GATEway workshop analysis

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Content

1.Summary

This report outlines the results of our first public participation workshops for the GATEway driverless vehicle project, carried out in July and August 2016.

We held eight workshops with technology enthusiasts, people with additional needs, drivers, non-drivers, the general public and professional stakeholders.

The activities included pre-workshop questions that provided a baseline understanding of people's attitudes towards journeys around London and prior knowledge of driverless vehicles; an opportunity for people to share their hopes and fears for driverless vehicles; and a co-development activity that gave participants support in designing and making their 'dream' driverless experience and vehicle.

Outcomes from the workshop included a better understanding of people's underlying attitudes and concerns together with a series of opportunities and challenges that designers and other professionals should consider when developing future vehicles, services and city infrastructure.

2.Objectives

The objective of the workshops were to understand the following research questions:

> **a. What are people's perceptions and attitudes towards autonomous vehicles that will be important when designing for acceptance and adoption?**

> **b. How might the design of autonomous vehicles influence people's perceptions and attitudes to make acceptance and adoption more likely?**

3.Methods

a. Participants

With the support of TRL, we recruited 109 people to attend eight late afternoon workshops in Greenwich, London. In order to ensure a range of views, we selected people who fell into the following categories: Drivers, Non-Drivers, Enthusiasts, Professional Stakeholders and those with Additional Needs. Five of the workshops were focused on these specific groups and 3 were open to people from any category.

DRIVERS	NON-DRIVERS	ENTHUSIASTS
PEOPLE WHO DRIVE TO WORK	PEDESTRIANS	TECHNOLOGY ENTHUSIASTS
PEOPLE WHO DRIVE THEIR CHILDREN	CYCLISTS	DRIVING ENTHUSIASTS
PEOPLE WHO DRIVE AS PART OF THEIR JOB	LOCAL RESIDENTS WHO DON'T DRIVE	DRIVERLESS CAR ENTHUSIASTS
LOCAL RESIDENTS WHO DRIVE	CHILDREN, TEENAGERS, YOUNG PEOPLE	SCI-FI ENTHUSIASTS
PROFESSIONAL STAKEHOLDERS	ADULTS WITH NO LICENSES OR WHO CANNOT DRIVE	ROAD INFRASTRUCTURE ENTHUSIASTS
	PEOPLE WITH ADDITIONAL NEEDS	PUBLIC TRANSPORT ENTHUSIASTS
INCLUDING TRANSPORT & URBAN PLANNERS		
DELIVERY COMPANIES & OTHER PROF. DRIVERS	LIMITED MOBILITY	
TAXI DRIVERS	HEARING IMPAIRED	
CRIMINALS / POLICE	ELDERLY	
MOTOR INDUSTRY PROF. /JOURNALISTS	VISUALLY IMPAIRED	
SERVICE & UX DESIGNERS, ENTREPRENEURS	CARERS & PEOPLE THEY CARE FOR	
INDUSTRY / ACADEMIC EXPERTS		
EMERGENCY SERVICE PERSONNEL		
CYCLING & PEDESTRIAN ORGANISATIONS		
PUBLIC TRANSPORT PROF.		

b. Workshop activities

Before the workshop, guests were invited to fill in an online form describing what they like and dislike about travelling around London as well as their impressions of sending or receiving parcels and post. This gave us a baseline understanding of the issues that people might consider important about mobility in the city.

On arrival, guests were asked to fill in a couple of simple questionnaires about themselves and their knowledge and attitudes to driverless vehicles.

About me...

My name is ....

I am aged...	0 - 20	20 - 40	40 - 60	60 - 80	over 80	prefer not to say

I work as ....
prefer not to say

A little bit about me:
....
....
....
....

I am most familiar with the term...

☐ autonomous cars / vehicles
☐ driverless cars / vehicles
☐ robotic cars / vehicles
☐ self-driving cars / vehicles
☐ other ....

>

I would describe them as...
....
....
....
....

My current knowledge of them is...

very limited	limited	average	good	v good /expert

How do you feel about them?...

positive unsure negative
☺ 😐 ☹

I think driverless cars will be:

☐ cost effective   ☐ expensive
☐ good for the   ☐ bad for the
  environment   environment
☐ safe   ☐ dangerous
☐ privately owned   ☐ shared vehicles

This also asked them to decide whether driverless vehicles were good or bad for the environment, safer or more dangerous than existing vehicles, cost effective or expensive, and whether they would be mainly privately owned or shared.

They also had an opportunity to describe their view of future technology in the city and what they would you like to spend their time doing when traveling in a driverless car.

To kick start the session we shared a short clip from Minority report, explaining that Hollywood technologists have already imagined a driverless future and this is an opportunity for the public to shape the future that they want rather than leaving it to futurologists.
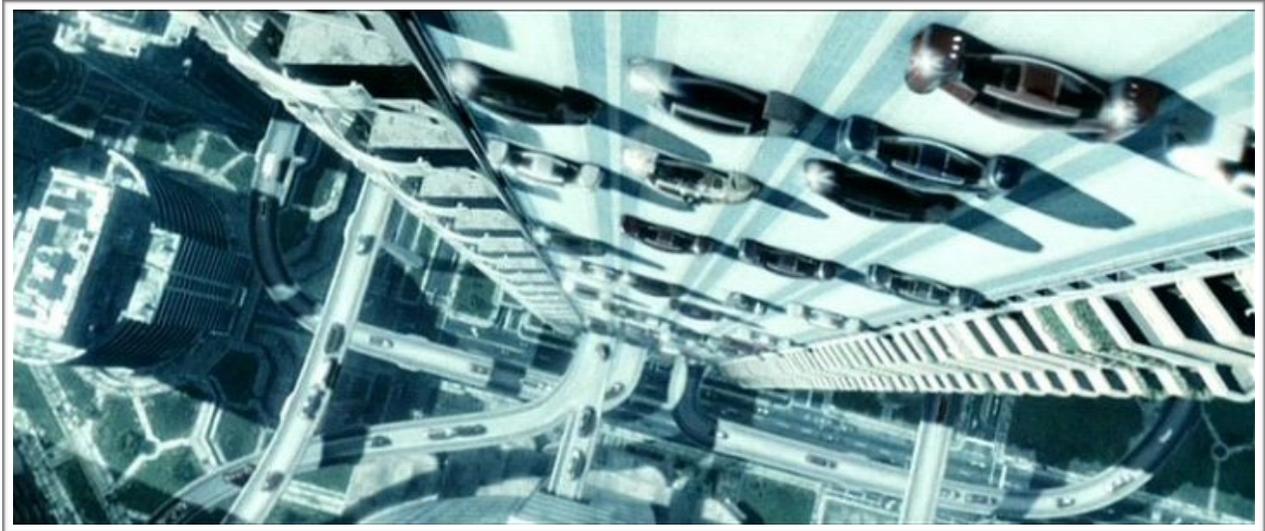
We then divided the participants across four tables so that smaller groups could engage in deeper conversations with the support of a facilitator from the Helen Hamlyn Centre for Design.

