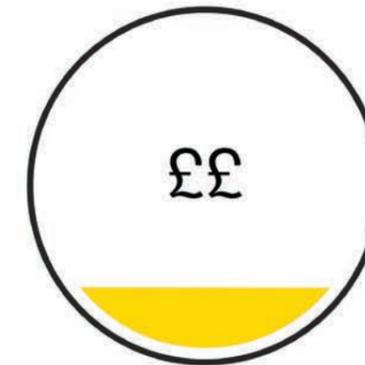
Workshop Tools for Pre-Journey Preparation



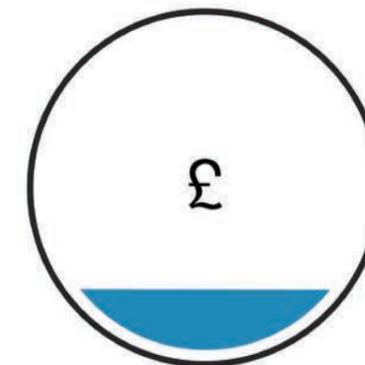
Workshop Tools for Circular Vehicle Upgrading



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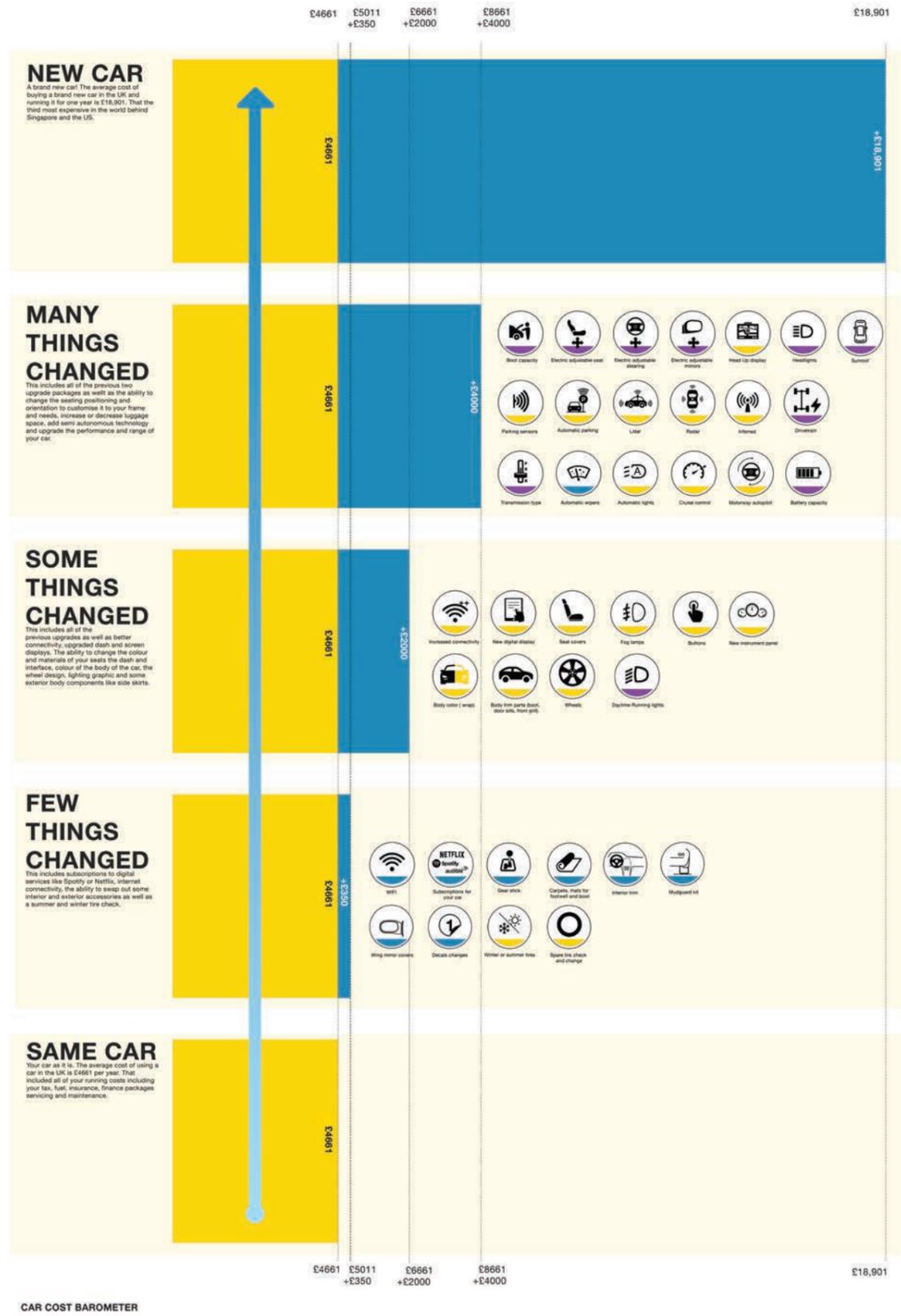
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