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The first exercise asked participants to write down all of their hopes around driverless vehicles. To help them, we highlighted the key areas that prior research has already established, including safety, cost, ownership, environment and other social and cultural issues.

Once participants had written down their personal thoughts, they worked together to share them and explain ideas in more depth. Our facilitators recorded the conversations for future transcription.

safety benefits

think about…
personal   cyclists
pedestrians   data privacy
other road users criminal activity
                  ethics

safety concerns

cost benefits

think about…
the vehicle   congestion charge
journeys   government / tax
parking   insurance
                  maintenance

cost concerns

ownership benefits

think about…
private service   sharing
personal vehicle taxi
renting   public
                  business

ownership concerns

environment benefits

think about…
road space   air pollution
green space   congestion
parking   pedestrian space

environment concerns

other benefits

think about…
employment   social
services   community
convenience   health
                  technology

other concerns

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This was then repeated, but with participants thinking about their fears and concerns for the future. We highlighted one potential dystopian future using a video-clip from WALL_E but left the participants to decide which elements of this were meaningful to them.

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After a break, we divided the groups into pairs and asked each team to develop a scenario for a current journey around London. They described what sort of journey they were taking, who was travelling, what they were carrying and the time and conditions on the journey.

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They chose a start and a destination and then mapped out all of the challenges that they might face on the journey. These included issues around getting to the vehicle, getting in and out, transporting baggage, activities and issues during the journey, traffic jams, changing modes of transport, refueling, parking and paying for the trip. We then asked them to imagine a driverless future and show how vehicles, services and city infrastructure might adapt to solve the problems that they had highlighted as well as creating a more delightful experience for all of the passengers.

We then asked the teams to create a checklist highlighting all of the elements that might help them to achieve this dream experience. Finally we gave the teams lego, plasticine, paper and pens and asked them to build a model of the driverless vehicle of their dreams and then explain the features that made this achievable.

Some teams produced three-dimensional models; others made notes and drawings and one or two focused on future infrastructure and smart city streets.

Our final task asked guests for feedback on the event and ways that we might improve the experience. The vast majority of people enjoyed the session (scoring an average of 4.5 out of 5) and felt that they had been able to contribute and learn from others in a creative and open space. We also asked participants if they had changed their views towards driverless vehicles.

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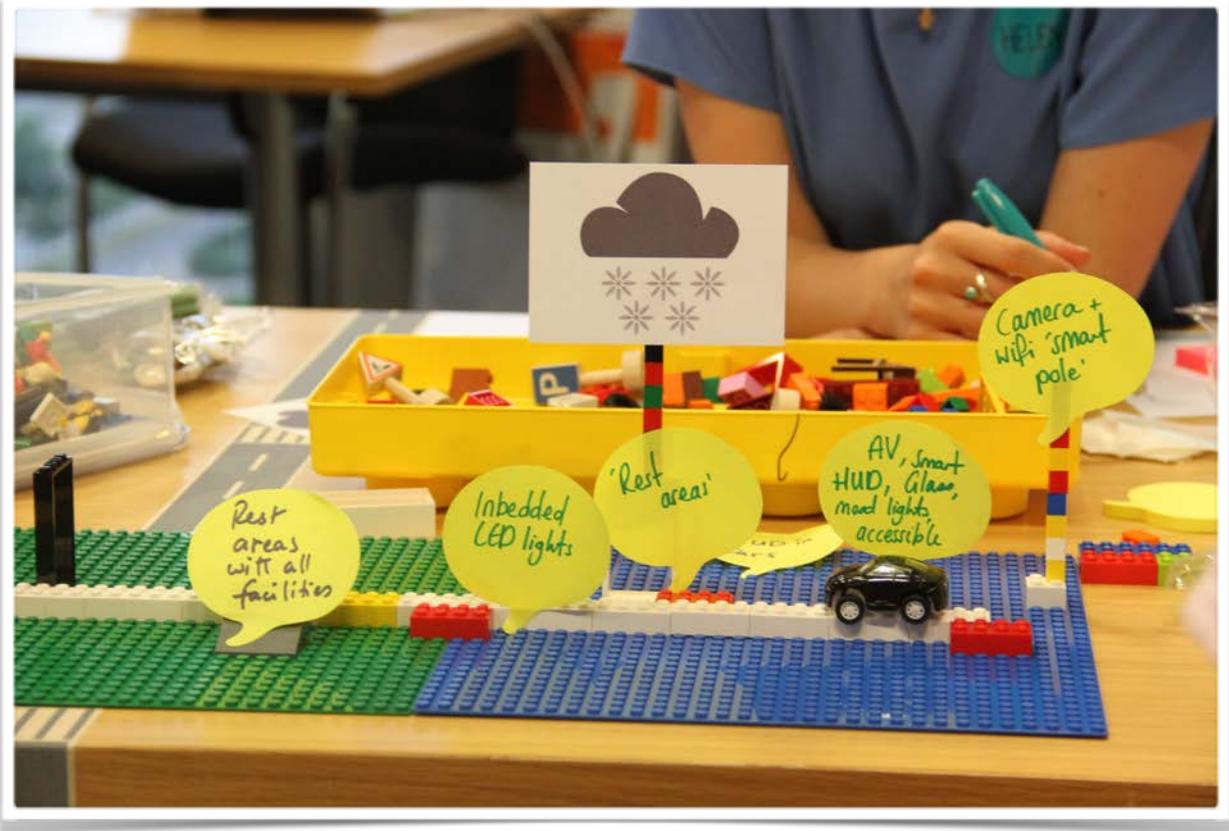
c. Qualitative approaches towards analysis

During the workshops we recorded all conversations, filmed highlights of the discussions as well as vox pops with individual participants and took photos of the teams and activities. We also worked with illustrators to create a real time record of the highlights. They captured some of the conversations, turned them into pictures for discussion and also created a record of the whole event for us to reflect on afterwards.
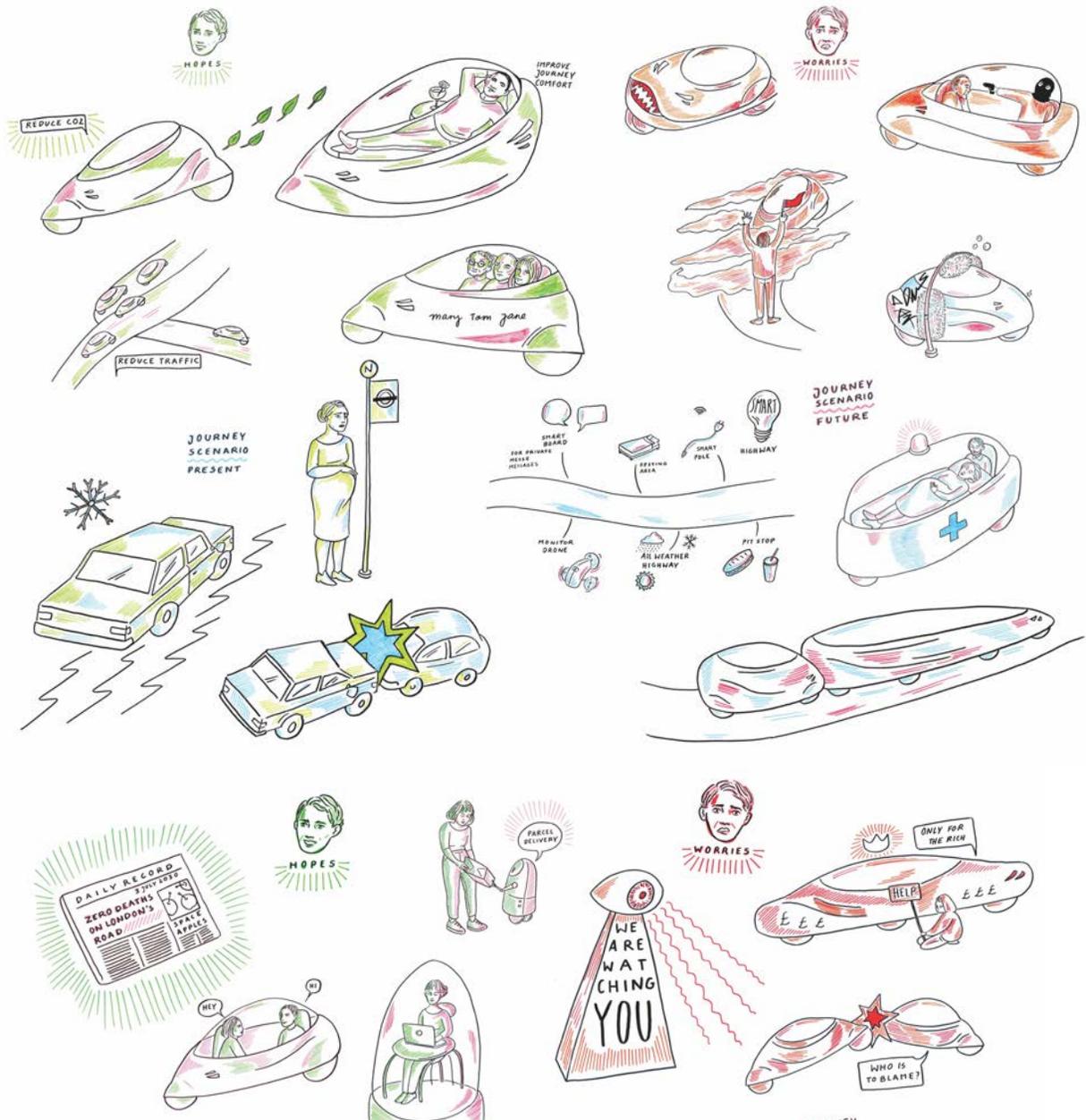
After the workshop we transcribed the audio recordings and used qualitative analysis software to organise information, highlight interesting quotes and identify concepts that might inform potential design opportunities and challenges. While not being over-prescriptive some of the areas that we were interested in identifying included the themes that we used in the hopes and fears activity (environment, safety, cost, ownership and social/cultural issues), people and their feelings, journeys and services, as well as features and qualities of vehicles or infrastructure that were discussed.
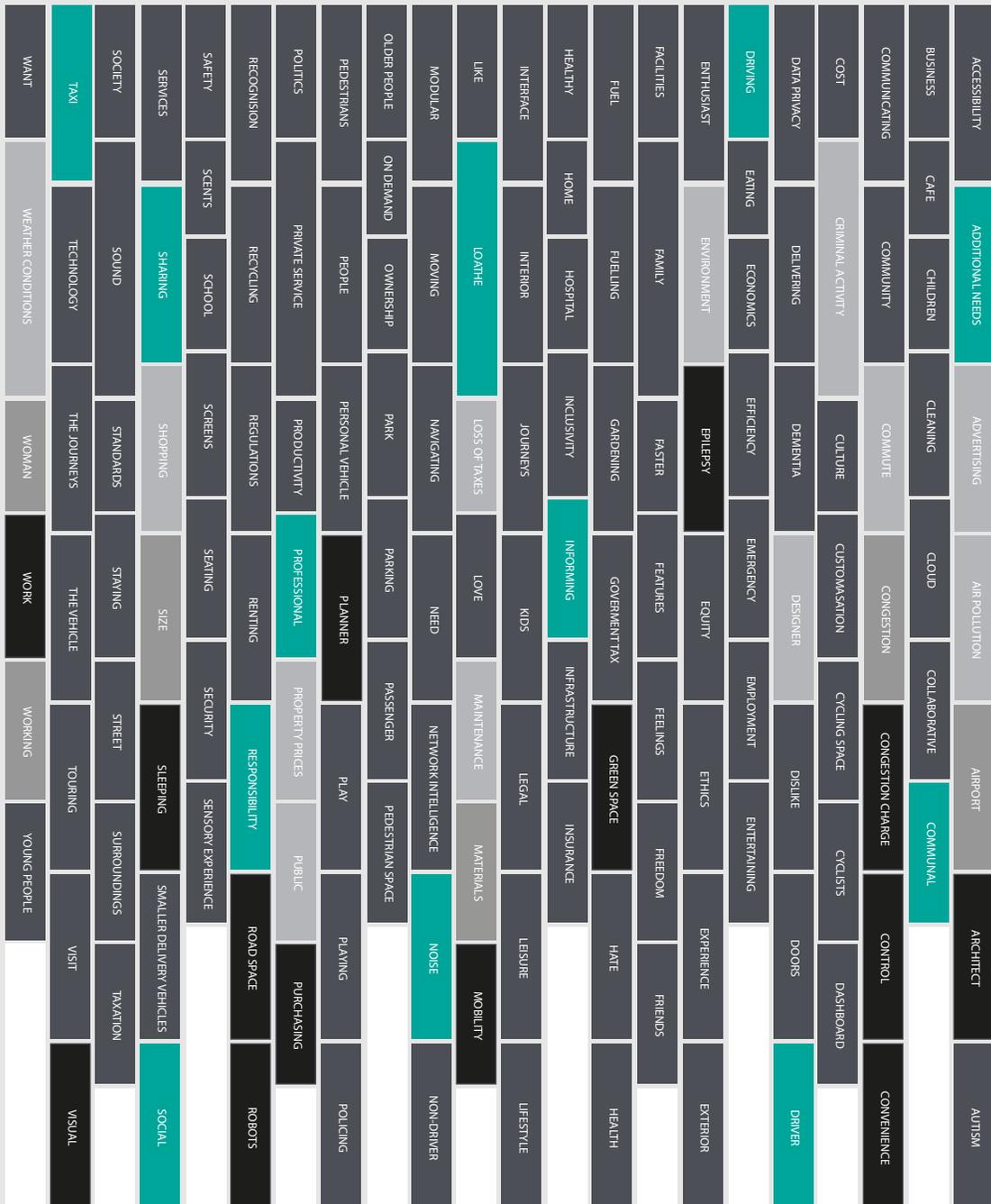
4.Preliminary Results