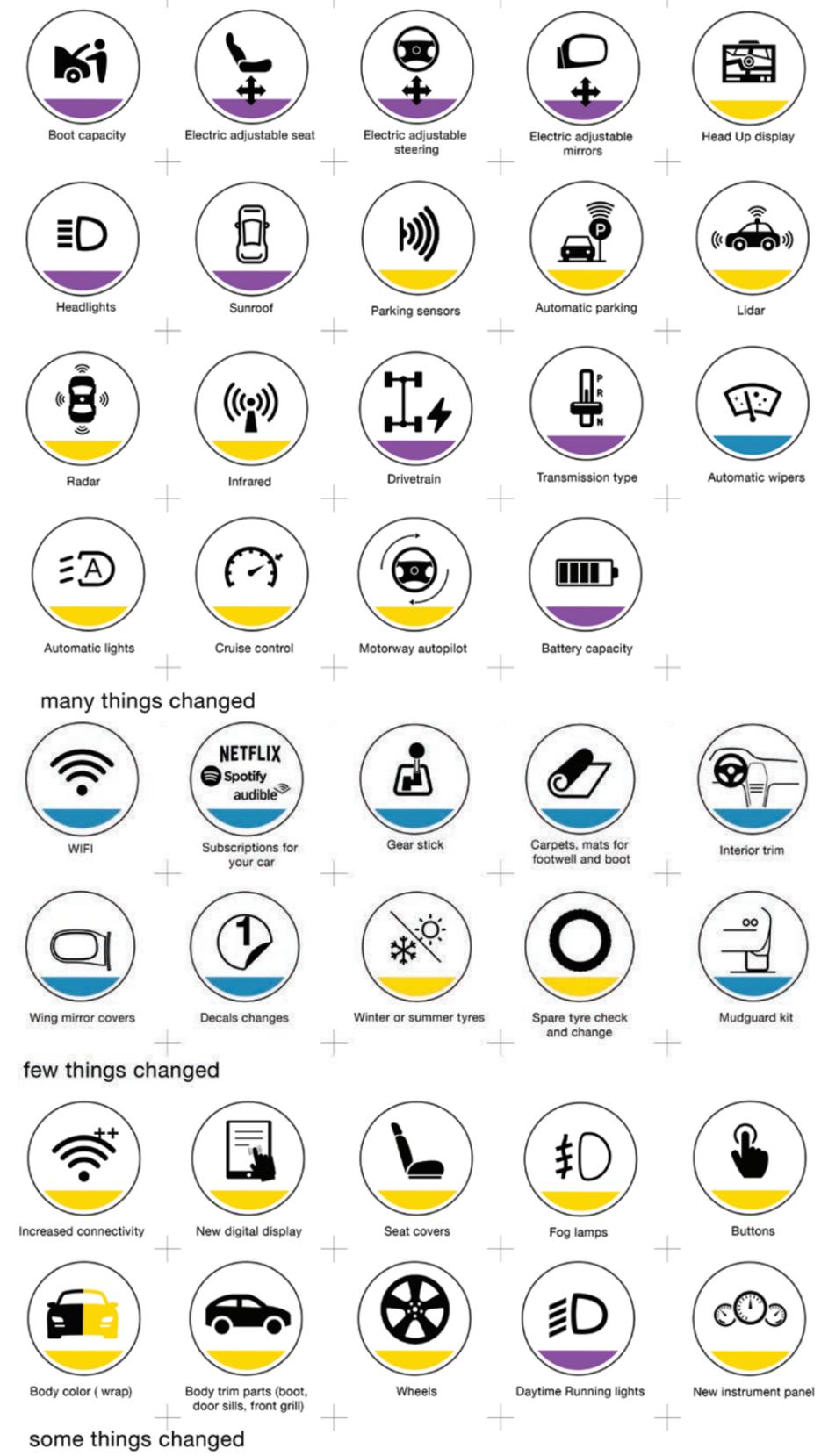
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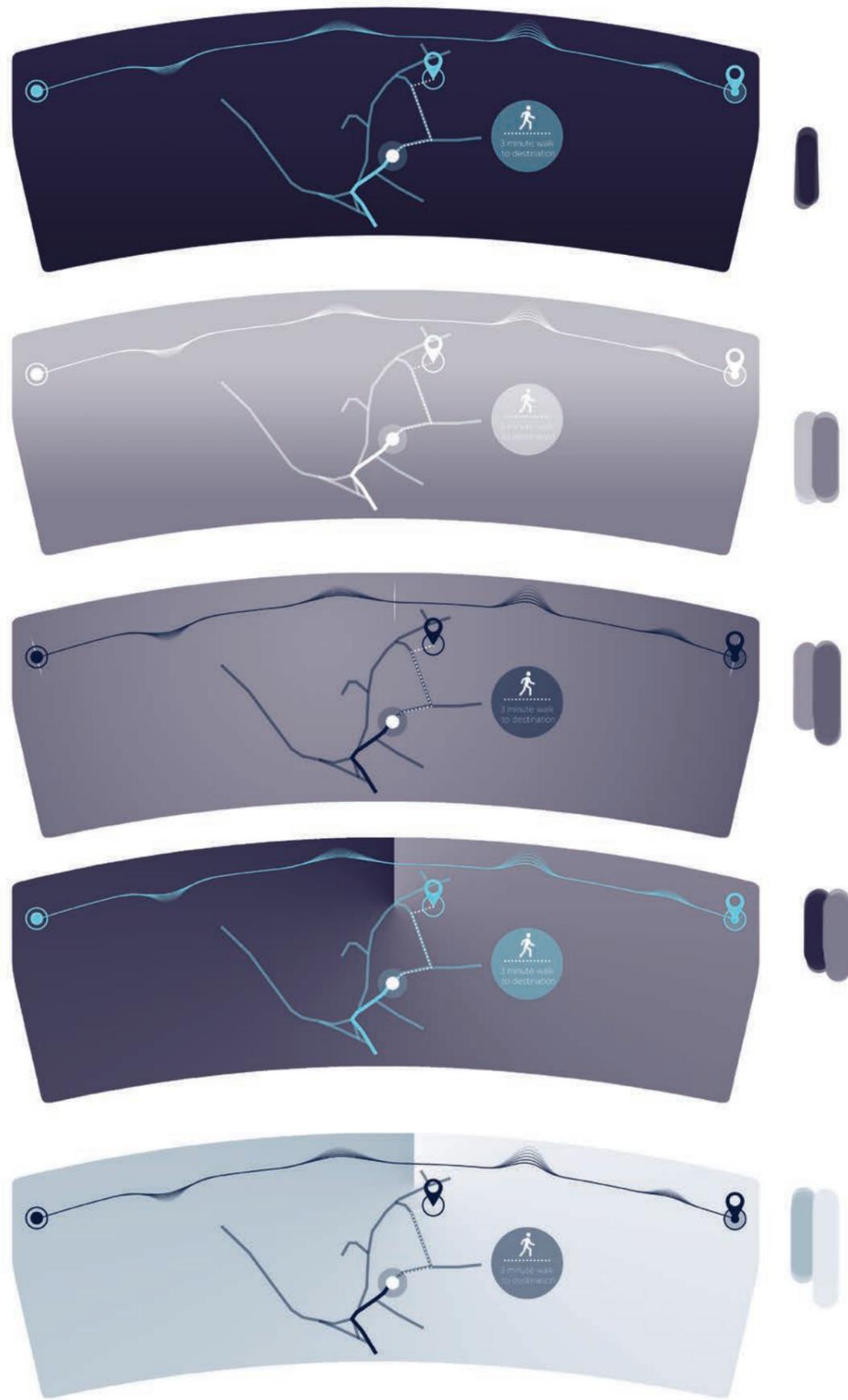
Estimated costs per item