We are planning further engagements including meeting participants during the trial of the shuttle vehicle in Greenwich and as part of a public exhibition that we are developing, so the results that we are sharing here are still preliminary.

a.Current knowledge and attitudes
i.   Likes and dislikes about current journeys
People enjoy the density, flexibility and convenience of Public Transport in London, the opportunity to walk or cycle when conditions were good and the freedom and perceived improvements in choice, comfort and speed that came with personal vehicles.

public transport +

| density |
| flexibility |
| convenience |

personal vehicle +

| choice |
| comfort |
| speed |

better conditions needed -

| walking |
| cycling |

Conversely they expressed concerns around issues like traffic jams and congestion, overcrowding and delays, noise, pollution and unpleasant environments.

~~traffic jams~~

~~congestion~~

~~overcrowding~~

~~delays~~

~~noise~~

~~pollution~~

~~unpleasant environment~~

When they thought about packages and parcels, they felt that things were generally improving with faster deliveries, greater certainty around timing as well as innovations like shop-based lockers, pick ups and drop off, and the sheer delight and pleasure of receiving a hand-written postcard in an era that is becoming more and more digitised.

packages & parcels+

faster deliveries
better timing
shop based lockers
other innovations
pick-ups/ drop-offs
hand written postcards

Some found no pleasure in posting and parcels, with many expressing dismay around missed deliveries, damaged or lost parcels, increasing costs and the difficulty of moving things around town if they were overloaded or had additional needs.

packages & parcels -

| |
|---|
| **missed deliveries** |
| **damaged parcels** |
| **lost parcels** |
| **increasing costs** |
| **difficulty to move around town** |

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ii. Knowledge and attitudes

Most of our participants said they had a limited or average knowledge of driverless vehicles with only 6% saying that they were experts in the field.


8% very limited

18% limited

31% average

37% good

6% very good/expert
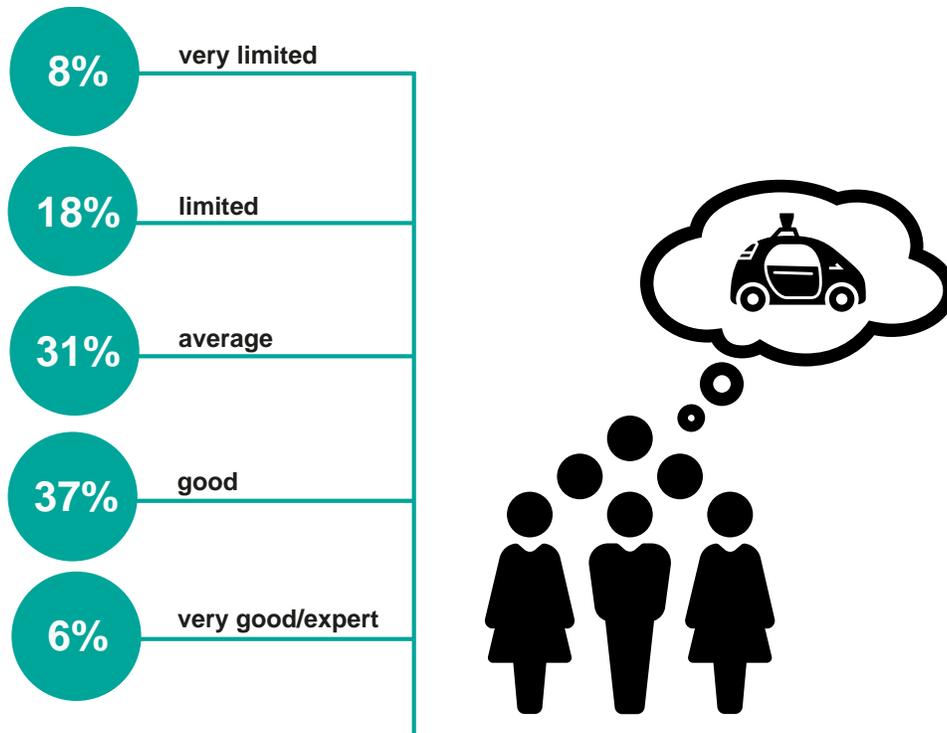
When asked how they would describe autonomous vehicles most used the terms driverless or self-driving with only 27% choosing autonomous.

44%
driverless

27%
autonomous

23%
self-driving

5%
robotic

1%
other
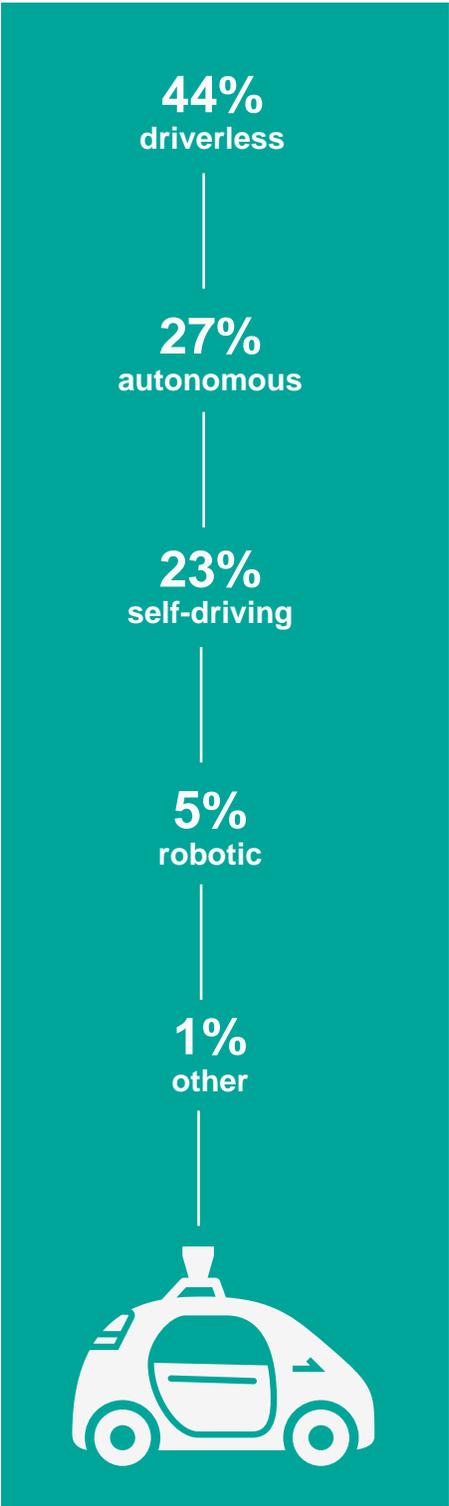
At the start of the workshops 75% of participants were positive about the technology, 24% were unsure and 1% were concerned, but by the end of the activities the number of positives had increased to 87% with only 13% still unsure. While changing attitudes was not the aim of the workshop, its important to note that active but neutral engagement with the general public is an important way of allowing people to change their attitudes, at least in the short term.

More detailed attitudes to driverless vehicles were also generally 'positive'.

89% felt they would be safer than current vehicles, 73% that they would be shared rather than owned, 75% that they would be cost effective rather than expensive and nearly everyone thought they would be better for the environment. Hidden within these attitudes are fundamental hopes for a safer, more inclusive, cleaner and calmer city where streets and places are designed for people rather than for vehicles and the supporting infrastructure that currently dominates their design.

Environment 99%

Safety 89%

Cost effective 75%

Shared ownership 73%
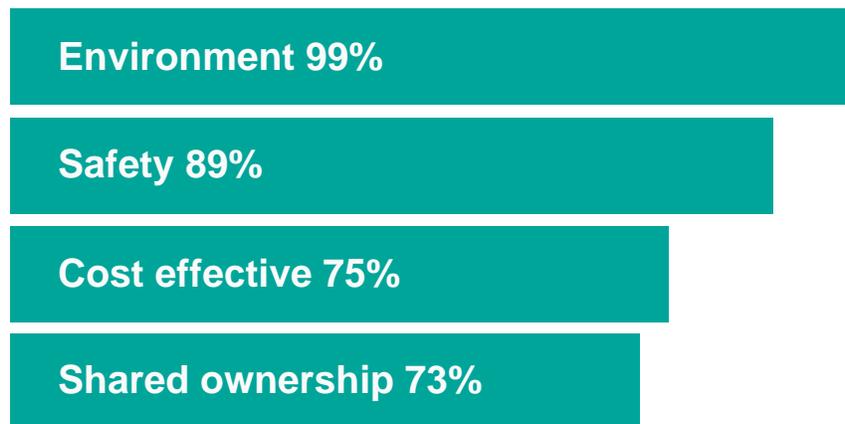
Many participants thought that driverless vehicles were the future of transport in the city, and the network of vehicles and sensors would create an exciting, efficient and potentially revolutionary transformation in how cities develop both spatially and economically.

As for the activities that they imagined doing in them, they mainly reflected current behaviours on public transport such as reading, watching media, chatting with friends or having a nap. Some expressed the desire to watch the world go by, explore new places or chat with fellow passengers. Designing with these activities in mind rather than simply designing vehicles as a transport utility might open up opportunities for new services, new social patterns and different types of economic activity.
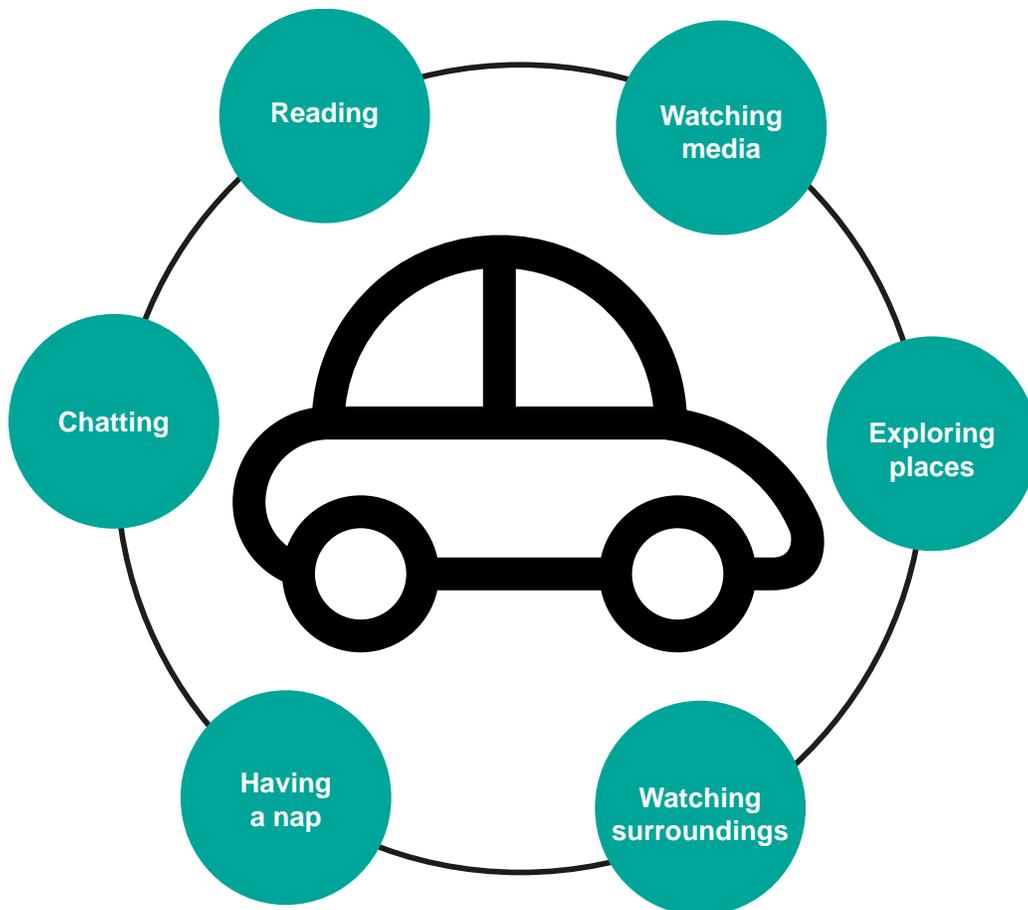
b. Hopes and Fears

Over the eight workshops, people shared over 700 'hopes' and a similar number of 'fears'.