Workshop Tools for Circular Vehicle Upgrading

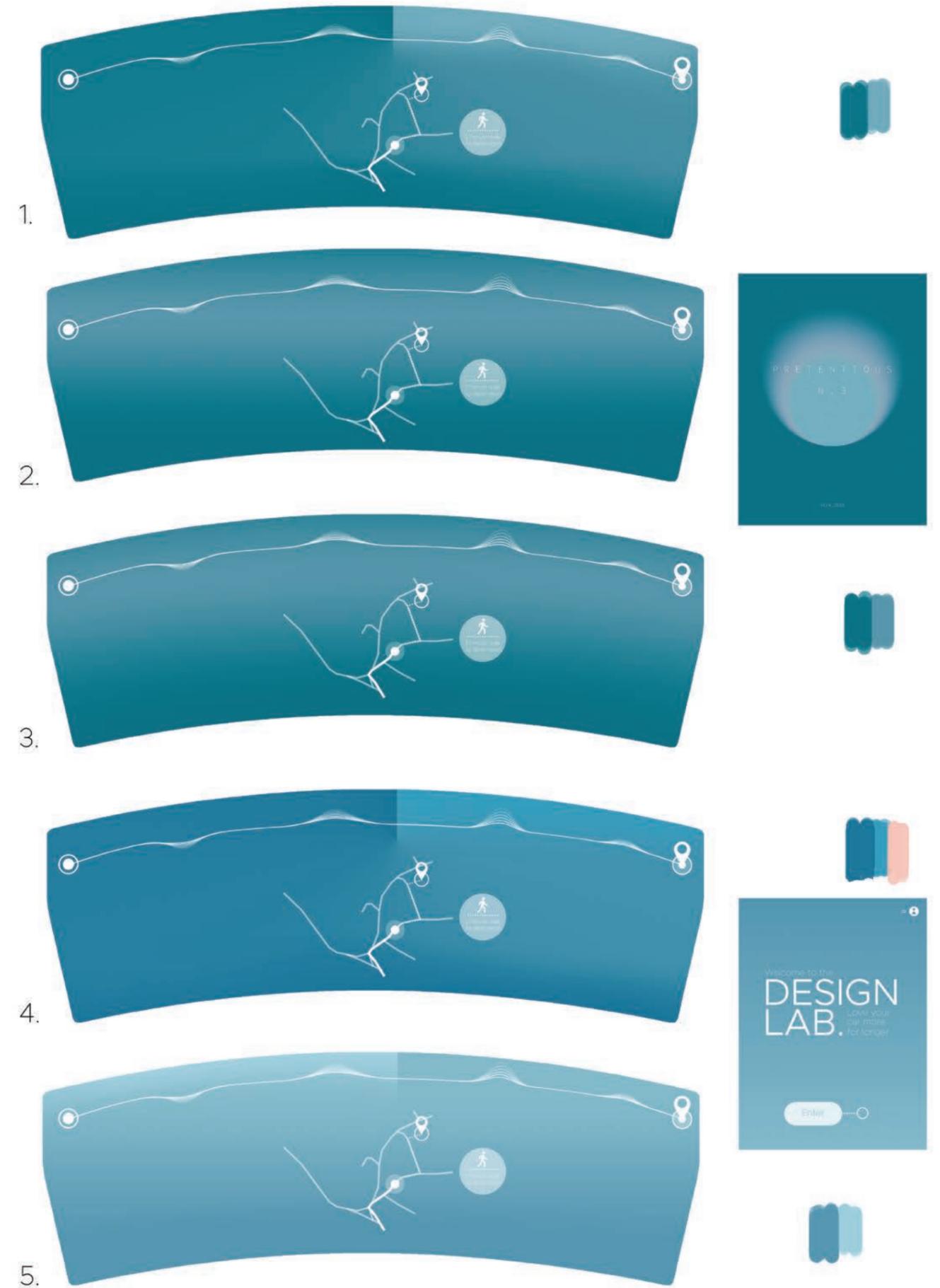


Workshop Tools for Circular Vehicle Upgrading





Dashboard design iterations - Concept Development



Dashboard design iterations - Concept Development

Supported by:
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