Major hopes centred on the freeing up of time, as cities become less congested and the time during journeys becomes more useful and valuable. They felt that driverless vehicles would create healthier and safer city environments leading to less stress, less pollution-related illness and more social and convivial streets and journeys.

Hopes

Travel on Demand

Redesign our streets

Driverless vehicles for all – accessible and affordable transportation

No need to park
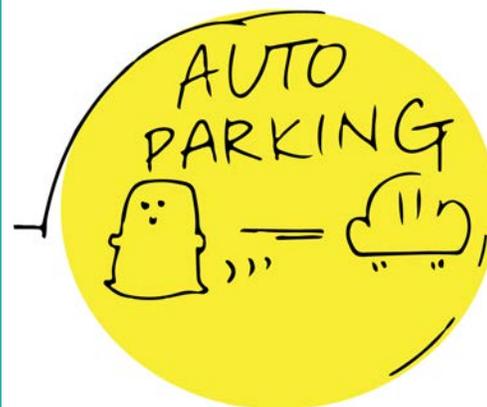
A spare room we can take on our travels

More time to do fun or useful things on journeys

Quiet, clean and pollution free

More comfortable commutes & journeys

Self - cleaning cars

Safe streets, even for hedgehogs

Driverless vehicles for the public good

Smaller vehicles as you don't need to pay for the driver

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People's concerns included the impact on employment as 'robots' take over existing jobs and economic activities, fears around data privacy, the ethical judgement of autonomous but supposedly intelligent vehicles, the loss of independence that might come when driverless vehicles control how we use the street, the challenges of cybercrime and the impact that on-demand vehicles will have on people's health as they find it easier and cheaper to get door to door transport rather than walking or cycling around town.

Fears

Compete with public transport making streets even busier than before

City will grow as people accept longer 'useful' journeys

Shared dirty not cared for vehicles

'Big Brother' – always

Vehicles create a lonely isolated and more disconnected environment

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Always connected - work, work, work

City will grow as people accept longer 'useful' journeys

Job losses and loss of skills

The noise from all those flying drones

Low cost door-to-door vehicles encourage laziness
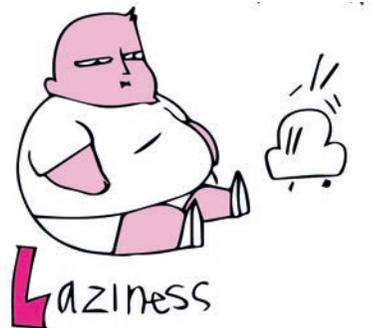
Ethical dilemmas around accidents

Inhumane and robotic systems that are pre-programmed and dull

An invisible network that makes the city less legible

**Dead high streets as more
and more is delivered by
just in time vehicles**

**Vehicles start to tout for
business**

Each of these hopes and fears can translate into opportunities for specific design studies that allow us to challenge purely functional requirements and create better social experiences and outcomes.

c. Current Challenges and Future Opportunities

Participants identified a wide range of challenges on their hypothetical journeys around London. These included obvious issues including congestion, bad weather, problems with parking and accidents en-route, but also personal and interpersonal issues such as lack of space, arguments between passengers, the need for step free access and the common problem of needing to find a toilet en route.

So, how did driverless vehicles and systems help to solve these challenges? Journey planning issues were solved by on demand services where vehicles could be ordered to meet specific needs; intelligent highway and maintenance systems helped to reduce problems associated with vehicle breakdowns or road works; and the interiors of vehicles had features that helped to deal with the social challenges of traveling together. For families, vehicles supported more playful experiences for children, less stress for the parents and even hygiene features like a mobile toilet. For cyclists, intelligent systems delivered on-demand bike repairs while public transport allowed people to transport a bike on a shared bus if the weather took a turn for the worse. People with additional needs could travel with their friends or family rather than using a mobility scooter while shoppers could send their purchases home in a separate 'goods pod' while they met up with friends or went for a meal.
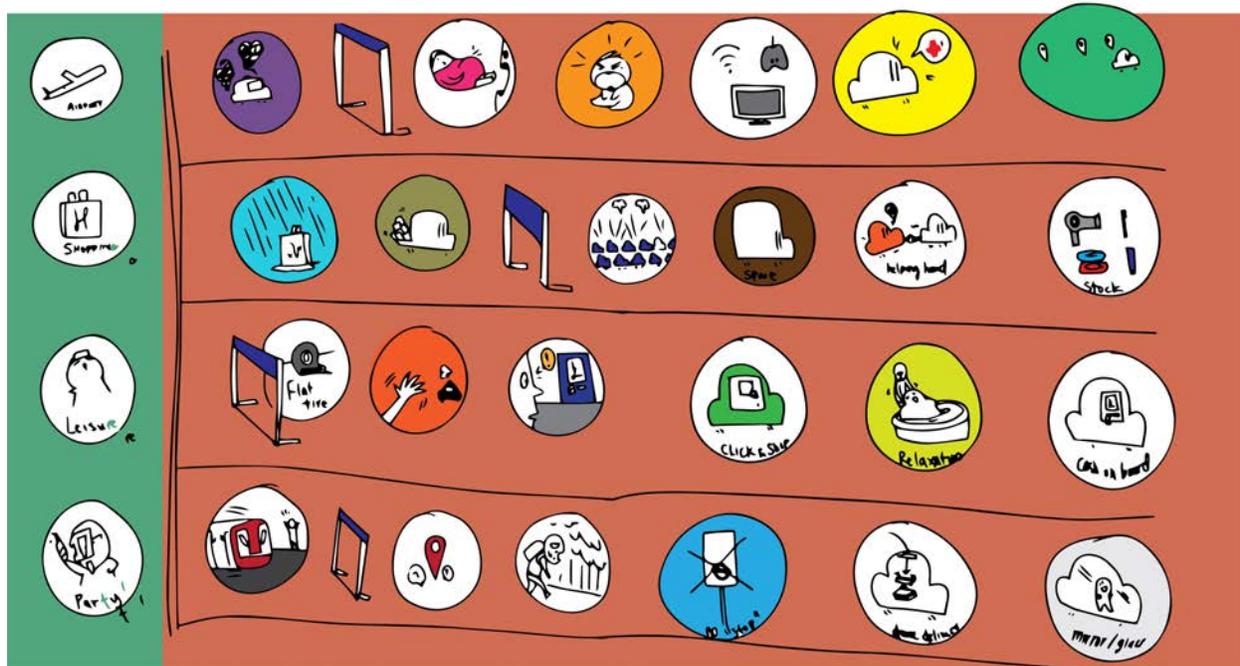
d. Experience Features and Future Vehicles

These opportunities were converted into checklists and 3D models that described the future driverless experience for our participants. Features ranged from the simple and mundane to the exotic and far-fetched. Many of the vehicles were delivered on-demand and set up with a range of features that were suited to the type of journey. The basic requirements included:

- **easy access via ramps or sliding doors;**

- **adequate space for everyone and everything including children, pets and luggage;**

- **personalisation of entertainment systems to suit individuals or groups;**

- **comfortable chairs and space that support different activities including work, play and individual contemplation;**

More radical ideas included:

- **beds;**

- **massage chairs;**

- **fridges to store on-demand food;**

- **waste disposal systems to deal with leftovers;**

- **exercise machines;**

- **toilets;**

- **showers to keep fit or freshen up on the go;**

While people with additional needs were particularly concerned about the overall sensory environment, they were not alone in wanting a safer, pleasant and engaging environment.

- **the soundscape should be attractive but audibly different so that guide dogs and blind people were aware of these potentially silent machines;**

- **materials soft but easy to clean;**

- **air should smell pleasant;**

- **windows should be fully adjustable to create entertainment spaces, to transport passengers into a different experience or to connect them more intelligently to the city that they are travelling through;**

The vehicles were serviced by a range of just in time support services including separate goods vehicles, mobile food delivery systems, maintenance and refuelling systems that were connected to and controlled by intelligent assistants.

Many of these features show that people see driverless vehicles in a completely different light to existing transport services, more akin to mobile homes, workspaces and hotels than cars, buses and trains.

5.Conclusions

This public engagement has shown a real appetite to reimagine our road-based transport systems from the ground up, not simply to retrofit 'autonomy' to existing vehicles but to radically reimagine how we use transport for our benefit.

When thinking about adoption patterns it becomes clear that the innovators and early adopters in this space might well include people who are currently excluded from driving including those with additional needs and the elderly. The early majority may be people who do not actually enjoy the current driving experience (which incidentally appears to be the majority of city-dwellers) and would prefer to spend time with their families and friends or focusing on work than guiding a vehicle through busy streets. The driverless laggards may be 'motoring enthusiasts' who enjoy being behind the wheel for a variety of reasons – whether because the vehicle is an extension of their personality or because the experience itself is enjoyable no matter the external conditions.

		34% **Early majority**	**34%** **Late majority**	
	13.5% Early **adopters**			
2.5% Innovators				**16% Laggards**

excluded
from driving
-
additional needs
-
elderly

people who do not
enjoy driving

people who rather
focus on something
else

motoring
enthusiasts
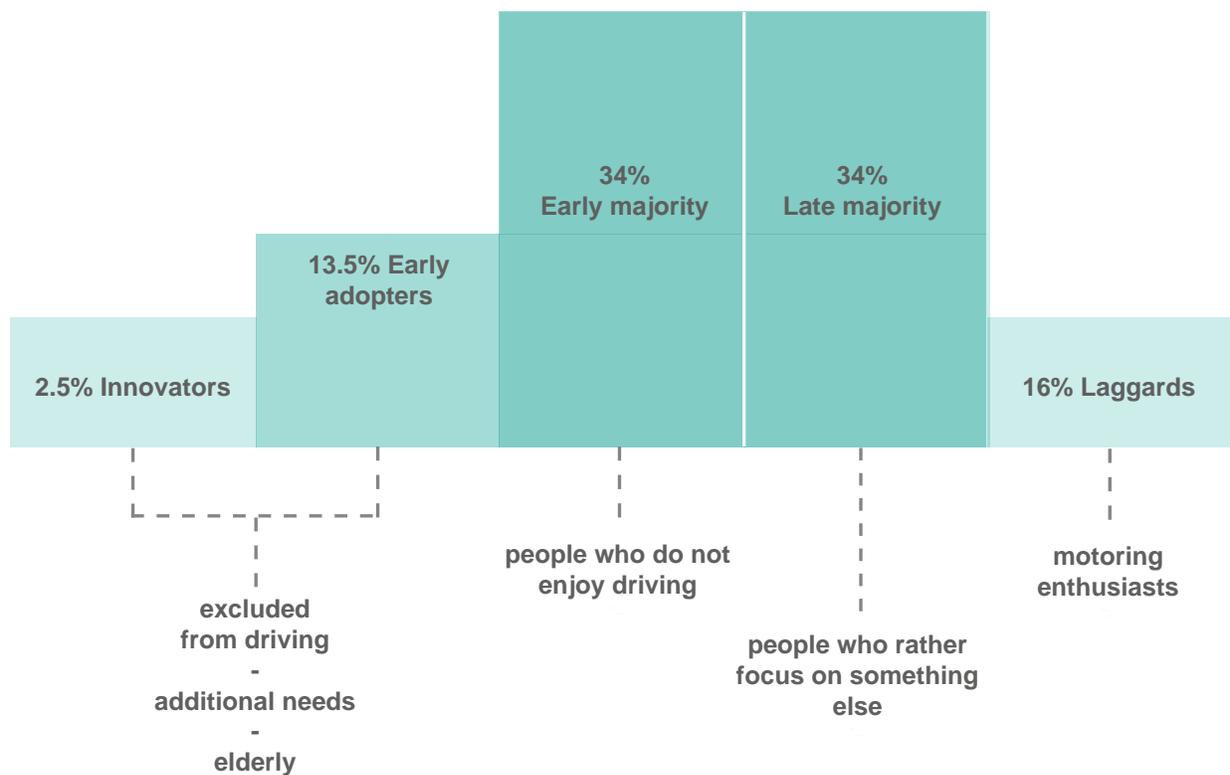
6. Design Opportunities and Challenges

1. Designing without robots - A Natural City

- Just in time driverless vehicle infrastructure will destroy many local shops. What happens to high streets?
- London's attractiveness has been destroyed by traffic. How can driverless vehicles help?
- What will 'a driverless vehicle free day' feel like? 'Anti-robot day'

2. Designing with 'Big Brother'

- How do we design the city/ for positive 'Big Brother'?
- Security - How do we know what is in a package or car?
- How do we deal with criminal activity/unsafe use?
- Challenge around ethics/control etc.?
- How do we design driverless vehicle to give people control especially in dangerous situations?

3. Designing for public service

- How can you make public driverless vehicles more desirable?
- How do we personalise driverless vehicles to increase acceptance?
- Public/private - what's the difference between public (single control e.g. tfl) and private competition (systems competing)?
- Impacts of driverless vehicle's on social inclusion?
- Create a truly public mobility platform integrating driverless vehicle and other shared services… go beyond moving people to city goods a service.
- Design driverless vehicle's as a 'cloud' service...what do it look like/feel like? (What are the attributes of clouds...reliable, available, scalable, secure, high quality, well supported, SLAs…)
- Robots on wheels…. How do we design robot driverless vehicles to be friendly and engaging in the context of city life?

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4.Designing the materiality of the driverless vehicle experience

- How can driverless vehicle service be made visible in city (beyond mobile app) (bus countdown) e.g. image future, 'legible London' sign with available mobility options…
- Everyone has the drivers seat
- Inside out. Design driverless vehicle's to look inwards. Design driverless vehicle's to look outwards
- Design driverless vehicle's to adjust automatically to seasons/weather/open top/ changing colour/ etc./warm and cosy/open for sunny…
- Organic material

5.Designing around health

- Street anger - will driverless vehicle reduce aggression...How will this work?
- Healthy travel
- How can we design a city that encourages well-being?
- Stress - How does driverless vehicle reduce this? Not enough to say you won't have to worry..
- How does driverless vehicle work with the river?

6.Designing for adoption and transition

- Overwhelming? How do we design the change so we are not overwhelmed by it?
- Cost of exchange (transition/adoption)
- Cultural change. How do we design the experience of cultural transformation?
- How we design for mixed use?
- How can we design a pod to convert traditional to driverless vehicle's?
- Large infrastructure, distribution interchanging, smaller infrastructure. Design driverless vehicle for London. Adoption of driverless vehicle challenge. Driverless vehicle zones - oxford st. = driverless vehicle and/or Soho = driverless vehicle (different vehicle types)
- Driverless vehicle's and zoning (home, work, play, school) different speeds and characteristics (Barcelona mega blocks)
- Can we really replace existing street infrastructure (bus stops, traffic lights, etc.)
- Driverless vehicle infrastructure that works with pedestrians and cyclists and promotes healthy lifestyles

7.Designing the integrated city infrastructure

- **Hop on/hop off driverless vehicle system (like travelators, San Fran tram, a boris bikes)**
- **Boarding is like a battle! Especially if disabled - How will driverless vehicle improve this?**
- **Driverless vehicle system to encourage safer city. Driverless vehicle speed zones - shop/school/home = walking speed, main roads-running speed**
- **Driverless vehicle system to encourage safer city -pavement =walking speed, -cycle/ close = trotting, -centre lane =running**
- **How do vehicle sizes change when you don't have to pay for the driver?**
- **Create smoother transitions between different modes (NB-sliding doors, inside/ outside, bikes, cars, trains, walking)**
- **How can driverless vehicle fit into an integrated mobility solution, including walking, buses, cycling, trains**
- **Convoy! What does a convoy of driverless vehicle look like in a city… (swarm/flock/ platooning etc.)**

8.Designing for parcels not people

- **Driverless vehicle system as mobile post boxes?**
- **Deliveries to follow you instead of going to an address**
- **Design driverless vehicle delivery to encourage 'surprise' and 'develop love' - people with additional needs benefit from deliveries, but may lose contact with people**
- **More lockers to store things...How where? How to bots put thing in and take them out?**
- **Zipvan for delivery (driverless vehicle version can do more?)**
- **Could driverless vehicle reduce the cost of sending postcards and letters?**
- **What does city look like with thousands of mini delivery bots? Is there a better way to design this?**

9.Designing around cost

- **Grading different levels of services (travel on budget, expenses how time affect it?)**
- **How to make driverless vehicle part of the oyster system including freedom pass/ monthly unlimited/off-peak etc.**
- **Travel is expensive - what does a low cost driverless vehicle system look like? (the extremes of services)**

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10. Communicating driverless vehicle future

- **Intriguing? How do we design to make driverless vehicles less intriguing and more natural?**
- **Industrial revolution! What is the film that communicates the nature of this industrial revolution?**
- **Driverless vehicles for density - How to design DV for effective movement of millions of commuters (with comfort, safety, speed etc.)**

11. Designing for comfort and cleanliness

- **What does London look like with vehicles that are used 80% of the time (not 5%) and how do we charge/maintain them (don't trust the optimists)**
- **Noise - driverless vehicles that is quiet but not silent**
- **Smell - driverless vehicles that deal with unpleasant odours**
- **Challenge of powering and maintaining hundred and thousands of driverless vehicles - where and how?**
- **Challenge of keeping vehicles clean (think public transport textiles/materials etc.)**

12. Designing for social employment

- **Human's needs not apply**
- **What are alternative jobs in the city for 'ex-drivers'? (think Olympic Ambassadors/ healthy and safe environments - supported by driverless vehicle machines)**
- **White van - city repair/makerspace as a service?**
- **Create opportunities for people to participate in society (especially excluded)**

13.Designing the experience

- **How does driverless vehicle encourage better relationships between travellers - empathic experience (e.g. travel together if in same school, workplace, industry, interest) - BN..Echo Chambers!**
- **Environment for people to contemplate while travelling**
- **What does an on demand city look like? -uber? Clickable city**
- **Design driverless vehicles to help people explore the city -connecting up 'walking' tours -'feel lucky'**
- **How do we create delightful journeys?**
- **How can TFL support change from 'functional' service to 'experience-led'? Difference between e.g. serviced offices and co-work studios) - obscure**
- **Connect driverless vehicles service to all the great events, places and people in London (airbnb/visit London etc.)**
- **How does it mean to control the total experience of driverless vehicles journey? - social environmental qualities**
- **driverless vehicle's contribute to knowing my city (what's on, where to go, history etc)**
- **Individually lost! How do we manage traffic and congestion without feeling like you are in the matrix**
- **Design to encourage spontaneity and serendipity rather than pre-programmed routes (hop on/hop off etc.)**

7.Next Steps

These conclusions are not exhaustive and we will continue to develop design principles and road maps for potential roll-out of vehicles, services and infrastructure based on further engagement with the wider public.

Our next steps include follow on workshops, design-led responses with teams of designers from the Royal College of Art, and exhibitions that share our explorations and those of our partners with the general public at the London Transport Museum and on the Greenwich Peninsula.

8.References

a.Literature Review
b.Expert Interviews
c.Media Findings
d.Background Research

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